Initial Environmental Examination

April 2012

IND: Jammu and Kashmir Urban Sector Development Investment Program — Jammu City Water Supply Subproject

Prepared by the Economic Reconstruction Agency Government of Jammu and Kashmir for the Asian Development Bank.

ABBREVIATIONS

ADB	-	Asian Development Bank
ASI	-	Archeological Survey of India
BIS	-	Bureau of Indian Standards
CBD	-	central business district
CTE	-	consent to establish
СТО	-	consent to operate
CPCB	-	Central Pollution Control Board
	_	Central Public Health and Environmental Engineering
OFFICEO		Organization
CPS	-	central pumping station
DI	-	ductile iron
DMA	-	District Metering Area
DSC	-	design and supervision consultancy
EA	-	executing agency
FAC	-	Expert Appraisal Committee
EARE	-	Environment Assessment and Review Framework
FC	_	environmental clearance
	_	environmental impact assessment
	-	environmentar impact assessment
	-	
	-	Economic Reconstruction Agency
	-	
GLSR	-	ground level service reservoir
GOI	-	Government of India
GPH	-	gallon per hour
GRM	-	grievance redressal mechanism
HDPE	-	high density poly-ethylene
IA	-	implementing agency
IEE	-	initial environmental examination
IST	-	Indian Standard Time
J and K	-	Jammu and Kashmir
JDA	-	Jammu Development Authority
JKUSDIP	-	Jammu and Kashmir Urban Sector Development
		Investment Programme
JMC	-	Jammu Municipal Corporation
LG	-	Lac gallon
LHS	-	left hand side
LPCD	-	Liter per capita per dav
MFF	-	multi –tranche financing facility
MI	-	Million liter
MLD	-	million liter per day
MoEE	-	Ministry of Environment and Forests
MSW/	_	municipal solid waste
MT	-	matricipal solid waste
	-	mente total rainfall
	-	notional ambient air quality standarda
NAAQ5	-	
	-	national nighway
OHI	-	over nead tank
OM	-	operations manual
PIU	-	project implementation unit
PMU	-	project management unit
PM _{2.5}	-	particulate matter below 2.5 micron particle size
PM ₁₀	-	particulate matter below 10 micron particle size
PSC	-	project support consultant

PUC	-	pollution under control
PWD	-	Public Works Department
RCC	-	reinforced cement concrete
REA	-	rapid environmental assessment
RF	-	resettlement framework
RHS	-	right hand side
RP	-	resettlement plan
ROW	-	right of way
RSPM	-	respirable suspended particulate matter
SPCB	-	State Pollution Control Board
SPM	-	suspended particulate matter
SPS	-	safeguards policy statement
STP	-	sewage treatment plant
TMP	-	traffic management plan
ToR	-	terms of reference
UEED	-	Urban Environmental Engineering Department

WEIGHTS AND MEASURES

cm	-	centimeter
crore	_	100 lac = 10,000,000
cumec	_	cubic meter per second
lac	_	100 thousand = 100,000
Kanal	_	505.39 square meter
km	_	kilometer
kph	-	kilometer per hour
lpd	_	liters per day
m	_	meter
m ²	_	square meter
mg/l	_	milligrams per liter
mm	_	millimeter
MSL	-	mean sea level
μ	-	10 ⁻⁶ meter
µg/m³	-	micrograms per cubic meter

NOTE{S} In this report, "\$" refers to US dollars. "INR" and "₹" refer to Indian rupees

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EXECUTIVE SUMMARY

1. Economic Reconstruction Agency (ERA) has undertaken Jammu and Kashmir Urban Sector Development Investment Program (JKUSDIP), financed by the ADB through Multi-Tranche Financing Facility (MFF). The total estimated cost of the program is about US \$485 millions, out of which \$300 million will be financed by ADB.

2. The primary objective of JKUSDIP is to promote economic development in the State of Jammu and Kashmir (J and K) through expansion of basic services such as water supply, sewerage, sanitation, drainage, solid waste management, urban transport and other municipal functions in Jammu, Srinagar and other important urban centers of the State. JKUSDIP will also strengthen the service delivery capacity of the responsible state urban agencies and urban local bodies through management reform, capacity building and training.

3. The program is to be implemented in 4 to 7 tranches over a period of 8 years. Each tranche constitutes a separate Ioan. Tranche I (Project-1) of JKUSDIP (Loan 2331–IND) is under implementation. One of the subprojects identified under Tranche 2 (Project-2) JKUSDIP is the rehabilitation of water supply system in Jammu city to improve the water supply system in the area.

4. The major objectives of rehabilitation of water supply system in Jammu city are: (i) to continue implementation of water loss reduction program in 5 subzones of Phase – IV, thus reducing the current water loss from existing 30-45% to 20% resulting in net water saving of about 3.50 MLD; (ii) to start up with the metered domestic connections in areas of improved water supply; (iii) to improve operational efficiency of the pumping machineries and reduce energy costs as well as operation and maintenance costs in water production; and (iv) to provide water in required quantity as per norms in water deficit areas and provide piped water supply in uncovered areas. The proposed subproject is expected to have the following benefits:

- (i) The rehabilitation of distribution network will result into substantial reduction in water losses in the project area from existing 30 45% losses to 20% losses.
- (ii) There will be proper accounting for use of water and system losses by installation of metered connections.
- (iii) The replacement of electrical and mechanical equipments of tube wells and central pumping stations will result in appreciable enhancement in running efficiency of water production and distribution system and corresponding energy saving of more than 5 lac units (kwh) per month.
- (iv) Enhancement in production and storage capacity by construction of new tube wells and over head tanks will result in supply of adequate volume of potable water to the designated areas thereby reducing the problems associated with scarcity of water.

5. The legal framework and principles adopted for addressing environmental issues in the proposed subproject have been guided by the existing legislation and policies of the Government of India, Government of Jammu and Kashmir, Asian Development Bank and the Revised Environmental Assessment and Review Framework (EARF)¹ adopted for the Tranche 2

¹ The EARF has been revised to be aligned with ADB's Safeguard Policy Statement 2009. The original EARF was prepared for JKUSDIP in accordance to ADB's Environment Policy 2002. However, with implementation of SPS 2009, the EARF was required to be revised for Tranche-2 and subsequent tranches of JKUSDIP.

of JKUSDIP.

6. Indian laws and the ADB Safeguard Policy Statement (SPS) require that environmental impacts of development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels.

7. The subproject comprises of (i) laying new rising mains from proposed tube wells to over head tanks / ground level service reservoirs for a length of 14.8 km; (ii) rehabilitation of about 67 km of distribution pipeline in 5 subzones of Phase – IV; (iii) installation of 8000 house connections with water meters in Gandhi Nagar and Shastri Nagar areas of Jammu city; (iv) rehabilitation and replacement of worn out pumping machinery and electrical equipment at pumping stations and tube wells and (v) construction of 19 tube wells, and 10 overhead tanks in water deficit areas of Jammu city.

8. The subproject site is located in the built-up area of Jammu city, the winter capital of Jammu and Kashmir. Jammu city is situated at an average altitude of 312m² above mean sea level in the foothills of lower Shivaliks. The subproject site is not within or adjacent to environmentally sensitive areas such as cultural heritage site, protected area, wetland, buffer zone of protected area and special area for protecting biodiversity. No water courses occur within the subproject corridor, however, river Tawi flows through the area bisecting Jammu city into two parts.

9. The design of proposed subproject has taken into consideration the establishment of an efficient water supply system by minimizing water losses due to leakages in pipelines and non revenue connections, augmentation in adequacy of drinking water supply at the user end, minimizing the risks of contamination associated with leakages, enhancing the efficiency of existing tube wells and pumping stations and providing adequate infrastructure facilities for production and storage of water in deficient areas. Planning principles and design considerations have been reviewed and incorporated into the site planning process whenever possible thus environmental impacts as being due to the subproject design or location were not significant. However, the social impacts (access disruptions) due to construction activities are not avoidable as the residential and commercial establishments exist along the subproject corridor. A Resettlement Plan has been developed in accordance with ADB SPS 2009 and Indian laws and regulations.

10. Anticipated impacts during the construction period include temporary disruption of services during realignment of existing utilities along the corridor; temporary closure of roads for laying of pipelines; interference with accesses to properties and businesses due to construction works; risk of accidents associated with vehicular traffic and transport of materials; increased volume of construction vehicles on the roads may lead to increased wear and tear of roads in the vicinity of the subproject sites; and exposure to increased noise, dust, vibrations; hazardous chemicals (oils and lubricants) and waste materials. An Environmental Management Plan (EMP) has been developed to provide specific actions deemed necessary to assist in mitigating the environmental impacts, guide the environmentally-sound execution of the proposed subproject, and ensure efficient lines of communication between the implementing agency, project management unit, and contractors. The EMP also provides a pro-active feasible and practical working tool to enable the measurement and monitoring performance on site.

² Source: Central Ground Water Board (Ground Water Information Booklet Jammu District, Jammu & Kashmir).

11. Anticipated impacts during operation and maintenance include improvement in water supply system and healthy environment; significant enhancement in quantity and quality of supplied water to water deficient areas; significant reduction in water losses and contamination due to leakages in distribution network; proper accounting of water by metering of connections; and the rehabilitation of water supply system is expected to give a boost to the overall development of presently water scarce areas. In general, rehabilitation of the water supply system shall provide broader impetus for the redevelopment of the surrounding areas and the Jammu city as a whole.

12. The public participation process included identifying interested and affected parties (stakeholders); informing and providing the stakeholders with sufficient background and technical information regarding the proposed development; creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments and concerns) with regard to the proposed development; giving the stakeholders feedback on process findings and recommendations; and ensuring compliance to process requirements with regards to the environmental and related legislation. The IEE includes the activities undertaken during project design to engage the stakeholders; and planned information disclosure measures and process for carrying out consultation with affected people and facilitating their participation during project implementation.

13. The subproject's Grievance Redressal Mechanism provides the citizens with a platform for redressal of their grievances and describes the informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance.

14. Therefore, as per ADB SPS, the subproject is classified as environmental Category B and does not require further Environmental Impact Assessment. As per Indian laws, the proposed subproject does not require an Environmental Clearance.

I. INTRODUCTION

1. Economic Reconstruction Agency (ERA) has undertaken the Jammu and Kashmir Urban Sector Development Investment Program (JKUSDIP), financed by the ADB through Multi-Tranche Financing Facility (MFF). The total estimated cost of the program is about US \$485 millions, out of which \$300 million will be financed by ADB. The primary objective of JKUSDIP is to promote economic development in the State of Jammu and Kashmir (J and K) through expansion of basic services such as water supply, sewerage, sanitation, drainage, solid waste management, urban transport and other municipal functions in Jammu, Srinagar and other important urban centers of the State. JKUSDIP will also strengthen the service delivery capacity of the responsible state urban agencies and urban local bodies through management reform, capacity building and training.

2. The program is to be implemented in 4 to 7 tranches over a period of 8 years. Each tranche constitutes a separate Ioan. Tranche I (Project-1) of JKUSDIP (Loan 2331–IND) is under implementation. One of the subprojects identified under Tranche 2 (project-2) of JKUSDIP is the Rehabilitation of water supply system in Jammu city.

3. The major objectives of rehabilitation of water supply system in Jammu city are: (i) to continue implementation of water loss reduction program in 5 subzones of Phase – IV, thus reducing the current water loss from existing 30-45% to 20% resulting in net water saving of about 3.50 MLD; (ii) to start up with the metered domestic connections in areas of improved water supply; (iii) to improve operational efficiency of the pumping machineries and reduce energy costs as well as operation and maintenance costs in water production; and (iv) to provide water in required quantity as per norms in water deficit areas and provide piped water supply in uncovered areas. The proposed subproject is expected to have the following benefits:

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- (iii) The replacement of electrical and mechanical equipments of tube wells and central pumping stations will result in appreciable enhancement in running efficiency of water production and distribution system and corresponding energy saving of more than 5 lac units (Kwh) per month.
- (iv) Enhancement in production and storage capacity by construction of new tube wells and over head tanks (OHT) will result in supply of adequate volume of potable water to the designated areas thereby reducing the problems associated with scarcity of water.

4. The legal framework and principles adopted for addressing environmental issues in the proposed subproject have been guided by the existing legislation and policies of the Government of India, Government of Jammu and Kashmir, Asian Development Bank and the Environmental Assessment Review Framework (EARF) adopted for Tranche 2 of JKUSDIP. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. According to the SPS, environmental assessment is required for all subprojects under a MFF modality.

5. An environmental assessment using ADB's Rapid Environmental Assessment (REA) Checklist for Water Supply (**Appendix 1**) was conducted for the proposed rehabilitation of water

supply system in Jammu City. The subproject comprises of (i) conditioning of the existing distribution networks in each subzone; (ii) rehabilitation / replacement of worn out pipelines. (iii) installation of service lines on two sides of the street for house connections; (iv) disconnecting all house connections made directly to distribution pipelines and reconnecting them with newly installed service lines; (v) installation of 8000 house connections with water meters in Gandhi Nagar and Shastri Nagar areas; (vi) replacement of worn-out machineries and electrical devices for 43 tube wells; (vii) replacement of worn-out machineries and electrical devices for 69 centrifugal pumps at 38 Central Pumping Stations; (viii) replacement of electrical devices, like panels, pumps and motors, cables, etc. in 38 pumping stations and 43 tube wells including essential repairs of related civil works; (ix) construction of 19 tube wells in water deficit areas and (x) construction of 10 overhead tanks to augment the deficient water supply in 8 district metering areas (DMAs) which currently have no overhead tanks and in 2 other DMAs having densely populated areas. Results of the assessment show that the proposed development is unlikely to cause significant adverse impacts. Thus this Initial Environmental Examination (IEE) report has been prepared in accordance to ADB SPS's requirements for environment Category B projects.

- 6. The IEE has been prepared to meet the following objectives:
 - (i) to provide critical facts, significant findings, and recommended actions;
 - (ii) to present the national and local legal and institutional framework within which the environmental assessment has been carried out;
 - (iii) to provide information on the existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence;
 - to assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socio-economic and physical cultural resources in the subproject's area of influence;
 - (v) to identify mitigation measures and any residual negative impacts that cannot be mitigated;
 - to describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation;
 - (vii) to describe the subproject's grievance redressal mechanism for resolving complaints about environmental performance;
 - (viii) to present the set of mitigation measures to be undertaken to avoid, reduce, mitigate or compensate for adverse environmental impacts;
 - (ix) to describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and
 - (x) to identify who is responsible for carrying out the mitigation and monitoring measures.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

7. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB's SPS, 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans and loans involving financial intermediaries and private sector loans.

8. **Screening and Categorization.** The nature of the environmental assessment required for a project depends on the significance of its 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. Projects are screened for their expected environmental impacts and are assigned to one of the following four categories:

- (i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.
- (ii) Category B. Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- (iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- (iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all Projects will result in insignificant impacts.

9. **Environmental Management Plan.** An EMP which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the Project's impact and risks.

10. **Public Disclosure.** ADB will post the following safeguard documents on its website so affected people, other stakeholders and the general public can provide meaningful inputs into the project design and implementation:

- (i) For environmental category A projects, draft EIA report at least 120 days before Board consideration;
- (ii) Final or updated EIA and/or IEE upon receipt; and
- (iii) Environmental Monitoring Reports submitted by PMU during project implementation upon receipt.

B. National and State Laws

11. The implementation of the subprojects will be governed by Government of India (Gol) and State of Jammu and Kashmir environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize/mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to

ensure subprojects are consistent with the legal framework, whether national, state or municipal/local. Compliance is required in all stages of the subproject including design, construction, and operation and maintenance.

12. **EIA Notification.** The Gol EIA Notification of 2006, as amended (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 require Environmental Clearance from the National Ministry of Environment and Forests (MoEF). Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The proposed subproject is not listed in the EIA Notification of 2006 "Schedule of Projects Requiring Prior Environmental Clearance" thus EC is not required.

13. Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments. Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act, 1974. These conditions regulate the quality and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the Project having potential to generate sewage or trade effluent will come under the purview of this Act, its rules and amendments. Such projects have to obtain Consent to Establish (CTE) under Section 25/26 of the Act from State Pollution Control Board (SPCB) before starting implementation and Consent to Operate (CTO) before commissioning. The Water Act also requires the occupier of such subprojects to take measures for abating the possible pollution of receiving water bodies. The subproject is not included in the lists of activities requiring CTE and CTO under the Water Act. However, the construction plants shall require CTE and CTO from SPCB for hot mix plants, wet mix plants, stone crushers etc, if installed for construction. Emissions and discharges shall comply with standards notified by the Central Pollution Control Board.

14. **Air (Prevention and Control of Pollution) Act of 1981, as amended.** The subprojects having potential to emit air pollutants into the atmosphere have to obtain CTE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from SPCB before starting implementation and CTO before commissioning the project. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution. The following require CTE and CTO from SPCB: (i) diesel generators; and (ii) hot mix plants, wet mix plants, stone crushers etc, if installed for construction. Emissions and discharges shall comply with standards notified by the Central Pollution Control Board.

15. **The Noise Pollution (regulation and control) rules, 2000, as amended**. Since the subproject corridor is located within the city, the construction activity and use of heavy machinery and vehicles may increase the ambient noise levels during the construction phase. It is considered necessary to regulate and control noise producing and generating sources with the objective of maintaining the ambient air quality standards in respect of noise. The occupier of subprojects have to take measures for abatement of noise pollution ensuring that the existing noise levels do not exceed the standards specified under the Noise Pollution (regulation and control) rules, 2000, as amended.

16. Ancient Monuments and Archaeological Sites and Remains Rules of 1959 and J and K Ancient Monuments Preservation (Amendment) Act of 2010. The Act and Rules designate the area within a radius of 100 meters (m) from the "protected property" as "prohibited area" and upto 200m from the boundary of prohibited area as "regulated area". No development activity (including mining operations and construction) is permitted in the "prohibited area" and all development activities likely to damage the protected property are not permitted in the "regulated area" without prior permission of the Archaeological Survey of India (ASI). Protected property includes the sites, remains, and monuments protected by ASI or the State Department of Archaeology. Some archaeological, historical monuments and religious places like Bahu Fort, Peer Mitha Tomb, Shahi Masjid at Mast Garh and Mubarak Mandi complex are located in Jammu City. However the locations of the subproject sites are beyond the prohibited and regulated areas.

17. Jammu and Kashmir Preservation of Specified Trees Act of 1969 and Rules of 1969, as amended. If cutting of scheduled trees is required during preparation of sites, permission will be obtained by ERA from the Sericulture/Revenue Department prior to commencement of construction works.

18. **Jammu and Kashmir Forest Conservation Act, 1997, as amended.** If cutting of forestry trees is required during subproject execution, permission to be obtained by ERA from the forest department prior to commencement of construction works.

19. Building and Other Construction Workers (Regulation of Employment and Conditions of service) Act of 1996 and Rules 1998, as amended. The Government of India has enacted this Act and is also applicable to the state of J and K. This act applies to all the building and other construction activities to which the provisions of Factories Act, 1948 and Mines Act, 1952 do not apply. The State Government, in pursuance of this act, has constituted a Welfare Board of building and other construction workers. This law aims to provide for regulation of employment and conditions of service of the building and other construction workers as also their safety, health and welfare measures in every establishment which employs ten or more workers. This act provides for registration of each establishment within a period of sixty days from the commencement of work and registration of building workers as beneficiaries under this Act. Compliance to provisions of health and safety measures for the construction workers in conformity with International Labour Organization (ILO) convention No.167 concerning safety and health in construction. The contractors engaged for execution of the subproject shall comply to the provisions of this Act.

20. The summary of environmental regulations and mandatory requirements for the proposed subproject is shown in **Table 1**.

Applicability of Acts/Guidelines	Compliance Criteria				
The EIA notification, 2006 (and its subsequent amendments in 2009) provides for categorization of projects into category A and B, based on extent of impact	The sub project is not covered in the ambit of the EIA notification as this is not covered either under Category A or Category B of the notification. As a result, the categorization, and the subsequent environmental assessment and clearance requirements, either from the state or the central Government is not triggered.				
The Wildlife Conservation Act, 1972, as amended and J and K Wildlife (Protection) Act 1978, as amended, provide for protection and management of Protected Areas	Clearance from state and national wildlife boards, Central Empowered Committee of Hon'ble Supreme Court of India and the State Wildlife Department, as applicable. The wildlife protection act is not applicable to the proposed subproject. The tube well construction site is located in built up area at a distance of about 320m from the boundary of the wildlife sanctuary.				

 Table 1: Applicable Environmental Regulations

Applicability of Acts/Guidelines	Compliance Criteria
Jammu and Kashmir Forest (Conservation) Act, 1997, as amended.	Clearance from Forest department for cutting of trees, if any. This act is not applicable to the proposed subproject as cutting of trees is not envisaged.
The Ancient Monuments and Archaeological Sites and Remains Act, 1958, and the rules, 1959 provide guidance for carrying out activities, including conservation, construction and reuse in and around the protected monuments.	Permission from the Archeological Survey of India for carrying out any construction activities within the prohibited and regulated areas of the ancient monuments and archeologically protected sites. The sub-project area does not fall within the prohibited/ regulated area or is situated close to any such site of archeological importance.
Water (Prevention and control of pollution) Act, 1974, as amended Air (prevention and control of pollution) Act, 1981, as amended and Noise Pollution (Regulation and Control) Rules, 2000, as amended.	Consent to Establish (CTE) and Consent to Operate (CTO) from the J and K SPCB for setting up of hot mix plants, wet mix plants, stone crushers and diesel generators. To be obtained by the Contractor, prior to construction.
The Jammu And Kashmir Preservation of Specified Trees Act, 1969 and Rules of 1969, as amended.	Permission from Forest/ Revenue Department /Concerned Deputy Commissioner for cutting of scheduled trees. This act shall not be applicable as the cutting of scheduled trees is not envisaged.
Building and Other Construction Workers (Regulation of Employment and Conditions of service) Act of 1996 and Rules 1998 provide for regulation of employment and conditions of service of the building and other construction workers as also their safety, health and welfare measures in every establishment which employs ten or more workers.	Registration of each establishment within a period of sixty days from the commencement of work and registration of building workers as beneficiaries under this Act. Compliance to provisions of health and safety measures for the construction workers in conformity with ILO convention No.167 concerning safety and health in construction

III. DESCRIPTION OF THE PROJECT

A. Existing Condition

21. Potable water supply distribution system was introduced in the city of Jammu in the year 1934 with surface source as river Tawi. Now the source of water supply to the city of Jammu is surface water from river Tawi and ground water tapped through number of tube wells located throughout the city.

22. Although, river Tawi is a perennial river, flow in the river is lean except in monsoon period. The surface water flow in the river Tawi is used for irrigation and water supply purposes. Only 23 MGD (103 MLD) surface water is reserved for water supply purposes. This limited available water is already tapped at existing water supply head works at Sitlee, Dhountly and Boria (intake well constructed under ADB Loan 2151-IND). Therefore, there is no further availability of surface water from river Tawi. Due to limited availability of surface water from river Tawi, remaining requirement of drinking water is met from the ground water sources (tube wells).

23. Population in Jammu city is increasing in range of 2.0-2.2% yearly. The population in Jammu city is estimated to 11,89,908 (Year 2011). With increase in population and establishment of new colonies in extended parts of Jammu city, the demand of water supply is also increasing.

24. The Jammu water supply system has been divided into seven water supply zones. Zones 1 to 5 are on the right bank of river Tawi (Jammu west) which comprises of old city and

extensions. Zone 6 comprises of left bank of river Tawi (Jammu east) and zone 7 comprises of industrial township of Bari Brahmana. The water supply zones were neither based on the natural topography nor the sources of water supply thus have no hydraulic meaning. Each zone is further divided into sub-zones and each sub-zone is further divided into sub-subzones for water supply management (there are about 59 and 49 isolated sub-subzones in the west and east Jammu respectively). Each sub-subzone has its own tube well(s) or being fed by gravity pipeline from higher level located service reservoirs (GLSRs), overhead tanks and independent distribution network.

25. The water supply network in Jammu city has been developed separately for each water supply subzone/sub-subzone without interconnection between the subzones/sub-subzones. Thus, in some subzones/sub-subzones, the actual water production capacity is exceeding the demand, but water is deficient in the other subzones. Therefore, water supply by tankers on every alternate day with very low rate supply of 30-70 lpcd is common in peripheral areas of Jammu city.

26. Losses in the distribution network within water supply sub-subzones are very high, up to 35-45%: It is a practice that (i) households are allowed to connect directly to the distribution pipelines without service lines; (ii) some households have more than one connection; (iii) flat rate of user charges without household meters; (iv) public taps without valves; and (v) absence of proper maintenance (affords and funds), resulting to very high losses in the distribution network within sub-sub-zones. ADB Loan 2151-IND has been addressing this problem to reduce water losses in the distribution networks, by replacement of worn out leaking distribution pipelines. However, Loan 2151 could cover about half of water supply sub-sub-zones of Jammu city only for replacement of worn out leaking distribution pipelines.

27. Some of the peripheral subzones have no service reservoir facilities, therefore water from tube wells is directly fed to the distribution networks and convey water directly to areas or colonies which are located at varying distances and different elevations. As a consequence, (a) "spaghetti" network has been developed, and (b) the pumps are made to operate at varying heads to reach the tail end of the supply area, resulting in high power consumption and gradual reduction in efficiency of the pumping system over time.

28. The pumping machinery in the existing tube wells is very old and is in use for many years, resulting in their efficiency getting substantially reduced and also requiring frequent repairs. Most of the pumping machineries and electrical devices at central pumping stations have outlived their useful lives; some have been in use for more than 20 years, resulting in frequent breakdowns, low efficiency and reduced discharges.

29. Lack of bulk or flow meters in all water production facilities (tube wells, OHTs, water treatment plants and pumping stations) makes it impossible to accurately measure the production capacities. All calculations were based on the installed/ designed capacities, resulting in high system capacities in figures, but low in actual production.

30. In order to meet the immediate need of improving water supply arising due to growth in population owing to urbanization, various subprojects for improvement in water production and distribution were undertaken by the Public Health Engineering Department (PHED) through State Government resources and by Economic Reconstruction Agency (ERA) under ADB Loan 2151-IND.

31. Under the ADB Loan 2151-IND, Jammu water supply sector is benefiting in two main aspects (a) preparation of Jammu Water Supply Master Plan for requirement upto 2036; and (b) immediate improvement investment on (i) reduction of water losses in the rising mains, some distribution sub-subzones and storages facilities; (ii) construction of new water sources (tube wells, water intake); (iii) construction of additional storage capacities; and (iv) providing water tankers to supply water for the areas having no piped distribution system or water deficit areas.

32. It was expected that in 2011, after completion of all the works of loan 2151-IND, the net water reaching households would be 188.75 MLD, compared to the demand of about 218.83 MLD in the same year. The actual production capacities of tube wells and treatment plants are currently estimated on the designed/installed capacities. The efficiencies of these production facilities are much lower than the designed/installed capacities. Thus, the second investment priority under "immediate improvement phase" should be given to rehabilitation/replacement of worn out machineries and electrical devices of tube wells and pumping stations to restore the designed/installed capacities.

33. After completion of all on-going works (under loan 2151-IND), ninety one overhead tanks will feed the population of Jammu east and west (including existing overhead tanks). The storage capacities of overhead tanks range from 1 to 4 lac gallons (LG). The cumulative storage capacities of overhead tanks at Jammu west and Jammu east will be 36 ML and 34.5 ML respectively. The approximate capacity of existing ground level reservoirs and sump tanks in Jammu east and west is 63.53 ML and 18.05 ML respectively. The existing total storage capacity is sufficient to meet present arrangement but is not uniformly distributed. Some outer areas have no service reservoirs; therefore water is supplied directly to the consumers.

34. Out of 50 subzones, 24 subzones are under rehabilitation/replacement by Loan 2151-IND. For the balance 26 subzones, distribution networks are to be rehabilitated. All the subzones will be converted into District Metering Areas (DMAs) once the distribution networks are properly rehabilitated. The rehabilitation of balance subzones can be considered as first priority of this proposed subproject as it will save potable water and it is a continuation of Water Loss Reduction Program, started in Loan 2151-IND.

35. As anticipated results of the Water Loss Reduction Program, which is being carried out under Loan 2151-IND and proposed works of Phase IV under Tranche – II of JKUSDIP, water loss in the system will be reduced from currently 30 – 45% to 20%. Some amount of treated water will be saved and could be transported to the water deficit areas. However, due to lack of transmission system interconnecting DMAs in each zone, the saved water cannot be transported till the transmission system is designed and installed to connect all DMAs together. Thus in order to supply water to inhabitants in currently water deficit subzones, some water production systems (tube wells) and storage capacity (OHTs) are being proposed to be included in Tranche – II of JKUSDIP. To meet immediate need, proposals of constructing 19 new tube wells and 10 over head tanks, in water deficient and low water distribution pressure areas, are included in this subproject.

36. Considering the existing deteriorated condition of the water supply system in Jammu city and other associated problems, there is a stringent need for rehabilitation of the existing water supply system to ensure adequate supply of potable water to user end by creating additional production and storage facilities, enhancing the efficiency of outlived machinery of tube wells and pumping stations, rehabilitating the distribution network and accounting for the use of supplied water with metered connections.

B. Proposed Subproject and Components

37. The sub-project area is spread over both eastern and western parts of Jammu city. The major objectives of rehabilitation of water supply system in Jammu city are:

- to continue implementation of water loss reduction program in 5 subzones of Phase – IV, thus reducing the current water loss from existing 30-45% to 20% resulting in net water saving of about 3.50 MLD;
- (ii) to start up with the metered domestic connections in areas of improved water supply;
- (iii) to improve operational efficiency of the pumping machineries and reduce energy costs as well as operation and maintenance costs in water production; and
- (iv) to provide water in required quantity as per norms in water deficit areas and provide piped water supply in uncovered areas.
- 38. The proposed subproject is expected to have the following benefits:
 - (i) The rehabilitation of distribution network will result into substantial reduction in water losses in the project area from existing 30 45% losses to 20% losses.
 - (ii) There will be proper accounting for use of water and system losses by installation of metered connections.
 - (iii) The replacement of electrical and mechanical equipments of tube wells and central pumping stations will result in appreciable enhancement in running efficiency of water production and distribution system and corresponding energy saving of more than 5 lac units (Kwh) per month.
 - (iv) Enhancement in production and storage capacity by construction of new tube wells and over head tanks will result in supply of adequate volume of potable water to the designated areas thereby reducing the problems associated with scarcity of water.

39. The survey and assessment undertaken during appraisal of the subproject indicates that the subproject will not involve any involuntary land acquisition. However, for construction of 10 over head tanks (OHTs) and 19 tube wells (TWs) 2311.29 m² of open state land currently in possession of government departments like PHED, JDA and Horticulture and 781. 27 m² of open land in possession of communities, trust, society, etc. will be used. State land in possession of communities, trust, society, etc. the land has been donated voluntarily and for which detailed no objection certificates (NOCs) have been availed and memorandums of understanding (MOU's) also stand signed. Additionally, due to laying of rising and distribution main pipelines a total of 117 residences, 216 commercial establishments and 28 institutions, offices and religious places will have temporary access disruptions during implementation.

40. The proposed subproject comprises of three components which include:

Component 1: Continuation of Water Loss Reduction Program for 5 subzones of Phase – IV in Jammu city. This component consists of (i) conditioning of the existing distribution networks in each subzone; (ii) rehabilitation / replacement of worn out pipelines. (iii) installation of service lines on two sides of the street for house connections; (iv) disconnecting all house connections made directly to distribution pipelines and

reconnecting them with newly installed service lines and (v) installation of 8000 house connections with water meters in Gandhi Nagar and Shastri Nagar areas;

Component 2: Rehabilitation/ replacement of worn out machineries and electrical devices of tube wells and central pumping stations. This component consists of (i) replacement of worn-out machineries and electrical devices for 43 tube wells; (ii) replacement of worn-out machineries and electrical devices for 69 centrifugal pumps at 38 Central Pumping Stations and (iii) replacement of electrical devices, like panels, pumps and motors, cables, etc. in 38 pumping stations and 43 tube wells including essential repairs of related civil works.

Component 3: Construction of additional water production and storage/distribution capacity (tube wells and overhead tanks) in some water deficient areas. This component consists of (i) construction of 19 tube wells in water deficit areas and (ii) construction of 10 overhead tanks to augment the deficient water supply in 8 DMAs which currently have no overhead tanks and in 2 other DMAs having densely populated areas.

41. **Table 2** shows the components of the subproject based on the present proposals which are expected to be substantially correct, although certain details may change as development of the subproject progresses.

Component Function		Description	Location		
General	Rehabilitation of water supply system in Jammu city	 Implementation of Water Loss Reduction Program by rehabilitation/ replacement of worn out / leaking pipes Improvement in operational efficiency of machineries and equipment at central pumping stations and tube wells Construction of limited production, storage and distribution facilities in water deficit areas. Provide domestic water meters as pilot project 	Replacement of worn out distribution pipelines-component is located in left side of river Tawi (Channi Himmat, Dilli, Matto Colony and Bikram Chowk). Rest of the components are located on both sides of the river Tawi.		
Replacement of worn-out pipelines and strengthening of distribution network	Water loss reduction by replacing worn out / leaking water distribution pipelines, reducing the current water loss from existing 30-45% to 20%.	Length-67 km (HDPE up to and including the size of 200 mm diameter and D.I. above the size of 200 mm diameter)	Located on left side of river Tawi (Channi Himmat, Channi Kamala, Dilli, Matto Colony and Bikram Chowk areas)		
Supply and installation of domestic water meters	For proper accounting of use of water.	Installation of 8000 water meters.	In Gandhi Nagar and Shastri Nagar areas of Jammu city		
Rehabilitation/ replacement of worn-out machineries and	Replacement of pumping equipments running at less than or equal to 45% efficiency and the pumps	Replacement of worn-out machineries and electrical devices in 43 tube wells and 38 central	Scattered in both eastern and western parts of Jammu city		

Table 2: Description of the proposed water supply subproject in Jammu city.

electrical devices	which have outlived their	pumping stations.	
in tube wells and	lives.		
pumping stations			
Construction of	Construction of additional	Construction of 19 tube	12 in eastern and 7 in western part
tube wells	water production and	wells	of Jammu city
(including civil,	distribution capacity in some		
mechanical and	water deficient areas.		
electrical			
equipment and			
piping works)			
Laying rising	Connecting tube wells with	Length-14831 m	Corresponding to the location of
mains from tube	the existing/proposed storage		proposed tube wells
wells to overhead	tanks		
tanks/ground			
level service			
reservoirs			
Construction of	Construction of additional	Construction of 10 over	6 in eastern and 4 in western part
overhead tanks	storage/distribution capacity in	head tanks	of Jammu city
(including	some water deficient areas.		
mechanical and			
electrical			
equipment and			
piping works)			

D.I.=ductile iron; H.D.P.E.=high density poly-ethylene; CPS=central pumping stations

42. The design standards adopted under this sub-project are from the Manual on Water Supply published by Ministry of Urban Development, Government of India. The same criteria are followed by the Public Health Engineering Department (PHED), the line department. Key design features of the proposed subproject are summarized in **Table-3** below.

Table 3: Design features of the subproject							
Design features	Description						
Component-Replacement of worn out pipes							
Subproject area	4.72 Sq.km						
Pipe diameter range	80 mm – 400 mm						
Net per capita water supply (excluding losses)	135 liters per capita per day						
Distribution losses (allowable)	15%						
Material of construction for distribution mains and	HDPE up to and including the size of 200 mm diameter and DI						
laterals	above the size of 200 mm diameter.						
Location	Located on left side of river Tawi (Channi Himmat, Channi						
	Kamala, Dilli, Matto Colony and Bikram Chowk areas)						
Component- Replacement of worn-out maching	neries and electrical equipment at pumping stations and						
tube wells							
Working hours of tube wells	Intermittent or 16 hours a day due to limited availability of power						
Efficiency of pumps	80% minimum						
Type of pumps	Multi-stage submersible pumps and vertical turbine pumps for						
	tube wells.						
	horizontal centrifugal pumps for CPS						
Incoming power supply	AC, 415 V, 3 Phase, 4 wires, 50 Hertz.						
System earthing	Solidly earthed						
Location	Located In different parts of the Jammu city						
Component- Construction of 19 tube wells in	water deficit areas						
Working hours of tube wells	Intermittent or 16 hours a day.						
Assumed efficiency of pump	80% Minimum						
Depth of tube well	200 m – 300 m						
Net per capita water supply	135 liters per capita per day						
(excluding losses)							
Type of pumps	Multi-stage submersible pump.						
Length rising mains from tube wells to overhead	14831 m						

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Design features	Description
tanks/ground level service reservoirs	
Material for construction of transmission line from	DI
tube wells to OHTs	
Location	12 in eastern and 7 in western parts of Jammu city
Component- Construction of 10 overhead tan	ks in water deficit areas
Foundation	Open type Reinforced Cement Concrete (RCC) raft
Super structure	RCC cylindrical shaft
Water tank	RCC cylindrical type
Material of construction of over head tanks	RCC (M30)
Total storage capacity	16 LG / 7.264 MLD
Supply hours	2 times a day, 4 hours in morning and 4 hours in evening.
Location	6 in eastern and 4 in western part of Jammu

CPS= central pumping station; DI= ductile iron; GLSR= ground level service reservoir; HDPE= high density polyethylene; LG= lac gallon; MLD= million liter per day; OHT= overhead tank

43. **Justification for construction of new tube wells:** As mentioned earlier, even though implementation of the water loss reduction program will save potable water in the existing subsub-zones or DMAs, but in the immediate future, it is not possible to transport saved water from one DMA to the other DMA due to lack of transmission system. It will take some years for design and construction of the transmission system for all water supply zones. So, water is still deficit in some areas. **Table 4** shows the water deficit quantity based on the population for year 2011 in the water distribution areas (DMAs) and proposed additional production capacity to be constructed for those DMAs.

44. Another fact is that the discharge of the existing tube wells constructed earlier by PHED is low due to many reasons, such as (i) most of them are getting water at the depth of 160-165 m and water table has gone down resulting in the reduction of yield; (ii) expiry of the useful life or choking of the strainers due to continuous withdrawal, etc. Thus, there is need of replacement of some existing, old, less efficient tube wells to get better water discharge at the depth of 300 m or more.

45. **Justification for construction of overhead tanks:** As shown in **Table 5**, out of 10 overhead tanks proposed to be constructed for 10 DMAs, 2 DMAs have existing OHTs with 2.0 and 2.5 LG storage capacity compared to the required storage capacities of 3.45 LG and 3.36 LG respectively. The other 8 OHTs are proposed to be constructed for other DMAs, which currently have no balancing storage capacity and water is pumped directly from tube wells to the households.

S.No.	Location of proposed tube well	Location of proposed tube well	Status of availability	Prop	osed tu	be well	DMAs served b	No v exi	o. of isting	Availability of water from		Population served	Water	Water deficit
		of land	Expe yield (GPH	cted	Water available (MLD)	propose tube wel	d tub l we /so	be ells burce	water in existing wells/so (MLD)	ng tube source	2011	(MLD)		
Propos	sed tube wells for CPS	Narwal distrib	ution n	etwork			•		•		•			
1	CPS Narwal	PHED land	1400	0	1.02	G46	1		7.6 ³		8487	1.51		
2	Fruit market	Hortculture land, NOC obtained	1400	0	1.02									
						G33					925	0.16		
						G34					3701	0.66		
3	Channi himmat, Sec-2	Panchamukhi mandir	8000	(0.58	H47					27347	4.87		
4	CPS Channi himmat	PHED land	8000	(0.58		2		1.631					
5	Channi Kamala	PHED land	8000	(0.58									
6	Malik market	Trust land, NOC obtained	1400	0	1.02									
		obtailiou				H49	1		0.252		4715	0.84		
						H44			0.202		943	0.01		
						H45					944	0.17		
						H38					3470	0.62		
7	Sainik colony S-F	Sainik co- operative society,	1200	0	0.87	H41					31110	5.54	-	
8	Sainik colony S-G	NOC obtained	8000	(0.58						-			
						H39	1		0.511		7778	1.39		
						H40	1		1.197		12963	2.23		
						Filling Station fo Tanker Service	or					0.45		
					6.26				*11.19		102380	*18.69	*7.50	
Propo	sed tube wells for othe	er Locations (DI	MAs)											
9	Ambika Colony	PHED land		15000	1.09	H4	3	1		0.58	10369	1.85	1.27	

Table 4: Calculation for Justification for 19 Proposed New Tube Wells.

³ Main source of water supply from Boria

10	D/C Block Gandhi Nagar	PHED land	18000	1.31	F1; F2; F3: F4: F5	4	7.85	53311	9.50	1.65
11	Bandu Rakh	PHED land	15000	1.09	H29	1	0.51	7002	1.25	0.74
12	Vijay park Nai Basti	Municipal land, NOC obtained	20000	1.45	F12	1	1.45	21921	3.91	2.46
13	Bakshi Nagar	PHED land	15000	1.09	D22; D23;	Supplying	1.8	36623	6. 53	4.73
14	PHE Complex New Plot	PHED land	12000	0.87	A21	from CPS Medical	7.56	59587	10.62	3.06
15	Bathing ghat Lohan	Pvt.	18000	1.31	D29; D30	1	0.315	12322	2.20	1.88
16	Missionary of Charity Janipur	Trust land,	15000	1.09	A21	Supplying from Manda	4.46	27729	4.94	0.48
17	Church at Wazarat road Near CM residence	NOC obtained	15000	1.09	A12; A13; A14	Supplying from Samadhian	5.06	42712	7.61	2.55
18	Park near Raina academy	Community land, NOC obtained	18000	1.31	D29; D42	1	1.45	18607	3.32	1.87
19	Rajinder park Phase-I	JDA, NOC obtained	12000	0.87	C48	From Roopnagar- II	1.1	12288	2.19	1.09
				12.58			32.14	302470	53.90	21.76
Total				18.84			43.33		72.59	29.26

Note : - Against deficit of 29.26 mld, sources are proposed for 18.84 MLD. Locations of the proposed tube wells are marked in the maps in **Appendix 5** and **6**.

Table 5: Calculation for Justification for 10 Proposed New OHTs

S.No.	Location	Status of	DMA	Exis	sting OHT	Population		Dem	Demand R		Required capacity		Capacity	
		availability of		C	apacity	2011	2045	2011	2045	20)11	20	45	proposed under
		land		(La	c gallons)									this Tranche
				LG	ML			MLD	MLD	ML	LG	ML	LG	LG
1	Nai basti	PHED land,	F11; F12; F13	2	0.9092	36535	125332	6.51	22.33	1.63	3.58	5.58	12.28	1.50
2	Block A, Gandhi Nagar	PHED land,	F1; F3;	2.5	1.1365	35540	121920	6.33	21.73	1.58	3.48	5.43	11.95	1.50
3	Channi Himmat Sector-7	PHED land,	H45; H48; H49	-	-	11711	40174	2.09	7.16	0.52	1.15	1.79	3.94	2
4	Delli	PHED land,	H42	-	-	6842	23470	1.22	4.18	0.30	0.67	1.05	2.30	1
5	Sainik colony Sector-D	Sainik co-	H40	-	-	8487	29115	1.51	5.19	0.38	0.83	1.30	2.85	2
		operative												
		housing society,												
6	Fruit market	Horticulture land	G46	-	-	12963	44468	2.31	7.92	0.58	1.27	1.98	4.36	1
7	Paloura Stage-III	PHED land	D29; D30		-	12322	42269	2.20	7.53	0.55	1.21	1.88	4.14	3
8	Baba Kalakh Nath temple	Temple land	C48	-	-	11623	39872	2.07	7.11	0.52	1.14	1.78	3.91	2
	Bantalab													
9	EWS Colony Sector-1	JDA Land,	C40	-	-	12288	42152	2.19	7.51	0.55	1.20	1.88	4.13	1
	Roop nagar													

S.No.	Location	Status of	DMA	Exi	sting OHT	Popu	lation	Dem	nand	Re	quired	d capa	city	Capacity
		availability of		c	apacity	2011	2045	2011	2045	20)11	20	45	proposed under
		land		(La	c gallons)									this Tranche
10	Rajinder nagar JDA Phase-	JDA Land,	C47	-	-	6643	22787	1.18	4.06	0.30	0.65	1.02	2.23	1
	1 Bantalab													
	To	tal		4.5		1,54,952	5,31,558	27.61	94.72	6.90	15.19	23.68	52.09	16

DMA=district metering area; LG=lac gallon; ML=million liter; MLD=million liter per day

Note: - Locations of the proposed OHTs are marked in the maps given in Appendix 5 and 6.

Total capacity will increase to 31 % of the required capacity of 2045.

46. The sample calculation of required storage capacity for one overhead tank proposed at Nai Basti is presented in **Table-6** below:

Table 6: Calculation Sample of the Required Storage Capacity of Proposed OHT at Nai Basti

Но	urs	Production (ML)	Water availability in OHT (ML)	Water supply	Cumulative water in OHT (ML)	Required balancing capacity
0	1	0	0	0	0	
1	2	0.3925	0.3925	0	0.3925	
2	3	0.3925	0.785	0	0.785	
3	4	0.3925	1.1775	0	1.1775	
4	5	0.3925	1.57	0.785	0.785	
5	6	0.3925	1.1775	0.785	0.3925	
6	7	0.3925	0.785	0.785	0	
7	8	0.3925	0.3925	0.785	-0.3925	-0.3925
8	9	0.3925	0	0	0	
9	10	0	0	0	0	
10	11	0	0	0	0	
11	12	0	0	0	0	
12	13	0.3925	0.3925	0	0.3925	
13	14	0.3925	0.785	0	0.785	
14	15	0.3925	1.1775	0	1.1775	1.1775
15	16	0.3925	1.57	0.785	0.785	
16	17	0.3925	1.1775	0.785	0.3925	
17	18	0.3925	0.785	0.785	0	
18	19	0.3925	0.3925	0.785	-0.3925	
19	20	0.3925	0	0	0	
20	21	0	0	0	0	
21	22	0	0	0	0	
22	23	0	0	0	0	
23	24	0	0	0	0	
		6.28				1.5700

Note: Required balancing reservoir capacity is about 25% of total per day water demand of the DMA.

Anticipated water supply situation after completion of proposed up-gradation works

47. The proposed up-gradation of water supply consists of replacement of worn out pipes in areas of Phase – III, Phase – IV and Phase – V, Replacement of worn out machineries and construction of tube wells and over head tanks. Though the proposed works in areas of Phase – III and Phase – V are to be taken up in subsequent Tranches of Loan – II, however, the **Table 7** below shows the expected water supply situation in Jammu City after completion of proposed augmentation works.

			• •	N1		
Component	Installed	Actual	System	Net quantity	Assumptions	
	capacity	production	losses	reaching		
	(MLD)	(MLD)	(%)	households		
				(MLD)		
Sitlee WTP 1	24.3	55.85	20	44.68	1. System losses will be	
Sitlee WTP 2	24.3				reduced down to 20% after	
Sitlee WTP 3	17.1				completion of the	
Sitlee WTP 4	24.3	23.10	20	18.47	rehabilitation works.	
Dhounthli WTP	5.4	4.59	20	3.67		
Boria WTP	8.1	7.70	20	6.16	2. Losses on transmission	
Tube wells on right bank	75	71.25	20	57.00	mains from treatment	
Tube wells on left bank	80.9	76.86	20	61.48	plants/tube wells to the	
New tube wells on right	61.04	57.99	20	46.39	distribution center is 5%.	
bank (32)					2 Novely constructed	
New tube wells on left	36.04	34.24	20	27.39	3. Newly constructed	
bank (23)					actinities will run with 100%	
12 New tube wells under	12.58	11.95	20	9.56	or design capacities.	
this Subproject on right					1 Draduction will increase	
bank					4. Production will increase	
7 New tube wells under	6.26	5.95	20	4.76	replacement of worp out	
this Subproject on left					mochineries	
bank						
Total	375.32	349.44		279.56		

Table 7: Water supply status in Jammu City after implementation of proposed augmentation works

48. The subproject covers Jammu urban area with an estimated population of 1,189,908 (2011). The subproject will enhance and strengthen the existing water supply to meet the demand of the population of Jammu City. Though the estimated benefited population for each component of subproject is mentioned below, it can be concluded that the entire population of Jammu City will be benefited by this subproject.

49. **Component 1:** Continuation of water loss reduction program for 5 subzones of Phase – IV in Jammu City.

i) Some rehabilitation/replacement works for "Phase"⁴ I and Phase II are covered in ADB Loan 2151- IND and are under implementation. Some subzones of Phase IV (Zone 6), such as Narwal, Karan Bagh, Gadigarh, Dashmesh Nagar, Apna Vihar, Bag-e-Bahu, Kalu Chak, Satwari, Bellicharana are under rehabilitation/replacement by Public Health Engineering Department under State Government schemes. Besides, Bandhu Rekh, Kunjwani, Babliana and Channi Rama are also being taken up by PHED.

⁴ "Phase" following definition of 2007 Water Master Plan

ii) The proposed Component 1 under this subproject will cover Bikram Chowk, Channi Himmat, Channi Kamala, Dilli and Matto Colony (5 subzones) of phase IV (Zone 6). **Table-8** below tabulates the respective command areas of Phase – IV, tentative length of new distribution network including replacement of existing leaking pipeline and current population. The proposed component consists of (i) conditioning of the existing distribution networks in each subzone; (ii) rehabilitation / replacement of worn out pipelines; (iii) installation of service lines on two sides of the street for house connections; (iv) dismantle/disconnect all house connections made directly to distribution pipelines and reconnect them with newly installed service lines. It is expected that after implementation of this component the water losses in this DMA will be reduced to level of 20% from existing 30 - 45% losses. The map depicting boundary of water supply phase-IV is appended in **Appendix 7**

iii) To have proper accounting for use of water and system losses, it is recommended to install 8000 house connections with water meters in Gandhi Nagar and Shastri Nagar areas.

Table_8: Details of areas covered with respective command area and population under
proposed rehabilitation work of Phase – IV.

Name of the Phase	Zone	Subzones	Command area (Sq.km)	Tentative length of distribution network coverage (km)	Current population
Phase IV	6	Bikram Chowk, Channi Himmat, Channi Kamala, Dilli, Matto Colony (5 subzones).	4.72	67	55212

50. **Component 2:** Rehabilitation/ replacement of worn out machineries and electrical devices of tube wells and central pumping stations.

(i) The objective of this component is to restore the operating efficiency of the machineries and electrical equipment at all pumping stations and tube wells, by replacing the worn out or less efficient pumps which will save the energy loss and reduce the power consumption. Energy auditing was carried out for the worn-out pumping machinery. Assessment of replacement of pumping equipments is based on the results of energy audit. The equipments running at less than or equal to 45% efficiency and the pumps which are more than 20 years old are recommended for replacement.

(ii) The scope based on Energy Audit Report for this component is proposed as below:

- a. replacement of worn-out machineries and electrical devices for 43 tube wells.
- b. replacement of worn-out machineries and electrical devices for 69 centrifugal pumps at 38 Central Pumping Stations.
- c. replacement of electrical devices, like panels, Pumps and Motors, cables etc. in 38 pumping stations and 43 tube wells including essential repairs of related civil works.

(iii) After replacement of above listed Electrical and Mechanical equipments, it will result in energy saving of more than 5 lac units (Kwh) per month.

51. The locations and number of wornout pumps and other electrical and mechanical equipments proposed to be replaced under this subproject are depicted in **Table_9** below.

Table 9: Locations and number of proposed replacement of worn-out pumps and
other electrical / mechanical equipments at PHED installations.Centrifugal Pumps at Central Pumping Stations

Α.	Centrifugal Pumps at Centr	al Pumping Stations		
S.No.	Name of the pumping station	Total No. of horizontal	Reasons for replacer	nent
		pumps to be replaced	No. of pumps having Efficiency ≤ 45%	No. of pumps more than 20 years old
Divisio	on North (West)			, ,
Sub di	vision- Dhounthly			
1	CPS Dhounthly	6	5	1
2	Tawi low lift	4		4
3	Tawi high lift	3	2	1
4	Secretariate	2	1	1
5	Manda	2		2
6	Maheshpura	2	2	
7	New Plot	2	1	1
8	Sarwal Khad	2	1	1
9	Toph	1	1	
	Total	24	13	11
Sub di	vision- Medical			
1	CPS Roopnagar- II	1	1	
2	CPS Roopnagar- III	2	1	1
3	Pumping station Shakti nagar	2		2
4	Pumping station Laboratory	1		1
5	CPS Medical	1		1
6	Pumping station R-22	1		1
7	Pumping station Muthi V	1		1
8	CPS Muthi	1	1	
	Total	10	3	7
Sub di	vision- Company Bagh			
1	CPS Company Bagh	4	4	
2	CPS Parade	3	2	1
3	CPS Samadhian	2	2	
4	Gujjar Nagar pumping station	2	2	
	Total	11	10	1
Divisio	on South (East)			
Sub di	vision- Gandhi nagar			
1	CPS Gandhi nagar	1		1
2	CPS 9 No	1	1	
3	CPS Boria	3	3	
4	CPS Khadwala	1	1	
5	CPS Shastri Nagar	2		2
6	CPS Ind. Estate, Digiana	1		1
	Total	9	5	4
Sub di	vision- Narwal			
1	CPS Narwal	3	3	
2	Pumping station Bathindi	1	1	
3	Pumping station Channi old	1	1	
4	Pumping station Channi Rama	1	1	
5	Pumping station Sector-7 Channi	1		1
6	Pumping station Dilli old	1	1	
7	Pumping station Dodi Gujjar	1	1	
8	Pumping station Sector-F Sainik	2	2	
	Colony			1

9	Pumping station Sector-A Sainik	1		1
	Colony			
	Total	12	10	2
Sub di	vision- III			
1	CPS Chatha	2		2
2	CPS Bandhu Rakh	1	1	
	Total	3	1	2
	GRAND TOTAL	69	42	27

B. Submersible pumps at Tube wells

		Total No. of numps to	Reasons for replacement					
S.No.	Name of the Sub division	be replaced	No. of pumps having Efficiency ≤ 45%	No. of pumps more than 20 years old				
Sub di	vision- Medical							
1	Medical	13	13					
Sub division- Co Bagh								
1	Company Bagh	7	3	4				
Sub di	vision- Gandhi nagar							
1	Gandhi Nagar	9	9					
Sub di	vision- Narwal							
1	Narwal	3	3					
Sub di	vision- III							
1	Sub division III	11	11					
	Total	43	39	4				

C. Other electrical and mechanical equipment

Sub di	vision- Company Bagh						
1	CPS Samadhian	1					
Sub di	vision- Medical						
1	CPS Medical	1					
2	CPS Roopnagar	1					
3	T/W Nai Basti	1					
4	T/W Bohri	1					
5	T/W Udheywala 1	1					
6	T/W Udheywala 5	1					
7	T/W Muthi 8	1					
8	T/W Gole (old)	1					
Sub di	vision- Dhounthly						
1	Tawi high lift	1					
2	Secretariate	1					
3	P/S Manda	1					
Statio	n to be provided with H.T AVR						
Sub di	vision- Co Bagh						
S.No.	Name of Location	H.T. AVR					
1	CPS Company Bagh	1					
S.No.	Name of the location	Stabilizer (L.T)					
Sub di	vision- Narwal						
1	T/W sector F old Sainik Colony	1					
2	T/W Dilli old	1					
3	T/W Channi old	1					
Sub di	Sub division- Gandhi Nagar						
1	T/W 18	1					
2	CPS Khadwala	1					
3	T/W Nagawala	1					
4	T/W Rail Head	1					
Station to be provided with H.T AVR							

Sub di	Sub division- Narwal							
S.No.	Name of Location	H.T AVR						
1	CPS Narwal	1						

52. **Component 3:** Construction of additional water production and storage/distribution capacity (tube wells and overhead tanks) in some water deficient areas.

(i) After analyzing the list of the water deficit sub-zones, conducting field visits in water deficit areas, it is proposed to construct additional 19 tube wells to meet immediate needs of population in water deficit areas. The proposed tube well locations are presented in **Appendix 5** and **6**.

(ii) Analyzing the need for construction of additional service reservoirs, it is proposed to include construction of 10 overhead tanks in the subproject area to augment the deficient water supply in 8 DMAs which currently have no overhead tanks and in 2 other DMAs having densely populated areas.

(iii) Summary of additional production and storage capacities of the tube wells and OHTs is presented in **Table-10** below. The estimated benefited population directly and indirectly from this component of the subproject is 5,08,500 persons.

Table 10: Additional production and storage capacity of 19 tube wells and 10 OHT	itional production and storage capacity of 19 tube wells and 10 OHTs
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Component	Additional Capacity
19 Number tube wells	18.84 MLD
10 Number overhead tanks	16.00 LG

C. Implementation Schedule

53. The implementation schedule of the subproject is given in **Table-11** below:

Activity	Component	Component	Component	Component	Component	
	1.a	1.5	2	5.a	5.5	
	(rehabilitation of	(installation of	(replacement of wornout	(construction of	(construction of	
	distribution network)	meters)	machinery of tube wells and pumping stations)	tube wells)	over head tanks)	
Acceptance of the SAR	Feb. 2012	Feb. 2012	Feb. 2012	Feb. 2012	Feb. 2012	
Completion of detailed design report	Feb. 2012	Feb. 2012	Feb. 2012	Feb. 2012	Feb. 2012	
Invitation for bids	May 2012	May 2012	May 2012	May 2012	May 2012	
Contract award	Oct. 2012	Dec. 2012	Nov. 2012	Oct. 2012	Oct. 2012	
Commencement of work	Nov. 2012	Jan. 2013	Dec.2012	Nov. 2012	Nov. 2012	
Completion of contract	Oct. 2014	Dec.2014	Nov. 2014	Oct. 2014	Oct. 2014	
Total months of construction works	24	24	24	24	24	

Table-11: Implementation schedule of the subproject

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Administrative Boundaries

54. The subproject sites are located in the built-up area of Jammu city. Jammu, the winter capital of Jammu and Kashmir, is situated at an average altitude of 312m above mean sea level (msl) in the foothills of Shivaliks. Jammu District is bounded in the north and north east by the Reasi and Udhampur districts; in the east and south east by Udhampur district and Samba district; in the south and west by international border with Pakistan; in the north west by district Rajouri. The entire district can be divided into two distinct portions. The area forming north of Jammu-Chhamb road and Jammu-Pathankot road which is known as *Kandi* area is comparatively under-developed and is mostly rainfed. The area south of these roads is largely fed by canal and tube wells for irrigation purposes and is relatively more prosperous.

55. River Tawi flows through the city and divides it into two parts. The old city is situated on the right bank of the River. Areas on left bank of Tawi are relatively newely developed. Jammu city is located between 32° 36' to 32° 48' North latitudes and 74° 48' to 57° 30' East longitude with a total municipal area of approximately 112 sq. km. and total Jammu Development Authority (JDA) area of approximately 287 sq. km. It is well connected by air, railways and road with other states of India.

2. Topography, Drainage, and Natural Hazards

56. **Topography**. The topography of the city is from plain to undulating. Jammu city falls in the sub Himalayan Region (lower Shivalik). The city is divided into two parts by river Tawi. First the plain part (south of Tawi river), where elevation varies from 280 to 310 m above msl and Second the old city on lower reaches of Shivalik having an altitude of 307 to 450 m above msl.

57. **Drainage**. Jammu city is located on a plain to undulating terrain and the drainage system of the city relies on gravity. Out of the total primary drainage network of 132 km length in Jammu city, 51 km length of primary drains are lined and the remaining 81 km are unlined channels. Following the master plan recommendations, part of drainage rehabilitation and improvement works has been taken up under ADB Loan 2151-IND by J and K Economic Reconstruction Agency (ERA) and by the Urban Environmental Engineering Department (UEED) under their ongoing schemes. Some of the remaining drainage works are proposed under Tranche – II of JKUSDIP.

58. As per storm water drainage master plan, Jammu city is divided into five drainage zones. The details of the drainage zones are as below:

- Zone- I: This zone includes the areas like Pratap Garh, Shalamar, Karan market, Rehari, Krishna Nagar, Peerkho, Rajindra Nagar, Christian Colony, Chand Nagar, Shiv Nagar, Shakti Nagar, Panjtirthi, etc. Major drains under this zone are Gandha nallah (length 3.2 km), Rehari nallah, Krishna Nagar nallah (length 3.5 km), Peerkho nallah (length 0.95 km), Rajindra Nagar nallah (length 1.7 km), Jogi Gate nallah (length 0.48 km), Chand Nagar nallah (length 0.5 km), Shiv Nagar nallah (length 0.7 km), Shakti Nagar nallah (length 0.5 km) and Panjtirthi nallah (length 1.5 km)
- Zone- II: This zone includes the areas like Nanak Nagar, Trikuta Nagar, Shastri Nagar, Sanjay Nagar, Nai Basti, Rampura, Bikram Chowk, Channi Himmat, etc.

Major drains under this zone are Landoichoi main nallah (15.4km), Landoichoi nallah T-2 (6.3 km), Landoichoi nallah T-3 (3.3 km), Nai Basti (Rampura) nallah (1.0 km), Bikram Chowk nallah (1.5 km), University to Bikram Chowk nallah (1.7 km), Channi Himmat main nallah (1.77km) and T4 (Landoi choi) nallah (4.93 km).

- Zone –III: This zone includes the areas like Ban Talab, Chenore, Roop Nagar, Om Nagar, Patoli, Janipur, Basant Nagar, Paloura, Subash Nagar, Bhawani Nagar, Rajpura, etc. Major drains under this zone are Ban Talab Chinore nallah (9.3km), Roopnagar nallah (7.66 km), Om Nagar nallah (4.9km), Patoli nallah (4.3), Janipur nallah (9.9 km), Basant Nagar nallah (0.75 km), Paloura nallah (4.0 km), Subash Nagar nallah (1.4 km), Bhawani Nagar nallah (4.2 km) and Rajpura nallah (0.8 km).
- Zone –IV: This zone includes the areas like Gangyal, Digiana, Trikuta Nagar Extension, Preet Nagar, Dilli, Sainik Colony, Matto Colony, Kalu Chak, etc. Major drains under this zone are Gangyal nallah (8.2 km), Digiana nallah (3.0 km), Ashram nallah (3.5 km), Dilli nallah (2.5 km), Sainik Colony nallah (6.0 km) and Kalu chak nallah (7.5km).
- Zone –V: This zone includes the areas like Narwal, Ratnu Chak, Suhaora, Darap, Sher Garh, Rakh Rajpur, Jarate Chak, Chuthe Chak, Basi Khurd, etc. Major drains under this zone are Balole nallah & Tributaries (12 km), Pati Khad & Tributaries (8 km), Tarore Khad (6 km), Kalk nallah and Tributaries (7 km) and Devika nallah and Tributaries (5 km).

59. **Natural Hazards**. The Indian subcontinent has a history of devastating earthquakes. The major reason for the high frequency and intensity of the earthquakes is that India is driving into Asia at a rate of approximately 47 mm/year. Geographical statistics of India show that almost 54% of the land is vulnerable to earthquakes. The latest version of seismic zoning map of India given in the earthquake resistant design code of India [IS 1893 (Part 1) 2002] assigns four levels of seismicity for India in terms of zone factors. In other words, the earthquake zoning map of India divides India into 4 seismic zones (Zone 2, 3, 4 and 5) unlike its previous version which consisted of five or six zones for the country. According to the present zoning map, Zone 5 expects the highest level of seismicity whereas Zone 2 is associated with the lowest level of seismicity.

60. The state of Jammu & Kashmir is the western most extension of the Himalayan mountain range in India. Here it comprises of the Pir Panjal, Zanskar, Karakoram and Ladakh ranges. The Main Boundary Thrust (MBT) underlies the Pir Panjal Range and is known as the Panjal Thrust in the region. The Zanskar ranges which are part of the Great Himalayan range are underlain by the Zanskar Thrust. The Kashmir Valley lies between the Pir Panjal and the Zanskar thrusts, making it very vulnerable to earthquakes. Other northern parts of Jammu & Kashmir are heavily faulted. Along the Zanskar and the Ladakh ranges runs a North West (NW) – South East (SE) trending strike-slip fault, the longest in the Jammu & Kashmir area. Apart from the routine small tremors, moderate to large earthquakes have hit nearly all parts of the state. However, it must be stated that proximity to faults does not necessarily translate into a higher hazard as compared to areas located farther away, as damage from earthquakes depends on numerous factors such as subsurface geology as well as adherence to the building codes.

61. Keeping in view the maximum credible earthquake magnitudes in the region, the subproject area (in Jammu) is classified in **Zone-IV** as per the Bureau of Indian Standards (BIS) Code of Practice (**IS-1893-2002**). These maximum credible earthquake magnitudes represent the largest earthquakes that could occur on the given fault, based on the current understanding of the regional geo-tectonics.



62. The earthquake zonation map of Jammu and Kashmir is given in **Figure-1** below:

Figure-1: Jammu and Kashmir earthquake zones.

63. **Floods.** Owing to its topography and presence of natural drainage in the form of river Tawi and other natural as well as artificial drains, incidence of any major flooding has not been recorded in the Jammu city. The volume of water received by river Tawi during rains does not cause flooding in Jammu city owing to large capacity of the river channel and elevation difference between the level of subproject area and river bed.

64. As per storm water drainage master plan, Jammu city is divided into five drainage zones. In order to make the drainage more efficient, different drainage projects in Jammu city were undertaken under Multi Sector Project for Infrastructure Rehabilitation in J and K (ADB Loan 2151-IND) and rehabilitation of drainage in some more areas has been proposed under tranche-2 of JKUSDIP.

3. Geology, Geomorphology and Soils

- 65. **Geology and Geomorphology**. The Geology of the territories of Jammu, Kashmir and Ladakh have been divided into three different structural Zones:
 - The Panjal

- The Zanskar
- The Tertiary Groups

66. These three geological divisions form the basis of the physical divisions of the State. The Panjal forms the outer plain, the outer hills and the middle mountains. The Zanskar includes the whole of the eastern region from Spiti and Lahol to the lofty Karakoram mountains in the north. The Tertiary Groups include the valley of Kashmir and other river valleys.

67. Jammu borders Kashmir to the north, Ladakh to the east and Himachal Pradesh and Punjab to the south. In the west, it borders the Pakistan. Sandwiched between the vale of Kashmir to the north and the Daman Koh Plains to the south, the Shivalik Range comprises most of the region of Jammu. The Pir Panjal Range, the Trikuta Hills and the low-lying Tawi River basin add beauty and diversity to the terrain of Jammu. The Pir Panjal range separates Jammu from the Kashmir valley.

68. District Jammu falls in sub-mountainous region at the foothills of the Himalayas. Shivalik range rises gradually in the northern part of the district and merges with the Indo-Gangetic plains in the south. The entire district can be divided into two distinct portions. The area forming north of Jammu-Chhamb road and Jammu-Pathankot road which is known as *Kandi* area is comparatively under developed and is mostly rain-fed. The area south of these roads is largely fed by canal and tube wells for irrigation purposes and is relatively more prosperous.

69. The *Kandi* tract has got steep topographic slopes ranging between 1:90 and 1:120. General altitude of the *Kandi* ranges between 320 to 400 m above the mean sea level. Water levels are deep, resulting into very less number of ground water structures i.e. dug wells and tube wells. The *Kandi* imperceptibly merges with the *Sirowal* southwards. The *Sirowal* tract occupies the southern plainest tract of the district. Topographic gradient is reduced and becomes very gentle i.e.1:250 to 1:300.

70. Geologically, the area can be explained as the northern hilly area underlain by the Shivalik rocks and the southern outer plain area underlain by the sediments of Recent and Sub-Recent times, laid down by the present day streams of the area.

1. Northern Hill Area: Hills constitute about 37% of the total geographical area of the district. The terrain is rugged with strike valleys and dissected ridge slopes. Altitude of the area varies roughly between 400 and 700m above mean sea level. Major physiographic slope is towards the southwestern direction i.e. towards the outer plain area. The major rivers flowing through the hilly area of the district viz. Basantar, Jammu Tawi, Chenab and Munawar Tawi have their origin quite to the north of the district limits. These rivers act as major drainage lines in the area and enter outer plains of the district south of the outer most Shivalik hills.

2. Southern Outer Plains: These are located at the foot of the outer most Shivalik hills and have an altitude varying between 280 and 400m above mean sea level. Innumerable seasonal drains traverse the area. These streams are boulder laiden and have broad shallow channels, having water only for short time after the rains. The plains can further be divided into two parts the '*Kandi*' in the north and the '*Sirowal*' in the south, towards Pakistan border.

71. The geological succession occurring in the area is presented in **Table 12** below.

	Geological Horizon	Lithology	Age
	Alluvium, fan, terrace deposits (<i>Kandi</i> and <i>Sirowals</i>)	Heterogeneous clastic sediments	Sub-recent to Recent
Upper	Boulder bed stage	Conglomerates sand stones with	Lower to Middle
Shivaliks		intercalations of red clays	Pleistocene.
	Pinjor stage	Coarse sandstone, sand rock and massive sandstone beds.	Lower Pleistocene
	Tatrot stage	Sandstone drab clays alternative beds.	Upper Pliocene
Middle	Dhokpathan stage	Sandstone & shale with isolated sand nodules	Lower Pliocene
Shivaliks	Nagri stage	Sandstones & Shale, Hard & compact	Upper Miocene
Lower	Chingi stage	Bright red shale and sandstones	Middle Miocene
Shivaliks	Kamlial stage	Hard red sandstones & shale with pseudo conglomerates	Middle to lower Miocene

 Table 12: Geological Succession of Jammu district

Source: Central Ground Water Board - Ground water information booklet, Jammu district

72. **Soils.** Two types of soils are mainly observed in the Jammu city and its adjoining areas namely mountainous soil and loamy soil. Mountainous soil is brown in colour, medium in available nitrogen and potash and deficient in available phosphorous. The soil reaction is slightly acidic to neutral and texture in general varies from loam to sandy loam except in low valley areas being heavy textured. The proposed alignment of subproject is located within Jammu city, which primarily comprises of alluvial deposits which generally include silty-clay or clayey-silt type soil in intermixed layers with potential seams of fine to coarse sand.

4. Climate

73. The climate of the area is subtropical with hot and dry climate in summer and cold climate in winters. May and June are the hottest months while December and January are the coldest.

74. **Temperature**: May and June are the hottest months while December and January are the coldest. In Jammu district the temperature varies from cold in winter with minimum temperature touching even 0.9 degree Celsius to heat wave in summers when the temperature shoots upto 46 degree Celsius. (J&K Official Website: http://www.jammu.nic.in/district/aboutjammu.asp).

75. **Rainfall**: The rainy season usually starts from the end of June or the beginning of July. Average annual rainfall in the district Jammu is about 1052 mm⁵. The rainfall data for district Jammu for five years (from 2006 to 2010) is presented in the **Table-13**.

Table-13. Kalilali uata of district Jaliliu (month's total fallilal in min).												
Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
2006	70.8	4.2	44.6	10.7	16.1	150.2	379.9	269.4	123.8	56.0	7.0	32.4
2007	0.0	95.9	243.6	3.0	28.0	185.2	274.0	333.0	42.4	0.0	3.7	8.9
2008	98.0	23.4	2.2	56.4	42.8	228.2	384.9	225.8	20.0	21.1	0.0	20.3
2009	69.5	34.1	15.6	41.1	11.6	18.6	244.4	273.4	26.1	7.2	4.2	0.6
2010	7.5	26.9	4.9	6.2	39.1	67.0	272.9	586.1	84.4	31.5	2.6	52.8

 Table-13: Rainfall data of district Jammu (month's total rainfall in mm).

Source: Hydromet Division, India Meteorological Department

⁵ Source: Central Ground Water Board - Ground water information booklet, Jammu district.

5. Air Quality

76. The sub project area is mostly urban area. Vehicular traffic is the major contributor for environmental pollution. The subproject sections pass through built-up area with residential, commercial and institutional establishments. The ambient air quality data with respect to RSPM (PM₁₀), SO₂ and NO₂ was measured at specified sites and the results are presented in **Table-14** below. The data was collected during the month of October-November, 2010 and February 2011 by the Environmental Monitoring Laboratory of ERA. The sampling was conducted by using the High Volume Air Sampler "Envirotech APM 460BL" with gas assembly APM 411TE. The sampling was done for 8 hours during the peak traffic hours.

S.No.	Site /Location	Site Type	Date of	Parameters		
			sampling	RSPM (PM ₁₀) ⁶ (μg/m³)	SO₂ (µg/m³)	NO ₂ (µg/m³)
1	Jodhamal Public School (play ground site)	Commercial/ residential	16/11/2010	89.79	13.82	26.38
2	Channi Himmat below Ritz Menor	Commercial/ residential	18/11/2010	65.68	15.10	34.34
3	Sainik Colony residential area near Kalu Chak Nallah	Residential	27/11/2010	105.96	11.02	26.90
4	Nai Basti commercial cum residential area	Commercial/ residential	30/11/2010	174.20	18.27	38.80
5	Janipur near government quarters	Residential	24/02/2011	49.93	14.46	31.75
6	Janipur near Pamposh colony	Residential	28/02/2011	67.70	10.99	29.64
7	Near A.G. office	Residential	22/02/2011	161.45	7.66	53.20
8	Near Karan Hotel, Geeta Bhawan, Bakshi Nagar	Residential	23/02/2011	131.94	13.75	64.02
9	Rehari	Residential	21/10/2010	95.02	10.96	29.31
10	Near Toph Morh	Residential	20/10/2010	219.39	20.83	44.12
11	Near Talab Ploura	Residential	23/10/2010	53.46	8.77	17.38
	NAAQ Standards ⁷			100	80	80

 Table- 14: Ambient air quality data at various locations

NAAQS= National ambient air quality standards of Government of India; NO₂= Nitrogen dioxide; PM₁₀= Particulate matter below 10μ particle size; RSPM= Respirable suspended particulate matter; SO₂= Sulphur dioxide

77. The result of the tests concludes that the values obtained for NO_2 and SO_2 are within the permissible limits at all the sites, similarly, the values of respirable suspended particulate matter (PM_{10}) were also within the permissible limit at six sites. However, the values of PM_{10} recorded at remaining five sites remained higher than the permissible limits as stipulated under National Ambient Air quality Standards. The higher RSPM values at these sites are due to movement of traffic in the vicinity of these sites.

78. The National Ambient Air Quality Standards have been revised by Ministry of Environment and Forests, Government of India on 16th September 2009, wherein the

⁶ PM_{2.5} will be provided later as the equipment to measure PM_{2.5} is not yet available. The requisite equipment shall be procured and the baseline data shall be again generated for all parameters before start of works on the proposed sub-project.

⁷ National Ambient Air Quality Standards (NAAQS), Government of India published in Gazette of India, Extraordinary, Part-II, Section-3, Subsection-i vide no. G.S.R. 826(E), dated 16th September 2009.

Respirable Suspended Particulate Matter (RSPM) has been further divided into PM_{10} and $PM_{2.5}$. The air quality monitoring equipment presently available with J and K ERA can measure the total particulate matter below 10µ particle size (i.e. PM_{10}). However, separate values for $PM_{2.5}$ cannot be determined. The requisite equipment shall be procured by ERA for measurement of $PM_{2.5}$ and baseline data shall be generated for all parameters before start of works on the proposed subproject. Procurement of equipments for environmental monitoring laboratories of ERA shall be an independent exercise and shall not be a part of this subproject.

6. Ambient noise levels

79. The subproject sections pass through built-up area with residential, commercial and institutional establishments and significant volume of traffic pass through these sections causing frequent traffic jams in the area. Heavy traffic movement in the sub-project area is considered to be the major cause of noise pollution. The existing noise levels at various locations have been presented as baseline data in **Table-15**. The noise levels were monitored during day time in October-November 2010 and February 2011 by the Environmental Monitoring Laboratory of J&K ERA.

S.No.	Site/ Location	Date of sampling	Site type	Day time noise levels dB(A) L _{eq}	Noise quality standards ⁸ (dB(A) L _{eq})
1	Jodhamal Public School (play ground site)	16/11/2010	Silence zone	56.2	50
2	Channi Himmat below Ritz Menor	18/11/2010	Commercial	63.8	65
3	Sainik Colony residential area near Kalu Chak Nallah	27/11/2010	Residential	53.6	55
4	Nai Basti commercial cum residential area	30/11/2010	Residential	62	55
5	Janipur near govt. quarters	24/02/2011	Residential	63.1	55
6	Janipur near Pamposh Colony	28/02/2010	Residential	51.9	55
7	Near A.G. office	22/02/2011	Residential	67.3	55
8	Near Karan Hotel, Geta Bhawan, Bakshi Nagar	23/02/2011	Residential	65.2	55
9	Rehari	21/10/2010	Residential	67.1	55
10	Near Toph Morh	20/10/2010	Residential	73.6	55
11	Near Talab Ploura	23/10/2010	Residential	69.0	55

 Table -15: Ambient noise quality data at various locations

dB(A) L_{eq =} the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

80. On comparison of noise quality data with the limits specified for different types of the areas in the ambient noise quality standards (under schedule to the Noise Pollution (Regulation And Control) Rules, 2000 of Government of India) it is evident that the noise values at most of the sites (8 out of 11) during day time are higher than the permissible standards.. This may be attributed to the commercial activities and traffic movement coupled with frequent traffic jams and blowing of horns in the subproject corridor.

⁸ Standards specified in the schedule of Noise Pollution (Regulation And Control) Rules, 2000 of Government of India The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.

81. Execution of the proposed sub-project shall be done during day time only, therefore ruling out the possibility of any noise pollution during night time. In case, any works are to be carried out during night time then the baseline data shall be generated prior to start of any such work.

7. Water Resources

i. Surface Water

82. During rains, the storm water flows through the existing drains and finally discharge into river Tawi, which is a major left bank tributary of river Chenab. The river divides Jammu city into eastern and western parts. The river originates from Kali Kundi glacier and area adjoining south-west of Bhadarwah in Doda district (J&K), at an elevation of about 4000m. According to Central Water Commission (CWC), Jammu the discharge of river Tawi is minimum during January-February and maximum during August. Execution of proposed subproject is not expected to have any impact of the any of the surface water resources of the area.

ii. Geohydrology and Groundwater

83. Ground water in Jammu occurs mostly under water table (phreatic or unconfined) conditions in major parts of the city. In the western part of Jammu city (on right bank of river Tawi) the depth of water level in the tube wells is ranging from 3.60m (Waziranwali Gali, Bohri) to 91.00m (Keran, Kamal Nagar) below ground level. Whereas, in eastern part of the Jammu city (on left bank of river Tawi) the depth of water level in the tube wells is ranging from 7.55m (in Babliana area) to 92.80m (Channi Himmat Sector-1A) below ground level.

84. The area of Jammu has surplus exploitable ground water potential as per hydrogeological assessment study carried out by Central Ground Water Board (CGWB) and Project Management Consultant of ADB loan 2151-IND (2007). It has been indicated in the reports that the present ground water extraction in the area is only 17.62% of the total available potential; and the area thus lies in the safe category of ground water development. Execution of proposed subproject is not expected to have any impact on the ground water resources of the area.

B. Ecological Resources

85. **Terrestrial ecology and Biodiversity**. Since, the subproject stretch is located within built-up area of Jammu city, no sensitive ecological areas are located along the subproject corridor.

86. **Forest Areas and Trees.** The subproject is located within Jammu city and there is no forest within or adjacent to the subproject corridor. Keeping in view the nature and scope of the subproject, cutting of trees is not required for execution of the proposed subproject.

87. **Wild fauna.** No wild animals are reported in and around the subproject corridor as the same is located in the city area and there is no forest close to the subproject site.

88. **Rare or Endangered Species**. No rare or endangered animal or plant species are reported in the subproject impact zone.

89. **Protected Area**. There is no protected area within or adjacent to the subproject sites. The Ramnagar wildlife sanctuary is located at a distance of about 0.32km from the periphery of
the proposed subproject (from tube well construction site at New Plot). Ramnagar wildlife sanctuary was notified under J and K Government order No. SRO-136 dated 10.04.1990. The sanctuary is spread over an area of 31.5 sq. km. The floral components of the sanctuary include *Acacia modesta, Pinus roxburghii, Acacia catechu, Acacia nilotica, Dalbergia sissoo, Bombax ceiba, Emblica officinalis, Zizyphus jujuba, Mallotus philipensis, Ficus benghalensis, Ficus religiosa, Butea monosperma, Grevia optiva, Carissa opaca, Adhatoda vesca, etc. The fauna reported in the sanctuary includes wild boar, barking deer, porcupine, rhesus monkey, jackal, hare, fox, etc. and birds like pheasants, parrots, pegeons, vultures, kites, bulbuls, black drongo, owls, etc. The sanctuary has not been bifurcated into core and buffer zones. The tube well construction site at New Plot is located outside the boundary of the wildlife sanctuary (at a minimum distance of about 0.32km). The tube well construction site is within existing PHED complex surrounded by habitations and army area. The activities proposed under this subproject are not expected to have any impact on the wildlife sanctuary.*



90. **Fisheries**. The aquatic biology of river Tawi comprises of phytoplanktons (eg. *Diatoma elongatum*, *Pediustrum duplex*, *Tetraedron minimum*, *Nitzschia palea*, *Gomphonema gracile*, *Gomphonema constrictum*, *Navicula cupsidata*, *Cymbella tumida*, *Pediastrum tetras*, *Oedogonium vulgar*e, *Ocsillatoria curviceps*, *Anabaena spiroides*.etc.), zooplanktons (*Polyartha vulgaris*, *Cyclops ladakanus*, etc), and benthos (*Chironmus* sp., *Tubifex* sp., etc), besides macro-fauna like small crustaceans, amphibians, fish and insects. The common fish species in river Tawi include *Garra gotyla*, *Garra lamta*, *Labeo dero*, *Labeo bata*, *Glyptothorax sp.*, *Glyptosternum sp.*, *Barilius vagra*, *Barilius bendelisis*, *Puntius conchonius*, *Puntius ticto*, *Puntius sophore*, *Oreochromis mossambicus*, *Channa punctatus*, *Channa gachua*, *Channa orientalis*, *Heteropneustes fossilis*, *Clarias batarachus*, *etc.* No fishing activity has been observed in river Tawi. Further, no impact of the proposed subproject is anticipated on the aquatic ecology of river Tawi.

C. Economic Development

91. Jammu and Kashmir's economy is predominantly dependent on agriculture and allied activities. Directly and indirectly, it supports about 80 per cent of the population besides contributing nearly 60 per cent of the state revenue, which adequately explains the overdependency of the population on agriculture. The overall economic growth of the state depends largely on the progress of agricultural sector.

92. The state is divided into three agro-climatic zones: Jammu, Kashmir and Ladakh; each has its own specific geo-climatic condition, which determines the cropping pattern and productivity. Rice is the chief crop of Kashmir zone, followed by maize, barley and wheat. Jammu region dominates both in maize and wheat production. In the Ladakh region, barley is the major cereal crop followed by wheat. The production of three important food crops, namely, rice, maize and wheat, contributes a major portion of the foodgrain in the state and accounts for about 84 percent of the total cropped area; the balance 16 per cent is shared by inferior cereals and pulses. Nearly 75 per cent of the country's temperate fruits, mainly apples, are grown in the state.

93. Agricultural exports from Jammu and Kashmir include apples, barley, cherries, corn, millet, oranges, rice, kidney beans, peaches, pears, saffron, sorghum, vegetables, and wheat, while manufactured exports include handicrafts, rugs, and shawls.

94. Horticulture also plays a vital role in the economic development of the state. With an annual turnover of over INR 300 crore, apart from foreign exchange of over INR 80 crore, this sector is the next biggest source of income in the state's economy. Horticultural produce from the state includes apples, apricots, cherries, pears, plums, almonds and walnuts.

95. **Land use Pattern**. Jammu is known as a city of temples and is the summer capital of Jammu and Kashmir state. The proposed landuse distribution of Jammu city as per the master Plan (2001-2021) is given in the **Table –16** below.

SI. No.	Land use	Proposed lar	nd use (2021)
		Area (ha.)	% of Developed area
1	Residential	12000	41.7
2	Commercial	487	1.7
3	Industry	521	1.8
4	Open spaces	4462	15.5
5	Transportation	3178	11.0
6	Utilities	50	0.2
7	Government	2277	7.9
8	Institutional	817	2.8
9	Agriculture and water bodies	5000	17.4
	Total Developed area (ha)	28,792	100

 Table –16: Jammu local area land use distribution – proposed

Source: Jammu Master Plan 2001 -2021

96. The land use in the project corridor comprises of built up area and transportation area. The built up areas consist of residential complexes, government/private offices and buildings, educational institutes, religious places and commercial establishments such as shops, hotels, restaurants, etc. The transportation area constitutes of existing roads in the subproject area.

97. The subproject components and a summary impact on land acquisition and resettlement is described in **Table 17.**

S.	Component	Location	Permanent impact on land	Temporary impact on	Remarks
No.			acquisition and resettlement	land acquisition and	
1	Laying new rising mains from proposed tube wells to over head tanks / ground level service reservoirs for a length of 14.8 km. Replacement of worn out pipes and strengthening of distribution network for a length of 67km Construction of 10	Laying new rising mains from proposed tube wells to over head tanks / ground level service reservoirs for a length of 14.8 km is spread over Jammu city. Replacement of worn out pipes and strengthening of distribution network for a length 67 km in Phase IV of Jammu city i. Gandhi Nagar, Block-A	No There will be no involuntary land	Yes, a total of 117 residences, 216 commercial establishments and 28 institutions will have access disruptions due to implementation of these two components.	Excavation will be carried out manually or by machine. Temporary impacts on livelihood in terms of impact on small businesses are anticipated during the construction due to temporary impact on access.
	over head tanks (OHTs).	 ii. Nai-Basti iii. Sainik Colony, Sector-D iv. Dilli v. Channi Himmat, Sector-7 vi. Fruit market, Narwal vii. Rajinder Nagar, JDA-phase I, Bantalab viii. Janipur Stage-III ix. Roopnagar , EWS colony x. Baba Kalakhnath Temple 	acquisition; however 2377 m ² of land would be used for construction of 10 tube wells. 05 tube wells will be constructed on 1125 m ² of land in possession of PHED, 02 on 450 m ² of land in possession of JDA, 01 on 225 m ² of land in possession of State Horticulture Department, 01 on 324 m ² of land in possession of Sainik Co-operative House Building Society Ltd (SCHSBS) and 01 on 253 m ² of land in possession of Baba Kalaknath Ji Temple Trust.		constructed inside the existing Public Health Engineering Department (PHED) premises. 02 will be constructed on Jammu Development Authority (JDA) land. 01 OHT will be constructed on the land belonging to Sainik Co-operative House Building Society Ltd (SCHSBS). No objection Certificates (NOCs) for construction of 9 OHTs from PHED, JDA and SCHSBS have been obtained and placed as Appendix 3 . Memorandum of Understanding (MOUs) for providing consent to construct 01 OHT on community land belonging to Baba Kalaknath Temple has been obtained and placed in Appendix 4 .
4	Construction of 19 tube wells (TWs).	 i. D/C Block, Gandhi Nagar ii. Vijay Park, Nai Basti iii. Channi Himmat, Sector-2 iv. Bandhu Rakh, PHE Complex v. Ambica Colony, PHE Complex 	There will be no involuntary land acquisition, however 12 tube wells will be constructed on 471.96 m ² of land in possession of PHED, 1 tube well will be constructed on 39.33 m ² of land in possession of JDA, 2 tube wells will be constructed on 54.25 m ² of land in possession of Sainik Co-operative	No	Out of the total 19 tube wells, 12 will be constructed inside Public Health Engineering Department (PHED) premises, 01 will be constructed on Jammu Development Authority (JDA) land, 02 will be constructed on the land belonging to Sainik Co-operative House Building Society Ltd. (SCHSBS). No objection Certificates

Table –17: Subproject components and summary impact on land acquisition and resettlement

S. No.	Component	Location	Permanent impact on land acquisition and resettlement	Temporary impact on land acquisition and	Remarks
		 vi. Sainik Colony, Sector-G, Near Market vii. Sainik Colony, Sec-F viii. Channi Kamala ix. PHE Complex, Channi Himmat, Sector-1 x. Idd Gah, Malik Market xi. CPS Narwal xii. Horticulture Park, Fruit Market xiii. Church at Wazarat road xiv. Missionaries of Charity xv. Park near Raina Academy, Paloura xvi. Bathing Ghat at Iohan, Paloura xvii. PHE Complex, New Plot xviii. Rajinder Nagar, JDA Phase-I, Bantalab xix. PHE Complex, Bakshi Nagar 	House Building Society Ltd (SCHSBS), 1 tube well will be constructed on 50.60 m ² of land in possession of Channi Himmat Panch Mandir Trust, 1 tube well will be constructed on 39.33 m ² of land in possession of Idd Gah Trust, Malik Market, 1 tube well will be constructed on 9.29 m ² of land in possession of St. Paul Church, Residency Road and 1 tube well will be constructed on 50.60 m ² of land in possession of Missionaries of Charity Church.		(NOCs) from PHED, JDA and SCHSBS have been obtained and placed as Appendix 3 . The Memorandum of Understanding (MOUs) for providing consent to construct 04 tube wells on community land belonging to Panch Mandir (Channi Himmat, Sector-2); Idd Gah, Malik Market; Church at Wazarat road and Missionaries of Charity have been obtained from concerned representatives and placed in Appendix 4 .
5	Replacement of worn-out pumping machineries.	Within the existing pumping stations on PHED land.	No	No	All replacement of old and worn our machinery would be done within existing pumping stations.

98. Thus execution of proposed subproject for construction of 10 over head tanks (OHTs) and construction of 19 tube wells (TWs) shall involve impact on some land. Conversion of 2311.29m² of open state land currently in possession of government departments like PHED, JDA and Horticulture and 781.27 m² of open land in possession of communities, trust, societies, etc. into public utility (facility of OHTs and tube wells). Apart from these minor changes, there shall not be any significant change in the landuse of the subproject area. The details of land to be acquired for the execution of proposed subproject is given in **Table-18**.

S. No.	Ownership	Land required for	Area to be acquired (m ²)	Approximate percentage (%)					
1.	State land (with Government Departments like PHED, JDA and Horticulture)	08 OHTs and 13 tube wells	2311.29	74.74					
2.	Community land in possession of trust/society etc.	02 OHTs and 6 tube wells	781.27	25.26					
	Total	3092.56	100						

Table-18: Details of land required for the subproject

Note: In case of all institutions/community owned lands, etc. where tube wells and OHTs are proposed, land has been donated voluntarily by these organizations for which detailed NOCs have been availed and MOU's also stand signed.

99. **Commercial Activities**. The subproject area is located in Jammu city and the predominant activities in the impact zone are of mixed type including, government departments, hotels, restaurants, banquet halls, shops, educational institutions, as well as residential houses. Varied types of commercial activities in the form of wholesale, retail or small scale services are carried out in the areas around the subproject sites.

No commercial activity will be impacted due to the implementation of the subproject 100. components other than the laying of rising and distribution mains. The new rising and distribution mains will be laid within the available right of way (ROW) of existing road (in shoulders). The replacement of worn out pipes will also be carried out within the available ROW of roads. It has been found through the transect walks along with a team of water supply design engineers that on an average available ROW including the dedicated pedestrian walkway with concrete foot path is 5 to 7 m in selected category of roads in Jammu City. The improvement work will be carried out within the ROW in road shoulders. The maximum required width for laying down of different categories of pipeline (rising and distribution main) will be 1 m. However, at certain junctions there may be some temporary impacts which may disrupt some business activities in terms of temporary impact on the access. The exact nature of temporary impacts will be known at the time of drawing up of the construction schedule of the contractor which will be documented and mitigated at the time of construction⁹ as per the entitlement matrix of the resettlement plan and resettlement framework on case by case basis. To determine the extent of temporary impacts due to the laying of rising and distribution main pipelines, transect walks were undertaken along the proposed networks with focus on the nature of the existing ROW, density of commercial and residential structure, etc.

101. The initial assessments made through transect walk shows that there will be temporary access losses to 216 commercial establishments during the laying of rising and distribution main pipelines. There will be no demolition and no relocation of any structures. The partial closure of road will follow the time string of action of excavation followed by laying of pipeline, testing of

⁹ The excavation of trenches for primary lines will last for a maximum of 03 days. The construction will be scheduled in such a way as to minimize disruption.

water supply, backfilling of excavated trenches and road restoration. The access to these shops, residences and institutions will be affected for a maximum of 3 days.

102. Potential temporary impacts of access disruption for all these shops/commercial establishments can be mitigated through good construction practices which will be the responsibility of construction contractors. Measures are identified in the IEE and include: (i) providing walkways and metal sheets to maintain access across trenches, (ii) increasing the workforce in front of shops/commercial establishments so as to reduce the period of impact, (iii) consulting business and institutions regarding operating hours and factoring this in work schedules, (iv) providing advance information on works to be undertaken including appropriate signages etc. The project contractor will ensure that there is provision of alternate access during the construction so that there is no closure of these shops or any loss of clientage. A format titled "Confirmation from Operator of Commercial establishment/shop for provision of temporary access by Contactor" has been developed which is part of Environment Management Plan and as per which it would be responsibility of contractor to provide alternate access to the shops/commercial establishments to the satisfaction of the person affected. The format is appended as Appendix 1 to EMP. Moreover, as per the contract provisions, the contractor will be required to put back the road to its original condition after the pipe laying.

103. In case, the loss of access to the shops during construction is not effectively mitigated by provision of alternate access by project contractors same may cause temporary loss of income during the construction for which provision for livelihood allowances have been made in the resettlement plan. There could be temporary disruption of business for certain number of days for which affected persons will be provided assistance for this transitional period on a case-to-case basis as per the provision has been kept in the Resettlement plan for same. The payment of assistance will be made for days of closure, and will be subject to the production of requisite documents in support of the claim. Cash assistance will be released after proper verification of documents¹⁰.

104. A detailed Resettlement Plan has been prepared for rehabilitation and resettlement of parties affected by execution of proposed subproject.

105. The proposed rehabilitation of water supply system will ensure adequate availability of potable water to various areas in Jammu City.

106. **Industrial Development**. In Jammu district a number of industrial areas are being developed. The information available with the Jammu and Kashmir Industries Department regarding various industrial areas is given in **Table-19**. The majority of industries in Jammu district are small-scale units. The dominant units belong to general engineering, food-stuff, textiles, etc.

S. No.	Location	Number of Units	Land under industrial area (in Kanal)
1.	Digiana	106	137.09
2.	Jammu Cantonment	34	96

Table-19: Industrial areas in Jammu district with number of units and land area.

¹⁰ Income certificate or income tax return certificate or any other document proving their income from affected commercial establishment.

S. No.	Location	Number of Units	Land under industrial area (in Kanal)
3.	Bari Brahmana Industrial Complex	464	6152
4.	Gangyal	336 (units have been allotted land)	988
5.	Birpur	156 (units have been allotted land)	306
6.	Akhnoor	21	

	_	-			
1	Kana	=	505	.39	m ²

Source: Official website of J&K Industries Department.

107. **Agriculture**. The outskirts of Jammu City are bordered with agricultural fields. Ranbir canal brings water to these agricultural fields from Chenab River through the Jammu City. The Basmati rice of Jammu (cultivated in Ranbir Singh Pura of Jammu district) is very famous and is exported to various countries. However, no agricultural activities are carried out in the subproject impact zone.

108. **Infrastructure Facilities**. Since, the subproject is spread over major portions of Jammu City; the infrastructure facilities like schools, hospitals, colleges, electricity and communication in the subproject area are satisfactory.

109. During execution of the proposed subproject, there will be no impact on the main building of any department/ facility, therefore no impact on any educational, administrative or medical service is anticipated.

110. **Water supply.** Potable water supply distribution system was introduced in the city of Jammu in the year 1934 with surface source as river Tawi. Now the source of water supply to the city of Jammu is surface water from river Tawi and ground water tapped through number of tube wells located throughout the city.

111. Population in Jammu City is increasing in range of 2.0-2.2% yearly. The population in Jammu City was estimated to be 11,89,908 (Year 2011). The gross water demand with permissible transmission and distribution losses of 20% and the net water demand in the Jammu City are given in **Table-20** below.

Year	Estimated population	Net domestic water demand @ 135 lpcd, and 10% demand of institutions (MLD)	Gross water demand @ 135 lpcd + 15% distribution losses + 5% transmission losses and 10% demand of institutions (MLD)
2011	1,189,908	176.7	220.88
2015	1,347,606	200.12	250.15
2030	2,192,081	325.52	406.90
2045	3,675,021	545.74	682.18

Table 20: Water demand in project area

lpcd= liter per capita per day; MLD= million liter per day

112. **Water source:** Although, river Tawi is a perennial river, flow in the river is lean except in monsoon period. The surface water flow in the river Tawi is used for irrigation and water supply purposes. Only 23 MGD (103 MLD) surface water is reserved for water supply purposes. This limited available water is already tapped at existing water supply head works at Sitlee, Dhountly and Boria (intake well constructed under ADB Loan 2151-IND). Therefore, there is no further availability of surface water from river Tawi. Due to limited availability of surface water from river

Tawi, remaining requirement of drinking water is met from the ground water sources (tube wells).

113. Ground water in Jammu City occurs mostly under water table (Phreatic or unconfined). The area of Jammu has surplus exploitable ground water potential as per hydro-geological assessment study carried out by Central Ground Water Board (CGWB) and Project Management Consultant of ADB loan 2151-IND (2007). It has been indicated in the reports that the present ground water extraction in the area is only 17.62% of the total available potential; and the area thus lies in the safe category of ground water development. Thus tube well is a viable option that can be exploited suitably to cater the present growing demand of Jammu City.

114. **Current water supply system in Jammu City.** River Tawi divides the Jammu City in two parts. Currently, water from one side of river to another side is not transferred. Owing to topography of Jammu City, uniform distribution pattern of water supply is not possible for whole city, thus the water supply system is divided into zones and subzones. Ground water is main source for extended parts of Jammu City and part of the city area located at higher elevations. Independent, isolated small water supply systems have been developed from time to time for these areas, which includes local productions (tube wells), storages (overhead tanks and ground level service reservoirs) and distribution networks.

115. Due to these reasons, the water supply network in Jammu City has been developed separately for each water supply subzone/sub-subzone without interconnection between the subzones/sub-subzones. Thus, in some subzones/sub-subzones, the actual water production capacity is exceeding the demand, but water is deficient in the other subzones. Therefore, water supply by tankers on every alternate day with very low rate supply of 30-70 lpcd is common in peripheral areas of Jammu City.

116. **Water production: Table 21** below shows the status of water supply in Jammu City in 2006¹¹ (before implementation of ADB Loan 2151-IND). As shown in the table, the total installed production capacity was 227MLD, but less than half of the production capacity could reach to the households.

Component	Installed capacity (MLD)	Actual production (MLD)	System losses (%)	Net quantity reaching households (MLD)	Assumptions		
Sitlee WTP 1	24.3	59.13	50	29.56	1. Water treatment plants		
Sitlee WTP 2	24.3		50		functioning at 90% efficiency.		
Sitlee WTP 3	17.1		50		Losses in distribution		
Dhountly WTP	5.4	4.86	50	2.43	network in old city (right bank		
Tube wells on right bank	75.00	60.00	50	30.0	of river Tawi) as high as 50%.		
Tube wells on left bank	80.9	64.72	40	38.83	 Losses in distribution network in newly developed areas (left bank of river Tawi) is 40%. Tube wells are running at 80% efficiency. 		
Total:	227.00	188.71		100.82			

 Table 21: Status of water supply in Jammu City in year 2006

MLD= million liter per day; WTP=water treatment plant

¹¹ Source: 2007 Jammu Water Supply Master Plan

117. **Distribution system.** The Jammu water supply system has been divided into seven water supply zones. Zones 1 to 5 are on the right bank of river Tawi (Jammu west) which comprises of old city and extensions. Zone 6 comprises of left bank of river Tawi (Jammu east) and zone 7 comprises of industrial township of Bari Brahmana¹². The water supply zones were neither based on the natural topography nor the sources of water supply thus have no hydraulic meaning. Each zone is further divided into sub-zones and each sub-zone is further divided into sub-subzones for water supply management (there are about 59 and 49 isolated sub-subzones in the west and east Jammu respectively). Each sub-subzone has its own tube well(s) or being fed by gravity pipeline from higher level located service reservoirs (GLSRs), overhead tanks and independent distribution network. In some sub-subzones, the distribution network consists of "spaghetti" of individual pipelines, connecting to separate colony or neighborhoods.

The positive side of these arrangements is easy to establish District Metering Areas 118. (DMAs) for non- revenue water reduction, but the negative side of the current arrangements is very hard to design and construct transmission systems to connect all sub-subzones and transport water from surplus areas to deficit areas. This is a "must" for a centralized water supply system, especially in near future; main water source may be from Chenab river¹³.

119. **Losses**. Losses in the distribution network within water supply sub-subzones are very high, up to 35-45%: it is a practice that (i) households are allowed to connect directly to the distribution pipelines without service lines; (ii) some households have more than one connection; (iii) flat rate of user charges without household meters; (iv) public taps without valves; and (v) absence of proper maintenance (affords and funds), resulting to very high losses in the distribution network within sub-sub-zones. ADB Loan 2151-IND has been addressing this problem to reduce water losses in the distribution networks, by replacement of worn out leaking distribution pipelines. However, Loan 2151 could cover about half of water supply sub-subzones of Jammu City only for replacement of worn out leaking distribution pipelines.

Direct supply. Some of the peripheral subzones have no service reservoir facilities, 120. therefore water from tube wells is directly fed to the distribution networks and convey water directly to areas or colonies which are located at varying distances and different elevations. As a consequence, (a) "spaghetti" network has been developed, and (b) the pumps are made to operate at varying heads to reach the tail end of the supply area, resulting in high power consumption and gradual reduction in efficiency of the pumping system over time.

121. **Irregular power supply.** On an average the power availability in Jammu is for 16 - 20hours and more often the voltage is too low for pumping machinery to operate. This leads to non utilization of the source or pumping equipment to the designed capacity and the total water generating capacity of the tube wells remain unutilized.

Aged pumping machinery. The pumping machinery in the existing tube wells is very 122. old and is in use for many years, resulting in their efficiency getting substantially reduced and also requiring frequent repairs. Most of the pumping machineries and electrical devices at central pumping stations have outlived their useful lives; some have been in use for more than 20 years, resulting in frequent breakdowns, low efficiency and reduced discharges.

¹² This division is revised in the updated Jammu Water Master Plan, based on two criteria (i) source of water supply; and (ii) topography of the areas ¹³ Updated Water Supply Master Plan

123. Lack of bulk or flow meters in all water production, storage and distribution facilities (tube wells, OHTs, water treatment plants and pumping stations) makes it impossible to accurately measure the production capacities. All calculations were based on the installed/ designed capacities, resulting in high system capacities in figures, but low in actual production.

124. Works under Multi Sector Project for Infrastructure Rehabilitation in Jammu and Kashmir (MPIRJK), ADB Loan 2151- IND. Under the Loan 2151-IND, Jammu water supply sector is benefiting in two main aspects (a) preparation of Jammu Water Supply Master Plan for requirement upto 2036; and (b) immediate improvement investment on (i) reduction of water losses in the rising mains, some distribution sub-subzones and storages facilities; (ii) construction of new water sources (tube wells, water intake well); (iii) construction of additional storage capacities; and (iv) providing water tankers to supply water for the areas having no piped distribution system or water deficit areas. The details of works being executed under Loan 2151 – IND are shown in Table 22.

S.No.	Component	Number	Capacity	Locations
1	Construction of new tube wells	55	21.36 MGD or 97.08 MLD	 Left bank: 23 tube wells: Sainik Colony Sector – C, Sainik Colony Sector – G, Sanjay Nagar, Adarsh Enclave, Gangyal, Deep Nagar, Apna Vihar, Kunjwani, Balmiki Nagar, Nanak Nagar Sector – 8, K.C. Colony, Jamwal Residency, Babliana, Digiana, Nakrian, Channi Himmat, Narwal Procurement Division, Lakshmi Narayan Mandir at Gandgi Nagar, Sector D Sainik colony, Greater Kailash, PHED complex Dilli, Sidhra and Trikuta Nagar Sector – 5. Right bank: 32 tube wells: JDA Park Indira Vihar, Science College – I, Science College – II, Science College – III, Bua Datti Mandir at Paloura, CPS Rajpura Mangotrian, Agricultural Complex, Play Ground Government Medical College, Waziron wali Gali, Bohri, Dental College, Gole (Shamshan Ghat), Relief Commissioner Complex, Rehari Park, Himmat Colony at Gole, Kabir Colony at B.C.Road, Camp Gole Gujral, Roop Nagar Stage – II, CPS Bantalab, CPS Muthi, CPS Muthi Goan, Suryavanshi Nagar, Poonch Colony Bantalab, Durga Nagar, Dharmal, Dream Land Colony, Rajinder Nagar, Keran, Kamla Nagar, PHE Station Barnai, Patoli Brahamana, Lower Muthi Lale-da-bagh, Lower Barnai, Qasim Nagar, Roop Nagar Park.
2	Laying new raising mains	161 km		The subproject included replacement of old leaking rising mains and laying of rising mains for new tube wells in both eastern as well as western parts of Jammu City.
3	Redevelopment of existing less discharge or defunct tube wells	38	5.16 MGD or 23.44 MLD	This is increased production capacity of the existing tube wells. This component was spread over Jammu City in both eastern and western parts.
4	Construction of new OHTs	43	71.5 LG	 Left bank, 21 OHTs: PHE Complex at Shastri Nagar, Tube Well No. 9 at Gandhi Nagar, PHE Complex at Channi Himmat, Tube Well No. 1at Gandhi Nagar, PHE Complex Rail Head, PHE Complex Trikuta Nagar, D/C Block Gandhi Nagar, Nanak Nagar Sector – 7, R & B Guest House, Sainik Colony Sector C, Thangar, Sainik Colony Sector A, Old Bandhu Rakh, Sainik Colony Sector F, Ajit Nagar, Dashmesh Nagar, Uttam Nagar, Babliana, Apna Vihar, Sanik Colony C and Langer. Right bank, 22 OHTs: Ram Mandir at Bakshi Nagar, Parade, Amar Colony, Sarwal, Idd Gah at Residency Road, Roop Nagar Stage-II, Suryavanshi Vihar, Roop Nagar Stage-III, JDA Park at Indira Vihar, Ranjeet Pura, Rajpura, Relief Commissioner Office, Puran Nagar, Tomal, Resham Ghar, Janipur Stage-IV, Paloura Top, Agricultural Complex, Dharmal, Muthi Village and Muthi Tube well No 5.
5	Construction of new ground level service reservoirs (GLSRs)	16	25.5 LG	Left Bank: (9 GLSRs) Channi Himmat, Boria Pumping Station, PHE Complex Narwal, Tube Well No. 1, Gandhi Nagar, Dodhi Gujjar, Sainik Colony Sector F/G, Nawabad near B.N.College, PHE Procurement Division, Qasim Nagar (Bahu Top) Right bank: (8 GLSRs) CPS Muthi, Roop Nagar Stage-II, Relief Commissioner Office, Sitlee, Company Bagh, New Plot, Parade and CPS Bantalab
6	Construction of new water intake structure	1	1.8 MGD	Construction of new water intake structure on river Tawi at Boria on left bank of river Tawi.

Table 22: Immediate Improvement works being implemented under ADB loan 2151-IND

125. **The Water Supply Master Plan prepared under Loan 2151-IND**: The Water Supply Master Plan of Jammu City was prepared in 2007 under ADB Loan 2151-IND. The planning horizon of the master plan was 2036. Assuming Loan 2151-IND would finance all the need for immediate improvement, such as (a) water loss reduction in transmission and distribution mains, (b) construction of water source and storage to meet water deficiency in all the city limit (c) improvement of operation efficiency of pumping machineries and equipment at pumping stations and tube wells for entire city by replacing the less efficient or worn out pumping equipment, the master plan was only to focus on two phases of water supply system expansion: (i) first phase of water supply system expansion to meet the water demand for the year 2021. The main water source of this phase was proposed to get sub-surface water from radial wells in the both sides of Tawi river; and (ii) second phase of system expansion to meet water demand of the year 2036 from Chenab river , which is about 30 km from Jammu City center was in the proposal.

126. **Investments being made under ADB Loan 2151 –IND.** In order to meet the immediate need of improving water supply arising due to growth in population owing to urbanization, various subprojects for improvement in water production and distribution were undertaken by the Public Health Engineering Department (PHED) through State Government resources and by Economic Reconstruction Agency (ERA) under ADB Loan 2151-IND. Table 23 shows the components of water supply improvement subprojects for Jammu City under Loan 2151-IND.

127. Production capacity. After completion of ongoing improvement works, funded by ADB under Loan 2151-IND, the water supply situation in Jammu City would be as reflected in the **Table 23** below. The table shows that after completion of all the works of loan 2151-IND, the net water reaching household will be 188.75 MLD, compared to the demand of about 218.83 MLD in the same year. The actual production capacities of tube wells and treatment plants are currently estimated on the designed/installed capacities. The efficiencies of these production facilities are much lower than the designed/installed capacities. Thus, the second investment priority under "immediate improvement phase" should be given to rehabilitation/replacement of worn out machineries and electrical devices of tube wells and pumping stations to restore the designed/installed capacities.

2101 110									
Component	Installed capacity (MLD)	Actual production (MLD)	System losses (%)	Net quantity reaching households (MLD)	Assumptions				
Sitlee WTP 1	24.3	55.85	50	27.925	1. The work carried under Loan 2151-				
Sitlee WTP 2	24.3		50		IND (MPIRJK), the water loss in				
Sitlee WTP 3	17.1		50		distribution network of zone 1–				
Sitlee WTP 4	24.3	23.1	50	11.55	supply (from Manda GLSR) will				
Dhounthli WTP	5.4	4.59	50	2.295	reduce to 30%; and the same of				
Boria WTP	8.1	7.7	40	4.62	zone 6 will be reduced to 40%				
Tube wells on right bank	75	71.25 ¹⁴	45	39.1875	(only half of the distribution network has been rehabilitated.				
Tube wells on left bank	80.9	76.86 ¹⁵	40	46.12	2. Old WTPs Sitlee WTP 1, 2, 3 & Dhounthli WTP will work at 85%				

Table 23: Water supply status in Jammu City after implementation of MPIRJK (ADB Loan 2151-IND)

¹⁴ Due to Redevelopment of existing tube wells under Loan – I, the production capacity will be re-stored

¹⁵ Due to Redevelopment of existing tube wells under Loan – I, the production capacity will be re-stored

Component	Installed capacity (MLD)	Actual production (MLD)	System losses (%)	Net quantity reaching households (MLD)	Assumptions
New tube wells on right bank (32 Nos)	61.04 ¹⁶	57.99	40	34.794	efficiency and Sitlee WTP 4 and Boria WTP will work at 95 % efficiency.
New tube wells on left bank (23 Nos)	36.04 ¹⁷	34.24	35	22.26	 Losses in transmission mains from treatment plants/tube wells to distribution center is 5%
Total	356.48	331.58		188.75	

GLSR=ground level service reservoir; MLD=million liter per day; WTP= water treatment plant

128. **Storage capacity:** After completion of all on-going works, ninety one overhead tanks will feed the population of Jammu east and west (including existing overhead tanks). The storage capacities of overhead tanks range from 1 to 4 lac gallons (LG). The cumulative storage capacities of overhead tanks at Jammu west and Jammu east will be 36 ML and 34.5 ML respectively. The approximate capacity of existing ground level service reservoirs and sump tanks in Jammu east and west is 63.53 ML and 18.05 ML respectively. The existing total storage capacity is sufficient to meet present arrangement but is not uniformly distributed. Some outer areas have no service reservoirs; therefore water is supplied directly to the consumers.

129. Distribution 24 system. Out of 50 subzones, subzones are under rehabilitation/replacement by Loan 2151-IND. For the balance 26 subzones, distribution networks are to be rehabilitated. 6 subzones are dropped and shall be undertaken in subsequent tranches of JKUSDIP. All the subzones will be converted into District Metering Areas (DMAs) once the distribution networks are properly rehabilitated. The rehabilitation of balance subzones can be considered as first priority of this proposed subproject as it will save potable water and it is a continuation of Water Loss Reduction Program, started in Loan 2151-IND. Table 24 shows the works for rehabilitation of subzone 6 under Phase - IV as being proposed under Tranche – II of JKUSDIP.

130. As anticipated results of the Water Loss Reduction Program, which is being carried out under Loan 2151-IND and proposed works of Phase IV under Tranche – II of JKUSDIP, water loss in the system will be reduced from currently 30 – 45% to 20%. Some amount of treated water will be saved and could be transported to the water deficit areas. However, due to lack of transmission system interconnecting DMAs in each zone, the saved water cannot be transported till the transmission system is designed and installed to connect all DMAs together. Thus in order to supply water to inhabitants in currently water deficit subzones, some water production systems (tube wells) and storage capacity (OHTs) are being proposed to be included in Tranche – II of JKUSDIP. **Table 25** shows the "list" of water deficit subzones provided by the Public Health Engineering Department. ERA officials and the consultants analyzed the "list", conducted field visits and verified the facts that some areas have deficient water supply. To meet immediate need, proposals of constructing 19 new tube wells and 10 over head tanks, in water deficient and low water distribution pressure areas, are included in this subproject.

¹⁶ Source- Design and Supervision Consultant, ADB loan 2151-IND

¹⁷ Source- Design and Supervision Consultant, ADB loan 2151-IND

Table 24: The water loss reduction works being implemented under ADB Loan 2151- IND and PHED and balance works proposed to be included in different tranches of JKUSDIP.

Phase'°	Zone	Sub zone being rehabilitated under Loan 2151 and	Balance rehabilitation works			
		PHED	(subzones) proposed to be			
			implemented under different			
			Tranches of JKUSDIP			
I	1	Gandhi Nagar, Nanak Nagar, Jeevan Nagar, Ajit Nagar, Shastri Nagar, Parade-Shalamar road, Shahidi	None			
		Chowk. Christian Colony. Mahalla Dalpatiya.				
		Radhunath Bazar Hari Market Ghas Mandi Pratan				
		Garb Janinur (Shivali Duram Shiv Nagar Mahasa				
		Mahalla (14 aubzanaa)				
			NI			
11	6	Sainik Colony, Greater Kailash, Channi Himmat,	None			
		Adarsh Enclave, Trikuta nagar, Nai basti, Sanjay				
		Nagar, Roop Nagar Digiana, Kunjwani Uttam Nagar,				
		Langar, (10 subzones)				
	2,3,4		Talab Tillo, Sarwal, New Plot, Janipur,			
			Bhagwati Nagar, Bakshi Nagar, Rajpura,			
			Shakti Nagar, Patoli, Top Sherkhania.			
			(10 subzones). To be taken up in			
			subsequent Tranches of JKUSDIP.			
IV	6	Narwal, Karan Bagh, Gadigarh, Dashmesh Nagar,	Vikram Chowk, Channi Himmat, Channi			
	-	Appa Vibar Bag-e-Babu Kalu Chak Satwari	Kamala Dilli Matto Colony (5			
		Rellicharana are covered by Public Health Engineering	subzones) Being taken up in Tranche –			
		Department under State Gevernment schemes				
V	F	Department under State Government Schellies.	Durgenager Deennager Dieure			
v	5		Durganagar, Roopnagar, Ploura,			
			Bantalab, Keran, Uninoor (6 subzones,)			
			To be taken up in subsequent Tranches			
			of JKUSDIP.			

131. Under water loss reduction programme along with the construction of tube wells and overhead tanks Phase – IV is to be implemented in Tranche – II of JKUSDIP whereas Phase – III and Phase – V shall be implemented in the subsequent Tranches of JKUSDIP.

Table 25: Zone Wise Water Deficit Areas

Zone	Sub zone/ Water deficit areas
1	Sub zone 1 : Old Rehari, Ambphala and Karan Nagar
	Sub zone 2: Jain Bazar, Moti Bazar, Kali Janni, Fatu Choughan and Choughan Salathian
	Sub zone 3: New Rehari Exchange, Dogra Hall, Palace Road and Mohalla Naraina
	Sub zone 4: Pratap Garh, Daru Girjan, Mohalla Malhotra, Lakhadata Bazar, Kanak Mandi area and Talab
	Khatikan.
	Sub zone 5: Raghunathpura, Kaleeth Mohalla, Hari Market and Gummat
	Sub zone 6A & 6B: Tehsil area, Mohalla Dalpatain and Talab Khatikan
	Sub zone 7: Gujjar Nagar, Residency area, Chand Nagar and Prem Nagar
2	Sub zone 1: Krishna Nagar
	Sub zone 2: Mohindar Nagar and Bhagwati Nagar
3	Sub zone 1: Janipur Colony, Old Janipur, Shant Nagar, Indira Vihar, Shivalik Puram, Pamposh Colony,
	Dhok Paloura, High Court and Buta Nagar.
	Sub zone 2&3: Rehari Colony, Subash Nagar, New Plot and Sarwal.
4	Sub zone 1: Rajpura
	Sub zone 2&3: Shakti Nagar and Talab Tillo
	Sub zone 4: Bakshi Nagar and Resham Ghar
5	Sub zone 1: Paloura and Patta Paloura, EWS Colony, Migrant Camp, Lower Roop Nagar
	Sub zone 3: Barnai, Bantalab, Gurha Dharmal and Patoli Brahmana
	Sub zone 4: Toph Sherkania, Thathar, JK colony, EWS Colony and Migrant Camp, Upper Muthi
	Sub zone 5: Lower Muthi, Netar Kothey and Udeywala partial

¹⁸ "Phase" following the definition of 2007 Water Supply Master Plan

Zone	Sub zone/ Water deficit areas
	Sub zone 6:Pata Paloura, Udeywala partial
	Sub zone 7: Bohri, Kabir Nagar Tomal and Hazoori Bagh
	Sub zone 9: Gole Gujral area
	Sub zone 8: Gole area, Agricultural complex
6	Sub zone 6: Nanak Nagar
	Sub zone 9: Nai Basti, Ashok Nagar
	Sub zone 13B: Belicharna
	Sub zone 14: Chatha, Bhour Camp
	Sub zone 17: Bahu and Rakh Bahu
	Sub zone 18: Narwal Bala, Digiana , Rakh Sanjuwan, Bhatindi
	Sub zone 19: Channi Himmat, Transport Nagar, Fruit complex, Sainik Colony, Birla Colony, Bahu Colony,
	Matto colony, and Greater Kailash
	Sub zone 20: Dilli
7	Peripheral areas of Jammu City (Kalu Chak, Bari Brahmana, Sarore under City Development Plan (CDP)

132. The Updated Water Supply Master Plan. Since all the rehabilitation works proposed under Loan 2151 could not be executed due to limitation of funds, therefore the water supply master plan was updated in the year 2010 under JKUSDIP to address the remaining work requirements such as (a) completion of improvement in water loss reduction activities by replacing worn out and leaking distribution pipelines, construction of new water sources and storage facilities to meet immediate present deficiency; improvement in operation efficiency of the pumping machineries and electrical equipment at pumping stations and tube wells by replacing the worn out pumping equipment, etc.; (b) getting surface water from Chenab river water source to expand the water supply system meeting the demand even in the year 2026 and future. The updated water supply master plan also addresses the non-technical part of the schemes which are very crucial for sector development, such as (c) institutional and organizational reforms for both asset owners (Municipal Corporation) and service provider (PHED or Water Board); (d) cost recovery and financing mechanism for both Capex and Opex; (e) customer management; etc. The Master plan has been updated and approved by PHED. The updated Jammu Water Supply Master Plan with planning horizon to 2041 has three phases of investment as detailed below:

i) Immediate improvement phase of the updated Jammu Water Supply Master Plan 2007-2014):

- a. Water Loss Reduction Program. This would include:
 - (i) rehabilitation/replacement of distribution system within sub-sub-zones and establishment of district metering areas (DMAs) for none revenue water control;
 - (ii) installation of bulk meters, service lines and house connections with metering;
 - (iii) rehabilitation/replacement of leaking rising mains, storage reservoirs, etc.;

b. Rehabilitation/replacement of machineries and equipment at pumping stations and tube wells to improve the operational efficiencies. This work should be done in parallel with rehabilitation of pipelines, distribution network in each zone/sub-zone/subsub-zones;

c. Construction of required additional production, storage capacities and distribution network in water deficit areas.

133. Some of these works are being executed under ADB Loan 2151-IND and some of balance works are now proposed under this subproject under Tranche – II of JKUSDIP with implementation time frame from 2012-2014.

ii) Phase 1 of Jammu Water Supply System Expansion:

a. Development of transmission system within the city, based on the new zones and DMAs division developed and rehabilitated in the immediate improvement phase;

b. Installation of bulk meters to measure the in-water flow to each DMA and household meters to measure water consumption; and

c. Development of 225 MLD additional gross water production capacity (180 MLD net) to meet the water demand of 2026 at Chenab river, transport the water to Jammu City and connect to the within city transmission system.

134. These investments need to be made from 2012 and put into operation in 2015 to meet the water demand of the city in 2026.

iii) Phase 2 of Jammu Water Supply Expansion:

135. Development of another 225 MLD additional gross water production capacity from Chenab River, to meet water demand of 2041, transport water to Jammu City and connect to city transmission system. These investments need to be made from 2021 till 2026.

136. **Sewerage System**. The western part of the Jammu City (old city on right bank of river Tawi) earlier had no systematic sewerage system in place and only a few areas were being catered by a 10 MLD sewage treatment plant (STP) at Gole, Bhagwati Nagar. Now proper sewerage network is being established in this part of the city by Urban Environmental Engineering Department (UEED) and Economic Reconstruction Agency and two new sewage treatment plants with 27 MLD capacity (UEED) and 30 MLD capacity (ERA) are being constructed for proper sewerage management. The sewerage network and STP construction by ERA are being carried out under ADB loan 2331-IND (Tranche-1 of JKUSDIP). At the moment, no user charges are levied by the Authority. But in the long run some user charges will be levied from every catered house hold to ensure operational efficiency of this vital public system. No separate sewerage system has been established in eastern part of the Jammu City (on left bank of river Tawi) which contains newly developed and developing areas of the city.

137. **Drainage**. As per storm water drainage master plan, Jammu City is divided into five drainage zones. Zone-I and III are in west Jammu (right bank of river Tawi) whereas Zone-II, IV and V cover areas of east Jammu (left bank of river Tawi). Surface water run-off from these basins is collected in the various storm water drains and channels which ultimately discharge into the river Tawi.

138. The details of the drainage zones are as below:

• Zone- I: This zone includes the areas like Pratap Garh, Shalamar, Karan market, Rehari, Krishna Nagar, Peerkho, Rajindra Nagar, Christian Colony, Chand Nagar, Shiv Nagar, Shakti Nagar, Panjtirthi, etc. Major drains under this zone are Gandha nallah (length 3.2 km), Rehari nallah, Krishna Nagar nallah (length 3.5 km), Peerkho nallah (length 0.95 km), Rajindra Nagar nallah (length 1.7 km), Jogi Gate nallah (length 0.48 km), Chand Nagar nallah (length 0.5 km), Shiv Nagar nallah (length 0.7 km), Shakti Nagar nallah (length 0.5 km) and Panjtirthi nallah (length 1.5 km).

- Zone- II: This zone includes the areas like Nanak Nagar, Trikuta Nagar, Shastri Nagar, Sanjay Nagar, Nai Basti, Rampura, Bikram Chowk, Channi Himmat, etc. Major drains under this zone are Landoichoi main nallah (15.4km), Landoichoi nallah T-2 (6.3 km), Landoichoi nallah T-3 (3.3 km), Nai Basti (Rampura) nallah (1.0 km), Bikram Chowk nallah (1.5 km), University to Bikram Chowk nallah (1.7 km), Channi Himmat main nallah (1.77km) and T4 (Landoi choi) nallah (4.93 km).
- Zone –III: This zone includes the areas like Ban Talab, Chenore, Roop Nagar, Om Nagar, Patoli, Janipur, Basant Nagar, Paloura, Subash Nagar, Bhawani Nagar, Rajpura, etc. Major drains under this zone are Ban Talab Chinore nallah (9.3km), Roopnagar nallah (7.66 km), Om Nagar nallah (4.9km), Patoli nallah (4.3), Janipur nallah (9.9 km), Basant Nagar nallah (0.75 km), Paloura nallah (4.0 km), Subash Nagar nallah (1.4 km), Bhawani Nagar nallah (4.2 km) and Rajpura nallah (0.8 km).
- Zone –IV: This zone includes the areas like Gangyal, Digiana, Trikuta Nagar Extension, Preet Nagar, Dilli, Sainik Colony, Matto Colony, Kalu Chak, etc. Major drains under this zone are Gangyal nallah (8.2 km), Digiana nallah (3.0 km), Ashram nallah (3.5 km), Dilli nallah (2.5 km), Sainik Colony nallah (6.0 km) and Kalu chak nallah (7.5km).
- Zone –V: This zone includes the areas like Narwal, Ratnu Chak, Suhaora, Darap, Sher Garh, Rakh Rajpur, Jarate Chak, Chuthe Chak, Basi Khurd, etc. Major drains under this zone are Balole nallah & Tributaries (12 km), Pati Khad & Tributaries (8 km), Tarore Khad (6 km), Kalk nallah and Tributaries (7 km) and Devika nallah and Tributaries (5 km).

139. Out of the total primary drainage network of 132 km length in Jammu City, 51 km length of primary drains are lined and the remaining 81 km are unlined channels. In addition to such primary drains, there are substantial lengths of secondary and tertiary drains/ deep drains. Following the master plan recommendations, part of drainage rehabilitation and improvement works have been taken up under ADB Loan 2151-IND by J and K Economic Reconstruction Agency (ERA) and by the UEED under their ongoing schemes. Some of the remaining drainage works are proposed under Tranche – II of JKUSDIP.

140. **Solid Waste**. Jammu City has been divided in two zones and 71 administrative wards for the purpose of civic administration including sanitation. The sanitation work of each ward is looked after by the Sanitation Officer, Assistant Sanitation Officers, Sanitary Inspectors and Sanitary Supervisors. There is multiple layer arrangement of supervision. Every layer of supervisor is meant for supervising the work of sanitary worker.

141. As per the Solid Waste Management Master Plan of Jammu City, average waste generation from residential areas was 298.675 grams per capita per day in 2006 and the total waste from Municipal area was estimated to be 221 metric ton (MT) per day in 2006, which was likely to be increased to 282 MT by 2011, 361 MT by 2016, 460 MT by 2021 and 587 MT by 2026. The waste generation from entire JDA (Jammu Development Authority) area was estimated to be 317MT; 409MT; 528MT; 681 MT and 880 MT in respective years of 2006, 2011, 2016, 2021 and 2026.

142. **Transportation**. Jammu City is well connected with rest of India by air, rail and road. National Highway - 1A connects Ambala to Srinagar via Jammu. The road network available within Jammu City caters to the intra-city traffic.

D. Social and Cultural Resources

143. **Demography**. Jammu and Kashmir has a Muslim majority population. Though Islam is practiced by about 67% of the population of the state and by 97% of the population of the Kashmir valley, the state has large communities of Buddhists, Hindus and Sikhs. In totality, the Muslims constitute 67% of the population, the Hindus about 30%, the Buddhists 1%, and the Sikhs 2% of the population. The demographic status of Jammu and Kashmir is given in **Table-26**.

Division	Population	% Muslim	% Hindu	% Sikh	% Buddhist and other
Kashmir (53.9%)	5,476,970	97.16%	1.84%	0.88%	0.11%
Jammu (43.7%)	4,430,191	30.69%	65.23%	3.57%	0.51%
Ladakh (2.3%)	236,539	47.40%	6.22%	-	45.87%
Jammu and Kashmir	10,143,700	66.97%	29.63%	2.03%	1.36%
Statistics calculated from the 2001 Census India District Profiles					

- 144. In Jammu and Kashmir, the principal spoken languages are Kashmiri, Urdu, Hindi, Dogri, Pahari, Balti, Ladakhi, Gojri, Shina and Pashto. However, Urdu written in the Persian script is the official language of the state.
- 145. **Health and Educational Facilities**. Since the subproject sectors are situated in Jammu City. The infrastructure facilities like schools, hospitals, colleges, electricity and communication in the subproject area are satisfactory.
- 146. The health care facilities are provided by both government and privately owned hospitals. Prominent among them are Government Medical College Hospital, Shri Maharaja Gulab Singh (SMGS) Hospital, Acharaya Shri Chandra College of Medical Sciences and Hospital, catering to the health care needs of major part of the state. The Government Medical College is being expanded with a Super-Speciality facility on the pattern of All India Institute of Medical Sciences (AIIMS), New Delhi. Apart from these, a number of private nursing homes are scattered throughout Jammu City.
- 147. Notable higher education or research institutes in Jammu include Government Medical College; Acharaya Shri Chandra College of Medical Sciences; Indira Gandhi College for Dental Sciences, Government College of Engineering and Technology and a number of Government and private Degree Colleges. University-level education is provided by University of Jammu; Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu; Shri Mata Vaishno Devi University; Baba Ghulam Shah Badhshah University and Central University of Jammu.
- 148. **History, Culture, and Tourism**. The Constitution of India does not allow people from regions other than Jammu and Kashmir to purchase land in the state. Jammu's Dogra culture and tradition is much similar to that of neighboring Punjab and Himachal Pradesh. Traditional Punjabi festivals such as Lohri and Baisakhi are celebrated with great zeal and enthusiasm throughout the region.
- 149. After Dogras, Gujjars form the second-largest ethnic group in Jammu. Known for their seminomadic lifestyle, Gujjars are also found in large numbers in the Kashmir valley. Similar to Gujjars, Gaddis are primarily herdsmen who hail from the Chamba region in Himachal Pradesh. Gaddis are generally associated with emotive music played on the flute. The Bakkarwals found both in Jammu and the Vale of Kashmir are wholly nomadic pastoral people who move along

the Himalayan slopes in search for pastures for their huge flocks of goats and sheep.

150. There are no archeological or historical monuments in the immediate vicinity of project site. The monuments protected by State in Jammu are Bahu Fort, Peer Mitha Tomb at Peer Mitha, Mast Garh Shahi Masjid, Mubarak Mandi complex, Royal Bowli at Nandini and Mosque at Chak Jaffer. Of these, Peer Mitha Tomb is the nearest with a distance of about 0.44 km from the outer periphery of the subproject area (from tube well construction site at Wazarat road). The Monuments protected by Archeological Survey of India are Fort at Akhnoor and Remains of Ancient Site (Pambaran) at Ambaran, Akhnoor. No such protected monument is located in the close vicinity of the proposed subproject corridor. The distance of protected monuments/sites from the outer periphery of subproject corridor has been presented in **Table-27**.

Table-27: Distance of protected monuments/sites from the outer periphery of subproject
corridor

S. No	A. State Protected monument/site	Distance from outer periphery of subproject site (in Kilometers)
1	Bahu Fort	1.02
2	Peer Mitha Tomb, Peer Mitha	0.44
3	Shahi Mosque, Mast Garh	0.60
4	Mubarak Mandi Complex	1.18
5	Mosque at Chak Jaffer	7.53
6	Royal Bowli at Nandini	15.50
	Archaeological Survey of India Protected monument/site	
1	Fort at Akhnoor	14.09
2	Remains of Ancient site (Pambaran) at Ambaran, Akhnoor	13.87

- 151. Jammu is known as 'City of Temples' and as such it is a famous tourist place. Every year a large number of pilgrims enter city to visit the temples. Roughly 7-10 million pilgrims visit Mata Vaishno Devi (about 50 Km from Jammu) and about 0.4 million pass through Jammu every year for Amarnath temple (which is in Srinagar). Besides, tourists also visit Bahu Fort (in Jammu City around 1.02 Km from outer periphery of subproject area), Raghunath temple (around 0.75 Km from outer periphery of subproject area), Mansar lake (around 62 Km from Jammu), Surinsar lake (around 35 Km from Jammu). Apart from these, a number of other shrines and temples are situated in Jammu City. The implementation of the subproject shall have no impact on any such site.
- 152. Sensitive Environmental Receptors. The sensitive environmental receptors existing along the alignment of proposed sub-project include religious places, educational institutions, health care centres, community property resources, etc. The details of the existing sensitive environmental receptors near tube well and OHT construction sites are given in the **Table-28** below.

S.	Name of sensitive receptor	Distance from the edge of proposed alignment
No.		(m)
1.	Church at Wazarat Road	Tube well shall be constructed within the premises of
		Church
2.	Panch Mandir, Sector-2, Channi Himmat	Tube well shall be constructed within the premises of
		temple
3.	Eid –gah, Malik Market, Narwal Bypass Road	Tube well shall be constructed within the premises of
		Eidgah
4.	Missionaries of Charity, Tali Morh, Janipur	Tube well shall be constructed within the premises

Table –28: Sensitive environmental receptors near OHT and tube well construction sites

S.	Name of sensitive receptor	Distance from the edge of proposed alignment
NO.		(11)
5.	Baba Kailakh Nath Temple, Bantalab Road,	OHT shall be constructed within premises of the temple
	Jammu	
6.	Temple at EWS Colony, Lower Roop Nagar,	15m from the OHT site
	Jammu	

153. One component of the sub-project i.e. laying of new and replacement of worn out pipes is spread over a large area in Jammu City. The nature and scope of activities will involve excavation followed by laying of pipeline, testing, backfilling and road restoration. The implementation of this component is not expected to have significant impact on any sensitive environmental receptor located in vicinity of the construction sites. However, all receptors likely to suffer temporary access disruption for a short period during implementation would be provided temporary access keeping in view the nature and location of the receptor. The list of receptors found during preliminary surveys and expected to have minor access disruptions due to execution of this component is provided in **Table-29** below.

Table –29: Sensitive environmental receptors near proposed distribution and rising mains

S.	Sensitive receptor	Impact		
No.				
	Channi Himmat Distribution starting point near OHT/PDD Office Channi Himmat Sector 1			
1.	Temple near transformer	Temporary access.		
	Properties in right and le	eft side lanes in Sector 1 Channi Himmat		
2.	Playway Nursery School	Temporary access		
3.	Buds Playing School	Temporary access		
	Main Road Channi Himmat P	arallel to Railway Line Left and Right Sides		
4.	Banquet Hall near Habib Saloon	Temporary access		
5.	Temple on main road Channi Himmat	Temporary access		
	Dilli Distribution Mains sta	rting point near bridge over Gangyal drain		
6.	Government Girls Middle School, Dilli	Temporary access		
7.	Sri Radha Krishna mandir, village Dilli,	Temporary access		
	Sainik Colony			
8.	Vivekananda Modern School, Dilli	Temporary access		
9.	Jodhamal Public School	Temporary access		
10.	Temple Shiv Mandir near Bye pass	Temporary access		
	Fr	uit market Narwal		
11.	Madr E Meherbaan Institute of Health Sciences	Temporary Access		
12.	Shri Prachin Hunumaan Mandir,	Temporary Access(construction to be avoided on Tuesday due		
	Transport Nagar	to weekly gathering)		
	Waza	rat road, rising main		
13.	Gujjar Bakarwall Hostel	Temporary Access		
14.	St. Pauls Church, Wazarat Road	Temporary Access		
New Plot, Rising Main				
15.	Srinath Bhagat Satsang Ashram	Temporary Access		
16.	Ashok Institute of Elementary Teacher	Temporary Access		
	Institute			
17.	Little Champs Play School	Temporary Access		
18.	Swami Pauls Meditation Home	Temporary Access		
19.	Missionaries of Charity Church	Temporary Access		
	Bikram Chowk Distribution Main			
20.	Temple opposite Kala Kendra	Temporary Access		

154. Replacement of pumping machinery of tube wells and pumping stations will be carried within the existing pumping stations and tube wells, thus no impact on any sensitive receptor is envisaged.

155. All the sensitive environmental receptors existing along the subproject sites shall be properly supervised during the subproject execution stage so as to avoid and minimise any negative impact. As such, these sites may face the minor impacts of temporary disruption of access and increased air and noise pollution during execution of the proposed subproject. During finalization of design, all the sensitive receptors are saved judiciously.

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

- 156. The present report assesses the impacts of the proposed activities on various environmental attributes of the subproject site.
- 157. **Methodology.** Issues for consideration have been raised by the following means: (i) input from interested and affected parties; (ii) desktop research of information relevant to the proposed subproject; (iii) site visit and professional assessment by environment specialist engaged by the implementing agency; and (iv) evaluation of proposed design scope and potential impacts based on the environment specialist's past experience.
- 158. The methodology used to rate the impacts was qualitative. Each category was divided into a number of different levels. These levels were then assigned various criteria as indicated in **Table-30**:

Duration (time-scale)	Short-term	Impact restricted to construction (0-2 year).		
	Medium-term	Impact will continue throughout operation (3-30 years for		
		storage facilities and distribution network and 3-15 years for		
		pumping machinery).		
	Long-term	Impacts will exist beyond the life of the water supply system		
		(>30 years for storage facilities and distribution network and		
		>15 years for pumping machinery)		
	Permanent	Impacts will have permanent potential		
Geographic spatial scale	Site	The impact will be limited to within the site boundaries.		
	Local	The impact will affect surrounding areas.		
	Regional	The impact will affect areas far beyond the site boundary but		
		limited to the State of Jammu and Kashmir.		
Significance rating pre / post-	Low	The impact will have a minimal effect on the environment.		
mitigation (positive / negative)	Medium	The impact will result in a measurable deterioration in the		
		environment.		
	High	The impact will cause a significant deterioration in the		
		environment.		
Mitigation	n/a	No mitigation necessary.		
	Full	Full mitigation/reversal of the impact is possible.		
	Partial	Only partial mitigation/reversal of the impact is possible		
	None	No mitigation or reversal of the impact is possible		
Degree of Certainty	Definite	(>90%)		
	Probable	(>70%)		
	Possible	(>40%)		
	Unsure	(<40%)		

Table-30: Summary of Quantifiers and Qualifiers Used for Assessment Purposes

159. Categorization of the subproject has been undertaken using ADB's REA Checklist for Water Supply.

Α. **Planning and Design Phase**

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Planning principles and design considerations have been reviewed and incorporated into 160. the site planning process whenever possible. The concepts considered in design of the proposed water supply subproject are: (i) no involuntary land acquisition; (ii) substantial reduction of water losses in sub-project area; (iii) augmentation in adequacy of drinking water supply at the user end; (iv) enhancing the efficiency of existing tube wells and pumping stations; (v) providing adequate infrastructure facilities for production and storage of water in deficient areas; (vi) most suitable construction methodology; and (vi) site constraints.

161. Salient design features are presented in Table 31.

Parameter	Design Consideration			
Component-Replacement of worn out pipes				
Pipe diameter range	80 mm – 400 mm as per design			
Net per capita water	135 liters per capita per day			
supply (excluding				
losses)				
Distribution losses	15% as per the manual on water supply published by Ministry of Urban Development,			
(allowable)	Government of India			
Material for	A comparative techno – economic study of various pipe materials was made which revealed			
construction of	that HDPE pipes up to 200 mm diameter are best fit for water supply distribution network			
distribution mains and	whereas from 250 mm diameter onwards DI pipes have an edge over HDPE pipes.			
laterals				
Component- Replace	ement of worn-out machineries and electrical equipment at pumping stations and			
Working bours of	Intermittant or 16 hours a day due to limited availability of power			
tube wells				
Efficiency of numps	80% Minimum			
Type of pumps	Multi-stage submersible pumps and vertical turbine pumps for tube wells			
Type of partipe	Horizontal centrifugal pumps for CPS.			
Component- Constru	ction of 19 Tube Wells at water deficit areas			
Working hours of	Intermittent or 16 hours a day.			
tube wells				
Assumed efficiency of	80% Minimum			
pump				
Depth of tube well	200 m – 300 m			
Net per capita water	135 liters per capita day			
supply				
(excluding losses)				
Type of pumps	Multi-stage submersible pump.			
Material of	Ductile iron (DI) pipes			
transmission line				
from tube wells to				
Component- Constru	Iction of 10 Overhead Tanks at water deficit areas			
Foundation	Open type RCC raft			
Super structure	RCC cylindrical shaft			
Water tank	RCC (Cylindrical type)			
Material of	Reinforced Cement Concrete			
construction of OVer				
Total atorage	16 L C/ 7 264 MLD			
canacity				
Supply hours	2 times a day 4 hours in morning and 4 hours in evening			
Location	Replacement of worn out distribution pines-component is located in eastern part of lammu			
Location	City (Channi Himmat Channi Kamala Dilli Matto Colony and Rikram Chowk). Rest of the			

Table 31: Salient design features of the subproject.

Parameter	Design Consideration
	components are located in both eastern as well as western parts of Jammu City.
Climatic Conditions	Rainfall and its run off in the subproject area may cause disruption/damage to works under execution and public inconvenience. Furthermore, climatic conditions play an important role during dispersion of noise and air pollutants. Seasonal climatic conditions have been considered for scheduling of construction activities.
Air Quality ¹⁹	During Construction phase some emissions of dust are anticipated during various transportation, excavation and construction activities. Certain volumes of dust and gaseous emissions will also be generated during the construction period from construction machineries like excavators, vehicles engaged in transportation of construction materials, etc. Pollutants of primary concern at this stage include Respirable Suspended Particulate Matter (PM_{10} and $PM_{2.5}$) and gaseous emissions. However, transportation of construction materials will be confined to adequate trips per day depending upon extent of construction activity. Proper mitigation methods will be adopted to control obnoxious gases and dust generated, if any.
Drainage and hydrology	The subproject components are not expected to have any negative impact on the drainage and hydrology of the area. Runoff from the subproject will produce a highly variable discharge in terms of volume and quality and in most instances will have no discernable environmental impact. The area of Jammu has surplus exploitable ground water potential as per hydro-geological assessment study carried out by Central Ground Water Board (CGWB) and Project Management Consultant of ADB loan 2151-IND (2007). It has been indicated in the reports that the present ground water extraction in the area is only 17.62% of the total available potential; and the area thus lies in the safe category of ground water development.
Ecological diversity	The subproject is situated within an existing built up area of Jammu City. No areas of ecological diversity occur within the subproject location. Due to the nature and locality of the subproject, it is unlikely to have any impacts on biodiversity within the area.
Land use and livelihoods	The land use in the project corridor comprises of built up area and transportation area. The built up areas consist of residential complexes, government/private offices and buildings, educational institutes, religious places and commercial establishments such as shops, hotels and restaurants. The transportation area constitutes of existing roads in the subproject area.
	The key efforts undertaken to minimize impacts are: (i) before the preparation of engineering design, a detailed survey of the properties was conducted with regard to their ownership with the objective that minimum proprietary land is utilized for the subproject; (ii) utilizing available state land in possession of government departments for construction of OHTs and tube wells, aligning water supply pipelines towards the available government land to minimize impact on private properties and (iii) aligning water supply pipelines in commercial areas wherever possible to avoid any physical displacement or temporary impact.
	The subproject will not involve any involuntary land acquisition. However, for construction of 10 over head tanks (OHTs) and 19 tube wells (TWs) 2311.29 m ² of open state land currently in possession of government departments like PHED, JDA and Horticulture and 781. 27 m ² of open land in possession of communities, trust, society, etc. will be used. State land in possession of government departments will be directly used for the subproject and in case of land in possession of communities, trust, society, etc. the land has been donated voluntarily and for which detailed NOCs have been availed and MOU's also stand signed. Additionally, due to laying of rising and distribution main pipelines a total of 117 residences, 216 commercial establishments and 28 institutions, offices and religious places will have access disruptions due to implementation of these two components.

¹⁹ Roadside pollution is often localized and generally only affects a narrow band of roads along the sides of the road. The major source of roadside pollutants is vehicle exhaust emissions. Other pollution sources emanate from combustion of hydrocarbon fuels in air producing carbon dioxide (CO₂) and secondary pollutants such as hydrocarbons (HC), nitrogen oxides (NOx), carbon monoxide (CO) and sulphur dioxide (SO₂). Emissions depend on the volume of traffic, the type of vehicle (including age, technology, and maintenance levels of the vehicle), fuel consumption and quality, engine temperature and road geometry. The highest emission rates are encountered in congested, slow moving traffic, and whenever vehicles shift gears, decelerate, accelerate or travel over steep gradients. There is also a tendency for emission rates to increase at high speeds.

Parameter	Design Consideration
	A Resettlement Plan has been prepared to address all involuntary resettlement impacts.
Traffic flow and access	Due to the location and nature of the subproject, there will be interference with accesses to the adjoining properties. A Traffic Management Plan (Appendix 2 to EMP) has been developed to provide vehicle and pedestrian access and maintain community linkages. A communications strategy is of vital importance in terms of accommodating traffic during road closure. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, road signages, etc. The implementation of the road detours will also be dependent on advance road signages indicating the road detour and alternative routes. ERA will coordinate with the traffic police for the implementation of the Traffic Management Plan.
Infrastructure and services	There are a number of existing infrastructure and services (roads, telecommunication lines, power lines and various pipelines) within the vicinity of the subproject. To mitigate the adverse impacts due to relocation of the utilities, DSC will (i) identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) require construction contractors to prepare a contingency plan.
Noise and vibrations	During construction phase, some noise and vibration will be generated from the various construction activities like construction works, operation of construction equipment and vehicles engaged in transportation of construction materials. However, these will be confined to the work sites only and will be temporary in nature occurring mostly during daytime.
Aesthetics, landscape character, and sense of place ²⁰	The subproject is considered to be compatible with the surrounding landscape and is not expected to negatively impact the existing visual quality or landscape character of the area.

DI=ductile iron; HDPE=high density poly-ethylene; CPS=central pumping station; GLSR=ground level service reservoir; OHT= overhead tank; LG=lac gallon; MLD= million liter per day; RCC=reinforced cement concrete

162. The following table (**Table 36**) outlines potential impacts gleaned from a process that included a review of available documentation, ground-verified during the site visit, i.e. how, where and when the proposed development could interact and affect the environment significantly, and details what mitigation measures may be taken to counteract these impacts.

163. **Design Features.** The design standards adopted under this sub-project are from the Manual on Water Supply published by Ministry of Urban Development, Govt. of India. The same criteria are followed by the Public Health Engineering Department (PHED), the line department. Key design features of the proposed sub-project are mentioned in the tables below.

164. **Design Period:** Different components of the proposed subproject are designed with design periods as under:

(i) The design period for distribution network is 30 years.

²⁰ Aesthetics refer to the visual quality of an area as imparted by the physical properties of an area, such as scale, colour, texture, landform, level of enclosure, and in particular, the land use occurring within an area. Landscape character refers to an area's intrinsic appeal and is not dependent on its visual quality but rather on its specific situation as determined by the following: its level of accessibility or remoteness, level of naturalness, lack of disturbance, current and potential use, rarity, cultural or historic importance, and potential value to people. The landscape character determines the extent of visual compatibility of the water supply structures with its immediate surroundings. Impacts are not restricted to the vicinity but the entire viewshed (area from where the infrastructure will be visible). The spirit, or sense of place (Genius Loci), can be defined as the extent to which a person can recognise or recall a place as being distinct from other places and as having a vivid, or unique, or at least a recognizable character. It is indicates the intrinsic value that a community places on the aesthetic, therapeutic or emotional qualities and character of an area. Aesthetics, landscape character and sense of place are all subjective concepts that are often influenced by individuals' perceptions.

(ii) The design period for submersible pumps, centrifugal pumps and electrical equipment is 15 years.

(iii) The design period for civil works is 30 years.

(iv) The design capacity for source is 15 Years (135 lpcd + 20% for transmission and distribution losses).

(v) The design capacity for storage system is 30 Years (135 lpcd +15% for distribution losses).

165. **Basis of design.** The design parameters considered for all the components of the proposed subproject are depicted in **Tables 32 to 35** below:

able 52. Design i eatures of th	ie Suppioje
Design feature	Description
Estimated population for year 2011	1,189,908
Projected population for year 2015	1,347,606
Projected population for year 2030	2,192,081
Projected population for year 2045	3,675,021
Project area	287 Sq.km

Table 32: Design Features of the Subproject

Table 33: Design Features of Component 1 – Rehabilitation/Replacement of Worn Out Pipes in 5 Subzones of Zone 6 of Jammu Water Supply System.

Design feature	Description
Subproject area	4.72 Sq.km
Pipe diameter range	80 mm – 400 mm
Peak factor for distribution line	3
Minimum residual head at end	12 m (G+1)
Hazen William Constant 'C'	For existing pipes – 100, For new pipes – 145
Net per capita water supply (Excluding	135 liters per capita per dav
losses)	100 liters per capita per day
Distribution losses (Allowable)	15%
Supply hours	8 hours. (2 times a day, 4 hours in morning and 4 hours in evening)
Material of construction of distribution	HDPE up to and including the size of 200 mm diameter and DI above
mains and laterals	the size of 200 mm diameter.

Table 34: Design Features of Component 2 – Rehabilitation/Replacement of Worn-Out Machineries and Electrical Equipment at Pumping Stations and Tube Wells.

Design feature	Description
Working hours of tube wells	Intermittent or 16 hours a day due to limited availability of power
Efficiency of pumps	80% Minimum
Type of pumps	Multi-stage submersible pumps and vertical turbine pumps for tube wells. Horizontal centrifugal pumps for CPS
Details of head	Total dynamic head is considered under discharge conditions:-
	(a) Direct boosting
	(b) Discharge at GLSR / OHT
Incoming power supply	AC, 415 V, 3 Ph., 4 wires, 50 Hertz.
Lighting	AC, 230 V, 1 Ph., 2 wires
Control system	AC, 230 V, 1 Ph., 2 wires.
Ambient temperature	50° C
System earthing	Solidly Earthed
Voltage variation	(+/-) 15% of rated voltage.
Frequency variation	(+/-) 5% of rated frequency.
Combined voltage & frequency variation	(+/-) 15%
System fault level	50kA for 1 sec.

Table 35: Design Features of Component 3 - Construction of Tube Wells andOverhead Tanks at Water Deficit Areas

Design feature	Description
Working hours of tube wells	Intermittent or 16 hours a day.
Assumed efficiency of pump	80% Minimum
Depth of tube well	200 m – 300 m
Net per capita water supply (Excluding losses)	135 liters per capita day
Transmission and distribution losses	20%
Type of pumps	Multi-stage submersible pump.
Tube well casing material	Mild Steel
Material of construction of over head tanks	Reinforced Cement Concrete
Material of construction of transmission line from tube wells to OHT	Ductile Iron

Environmental	Summary of Implication	ons and Mitigation	Assessment of Environmental Impacts				
Aspect	Potential Impacts	Mitigation	Significance	Geographic	Duration	Mitigation	Significance
			before	Spatial			After
			Mitigation	Scale			Mitigation
Existing Situation	 There is acute shortage of potable water in many water deficient areas of Jammu City. Newly established settlements lack adequate infrastructure for water production, storage and supply. The distribution pipelines are worn out and as a result the leakages are persistent with loss of pressure at user end. Leakages in distribution system result in contamination and consequent reduction in water quality. Adequate water production and storage capacity is not available in many water deficient areas of Jammu City. The pumping machinery of tube wells and pumping stations has outlived resulting into reduction in performance and output. The un-metered connections result into non revenue water 	• The subproject will improve the overall water supply system of the area in a safe and efficient manner by providing adequate water production facilities (tube wells), storage facilities (OHTs), strengthening of distribution network (laying of new and replacement of wornout pipelines) and enhancing the efficiency of the existing tube wells and pumping stations (replacement of pumping machinery). The subproject also includes installation of meters at user end to check the non revenue water losses.	High (-)	Site/Local	Medium- term	Full Mitigation Definite	High (+)
Planning initiatives	 Planning initiatives have been identified as: Establishment of an efficient water supply system in the area. Ensuring adequate potable water supply to the user end. Enhancing the water production and storage capacity of the water deficient areas. Strengthening of distribution 	The subproject will improve the water supply system in the area in a safe and efficient manner. This will allow for the planning initiatives to be realized.	High (-)	Site/Local	Medium- term	Full mitigation definite	High (+)

Table-36: Summary of Anticipated Potential Environmental Impacts during Planning and Design Stage

Environmental	Summary of Implication	ons and Mitigation	Assessment of Environmental Impacts				
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
	network so as to minimize the water losses.Minimize the non revenue water losses.						
Identification of water supply needs and demands	The ERA vision is to provide safe, reliable, effective and efficient water supply system which will best meet the needs of the people at improving levels of service in a way which supports government strategies for economic and social development, whilst being environmentally and economically sustainable.	 The subproject will substantially increase the water production and storage capacity in the water deficient areas. Replacement of pumping machinery will enhance the efficiency of tube wells and pumping stations. By rehabilitating the distribution network, the water deficient areas will receive adequate potable water. Metering of connections shall substantially reduce the non revenue water losses. 	High (-)	Local	Medium- term	Full mitigation definite	High (+)
Location and pipe alignment	The laying of new and replacement of worn out pipelines shall be done along the existing roads and streets spread over the subproject areas in Jammu city.	 Laying of pipelines along the road shoulders will ensure minimization of impacts on the adjoining properties during subproject implementation and maintenance of the same during operation. 	Low (-)	Local	Medium – term	Full mitigation definite	Low (+)

B. Construction Phase

166. **Table 37** presents an indication of what activities and facilities are likely to be undertaken during construction of the subproject, including the associated inputs and outputs.

	Activities and Facilities		Inputs/Resource Use		Outputs/Waste Production
•	Construction camp and its	•	Bitumen	•	Old asphalt (removed from road
	associated facilities (including	•	Cement		carriageway during laying of
	lay-down areas)	•	Chemical additives used in		pipelines) ²¹
•	Storage camps and lay-down		concrete	•	Waste concrete and other
	areas	•	Paving blocks		construction rubble
	 Materials and equipment 	•	Aggregate (sand and stone)	•	Waste bitumen ²²
	stockpiles		Gravel (fill material and selected	•	Used fuels, lubricants, solvents
	 Handling and storage of 		material for sub-base and base		and other hazardous waste
	hazardous materials		lavers)	•	General waste
	including chemicals		Water		Contaminated soil
	additives, gravel, cement,	•	- Drinking cooking and	-	 Soil contaminated with
	concrete and lubricants		sanitation at construction		bitumen
•	Source of water		camps		 Soil contaminated with
•	Vegetation clearance	1	 Water for dust suppression 		petrochemicals (i.e. oils and
•	Bulk earthworks. Grading and		 Water applied to base and 		lubricants) and other
	contouring		sub-base layers during		chemicals
•	Drilling		compaction	•	Sewage and grev water
•	Movement of construction staff		 Water for application to sub- 	-	(temporary construction camp
	equipment and materials		base and base lavers prior		sanitation)
	Importation of selected materials		to compaction	•	Spoil material (excess soil
•	for construction		Petrochemicals	-	removed during excavations)
	Temporary detours		Other		Noise and vibrations
	Noise and vibrations	•	chemicals/lubricants/naints	-	(construction vehicles and
			Construction vehicles		machinery)
•	Wests production and temporary	•	machinery and equipment		Lighting at construction camps
•	starage/dispessel is used fuels		Tomporary operate supply to	-	equipment yards and lay-down
	storage/disposal i.e. used ideis,	•	construction camps		areas
	spoil materials and general		Labour		Plant material removed from
	waste	•	- Recruitment of construction	-	servitude/right-of-way during
	l lse of hitumen/asnhalt		workforce		vegetation clearance
	Erosion prevention		 Skills training 		Smoke and fumes
•	Concrete betabing plant (and		Public movement control	-	 Burning of waste
•	Concrete batching plant (and	•	 need barriers (not just 		 Burning of waste Burning of vegetation cover
			danger tane) to protect		 Fires used for cooking and
	Dependitation of disturbed areas		people from trenches during		space heating (construction
	Internation between construction		construction		camps)
•	meraciion between construction				 Vehicle exhaust emissions
	workiorce and local communities				
•	ivianagement of the passing				
	pedesitians and points of				
•	Management of the passing pedestrians and points of congestion				

Table 37: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Construction Phase

²¹ The water supply rehabilitation works affecting roads may involve the stripping and demolition of old asphalt layers. Ideally, old asphalt shall be reused during construction of the new road in order to avoid large quantities of waste being produced. However, depending on the availability and cost of virgin aggregate in the area through which the road is aligned, reusing the old asphalt may be more costly than using virgin aggregate.
²² Bitumen has relatively low levels of polycyclic aromatic hydrocarbons (PAHs) and is largely inert. However, certain

²² Bitumen has relatively low levels of polycyclic aromatic hydrocarbons (PAHs) and is largely inert. However, certain other potentially hazardous chemical may be added to the bitumen or to the aggregate during the construction process in order to render the compound more workable. The objective is to use the least hazardous chemicals available and to locate asphalt plants, aggregate stockpiles and mixing areas where they do not pose a significant environmental risk.

	Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
٠	Implementation of the		
	Resettlement Plan prior to start of construction		
•	Reminders to affected people of construction with timeframes		

167. The following table (**Table 38**) outlines potential impacts during the construction phase gathered from a process that included a review of available documentation, verified during the site visit, i.e. how, where and when the proposed development can interact and affect the environment significantly, and details what mitigation measures may be taken to counteract these impacts.

Environmental	Summary of Impli	cations and Mitigation	Assessment of Environmental Impacts				5
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Climate	 The nature and intensity of rainfall events in an area, has implications for storm water management. Smoke from burning activities could be wider spread on windy days especially when dust could be blown off site. 	 Seasonal climatic variations will be considered during scheduling of construction activities in the area. Excavations and other clearing activities will only be done during agreed working times and permitted weather conditions. Storm water control during construction phase as per the method approved by the Engineer. Seeding of topsoil and subsoil to prevent wind and water erosion of soil surfaces. No open fires permitted on site 	Low (-)	Site	Short- term	Full Mitigation Probable	Low (-)
Air Quality	 Sensitive receptors (e.g. health facilities, educational institutions, religious places) may be affected temporarily by increased traffic and related impacts during the construction phase. Fugitive dust can also impact roadside air quality during construction. Exhaust fumes from construction machinery, and potential smoke from cooking fires. Burning of waste and cleared vegetation. Odors from use of toilet 'facilities' other than provided facilities. 	 Ensure compliance with the Air Act. Ensure compliance with emission standards. Guidelines that deal with the control of air pollution on site have been outlined in the Environmental Management Plan (EMP). Monitoring of air pollution levels in potential problem areas will be undertaken. Management (including storage, transport, handling and disposal) of hazardous substances used during construction. Dust control measures have been included in the EMP. Dust generating construction activities will be avoided during strong winds. Soil loads in transit will be kept 	High (-)	Local	Short- term	Partial Mitigation Probable	Medium (-)

Table 38: Summary of Anticipated Potential Environmental Impacts during Construction Phase

Environmental	Summary of Implic	ations and Mitigation	Assessment of Environmental Impacts				
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
		 covered. Stockpiles of soil will be kept covered or have suitable dust palliative applied such as water. A suitable dust palliative (water) will be applied if dust levels rise above acceptable levels. Regular servicing of the vehicles off site in order to limit gaseous emissions. No open fires permitted on site. Temporary toilet facilities will be provided on site and will be maintained on a daily basis. 					
Geology	 Strong water flows into open excavations may occur, causing damage to structures. Contamination from spillage of petroleum products, spent engine oil and oil leaks from construction vehicle maintenance taking place on site. Contamination through use of toilet 'facilities' other than provided facilities. 	 Adequate arrangements shall be put in place for diversion of storm water within the existing drains so as to avoid impacts on construction sites during construction period. Rehabilitate all sites used during construction including construction camps, stockpile area, temporary access and hauling routes, as soon as possible after the disturbance has ceased. Contractor to exercise strict care in the disposal of construction waste, with proof of disposal at an approved site provided after offloading each waste load and this is logged/registered. Contaminated water will be contained and disposed off site at an approved disposal site (the site to be identified by contractor and approved by Engineer). The contractor will dispose of waste form the oil intercenter at the oil intercen	Medium (-)	Site	Short- term	Full Mitigation Probable	Low (-)

Environmental	Summary of Implic	Assessment of Environmental Impacts					
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
		 approved disposal site (the site to be identified by contractor and approved by Engineer). Cement, concrete and chemicals will be mixed on a concrete plinth and provisions will be made to contain spillages or overflows into the soil. No vehicle maintenance to be allowed on site. If oil spills occur the contaminated soil will be disposed of at approved disposal site (the site to be identified by contractor and approved by Engineer). Temporary toilet facilities will be provided by contractor on site and maintained on a daily basis. Topsoil and subsoil will be protected from contamination. Subsoil and overburden in all construction and lay down areas to be stockpiled separately and returned for backfilling in the correct soil horizon order. 					
Drainage and hydrology	• The proposed development is situated within an existing built up area where drainage infrastructure already exists. No water courses, wetlands or estuaries occur within the subproject location. Due to the nature and locality of the subproject there is unlikely to have any significant impacts on water resources within the immediate area.	 The site surface to be engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved. Provide containment areas for potential pollutants at construction camps, refueling, depots, concrete batching plants, etc. Waste management practices will be implemented. The transport, storage, handling and disposal of hazardous substances will be controlled and 	Low (-)	Site	Short- term	Full Mitigation Probable	Low (+)

Environmental	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
		managed.	Ŭ				
Biodiversity Fauna and Flora	 The proposed development is situated within an existing built up area. No areas of ecological diversity occur within the subproject location. Due to the nature and locality of the subproject there is unlikely to have any significant impacts on biodiversity within the area. The proposed rehabilitation of water supply system will not involve cutting of trees. 	 Adequate care shall be taken during construction of tube wells and OHTs to avoid any impact on the existing trees. 	Low (-)	Site	Short- term	Full Mitigation Probable	Low (+)
Land Uses	 Due to the location and nature of the subproject, there will be interference with access at some places. Existing public transport facilities and operations will be affected by the road closure and detours at some pipeline laying sites. There may be temporary disruptions to health services, education services, local businesses, transport services, pedestrian movements, due to traffic and construction related noise, visual, and air pollution. 	 ERA has consulted with various interested and affected parties, departments, etc. within the area and will be continued during the construction phase. Critical roads (e.g. in front of health facilities) will have a sign of "Keep Clear". ERA will make provisions for vehicle and pedestrian access to maintain community linkages. Consult with local departments, organizations, etc regarding location of construction camps, access and hauling routes and other likely disturbances during construction. Provide clear and realistic information regarding detours and alternative accesses for local communities and businesses in order to prevent unrealistic expectations. Provide clear and realistic information regarding detours and alternative accesses for local communities and businesses in order to prevent unrealistic expectations. 	High (-)	Local	Short- term	Partial Mitigation Probable	Medium (-)

Environmental	Summary of Implications and Mitigation		Assessment of Environmental Impacts					
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation	
		 communities in order to prevent unrealistic expectations. Make use of local labor, materials, goods and services as far as possible. Provide walkways and metal sheets where required to maintain access for people and vehicles. Increase workforce in front of critical areas such as educational institutions, places of worship, business establishments and health facilities to shorten the duration of impacts. Consult businesses and institutions regarding operating hours and factor this in work schedules. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. 						
Infrastructure and Services	 There is likely to have temporary disruption of infrastructure and services during the proposed rehabilitation of water supply system. There are a number of existing infrastructure and services (roads, telecommunication lines, power lines and various pipelines) within the vicinity of the subproject area. 	 Utility shifting will be undertaken prior to commencing construction works. Keep construction related disturbances to a minimum. Consult with affected service providers regarding impacts on access to infrastructure and services and alternatives. Consult with affected communities or businesses prior to foreseeable disruptions, for example notifying residents of a temporary interruption of water supply. Provide backup or alternative 	Medium (-)	Local	Short- term	Full Mitigation Probable	Low (-)	
Environmental	Summary of Implic	ations and Mitigation	Assessment of Environmental Impacts				6	
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Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation	
		 services during construction- related disruptions, for example by providing generators for power supply. Provide access points to infrastructure and services. Monitor complaints by the public. 						
Traffic	 Increased volume of construction vehicles on the roads may lead to increased wear and tear of roads in the vicinity of the subproject sites. Road safety concerns due to slow moving construction vehicles. Traffic flow within the vicinity will be affected. The temporary road closure will result in a decrease in overall network performance in terms of queuing delay, travel times/ speeds. The road closure will impact on a public transport operations and routing. Pedestrian movements will be affected by the road closure. 	 Traffic will be rerouted and roads will be closed according to the Traffic Management Plan (TMP). The objective of the TMP is to ensure safety of all the road-users along the work zone and to address: (i) protection of work crews from hazards associated with moving traffic; (ii) mitigation of adverse impact to the road-users; (iii) maintenance of access to adjoining properties; and (iv) issues that may delay the subproject works. Negotiations with privately-owned public transport operators regarding the affected public transport facilities and routing. 'Clear roads' signs will be erected for the full length of the construction period at the work sites. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. The City Traffic Police will be available on site in the monitoring of traffic in the early stages of the operations during road closure. 	High (-)	Site/Local	Short- term	Partial Mitigation Probable	Medium (-)	

Environmental	Summary of Implic	ations and Mitigation	Assessment of Environmental Impacts			6	
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Hoalth		 be implemented. This would include carrying out of traffic counts and onsite visits. Traffic monitoring during early stages of the road closure will be necessary to address: Adjustments to traffic signal settings, signs and markings Adjustments to accommodation of pedestrians Adjustments necessary to public transport operators. A communications strategy is of vital importance in terms of accommodating traffic during road closure. The road closure together with the proposed detour will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc. The implementation of the road detour is also dependent on advance road signage indicating the road detour and alternative routes. Construction routes clearly defined. Access of all construction and material delivery vehicles will be strictly controlled. Enforcement of speed limits. Deliveries will not be allowed during peak traffic hours. 		Site and	Short	Partial	
Safety	 Danger of construction related injuries. Open fires in construction camp can result in accidents. Safety of workers and general 	 Implement good nousekeeping practices at the construction camp. Strict health and safety measures to be implemented 	nıgn (- <i>)</i>	Local	term	Partial Mitigation Possible	LOW (-)
	public must be ensured.	and audited on a regular basis.					

Environmental	ental Summary of Implications and Mitigation Assessment of Environ				f Environme	ental Impacts	;
Aspect	Potential Impacts	Mitigation	Significance	Geographic	Duration	Mitigation	Significance
			before	Spatial			After
	 Poor waste management practices and unhygienic conditions at temporary ablution facilities can breed diseases. Standing water due to inadequate storm water drainage systems and inadequate waste management practices, pose a health hazard by providing breeding grounds for disease vectors such as mosquitoes, flies and snails. The use of hazardous chemicals in construction can pose potential environmental, health and safety risks. The laying of pipelines may involve the stripping and demolition of old asphalt layers. Road safety may be affected during construction, especially when traffic is detoured. 	 Secure enclosed construction site. Hiring of reputable contractors. Provide warning signs of hazardous working areas. Excavations to be clearly demarcated and barriers (not just danger tape) erected to protect pedestrians from open trenches. Workers will be thoroughly trained in using dangerous equipment. Workers have the right to refuse work in unsafe conditions. Undertake waste management practices. Control speed and movement of construction vehicles. Improved signage, speed control, walkways and crossings will reduce safety risks due to construction. Exclude public from the site. Ensure all workers are provided with and use Personal Protective Equipment. Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; Provide medical insurance coverage for workers; Provide clean eating areas 	before <u>Mitigation</u>	Spatial Scale			After <u>Mitigation</u>
		to hazardous or noxious					

Environmental	Summary of Implic	ations and Mitigation		Assessment of	ssessment of Environmental Impacts			
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation	
		 substances; Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; Ensure moving equipment is outfitted with audible back-up alarms; Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate. 						
Noise and Vibrations	 Sensitive receptors (health facilities, educational institutions, religious places) may be affected temporarily by increased traffic and related impacts. Use of heavy vehicles and equipment may generate high levels of noise. Vibrations resulting from bulk earthworks and other construction activities may create significant disturbances to nearby people and businesses. Disturbance from afterhours work. 	 Locate concrete batching, asphalt, crushing plants, laydown areas and construction camps away from sensitive receptors. Restrict construction activities to reasonable working hours where near sensitive receptors. Keep adjacent landowners informed of unusually noisy activities planned. Regulate roadworthiness of vehicles. Ensure that machinery is in a good state of maintenance. Silencers must be fitted and maintained to all machinery on site. 	High (-)	Site and Local	Short- term	Partial Mitigation Probable	Medium (-)	

Environmental	Summary of Implic	ations and Mitigation		Assessment o	ent of Environmental Impacts		
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
		Monitor noise levels in potential problem areas.					
Aesthetics, Landscape Character, and Sense of Place	The presence of heavy duty vehicles and equipment, temporary structures at construction camps, stockpiles, may result in impacts on aesthetics and landscape character.	 Storage areas will be properly fenced off. All domestic solid waste will be collected from a central point of disposal and fed into the city waste collection system. Contractor to exercise strict care in disposing construction waste, with proof of disposal at the approved site provided after offloading each waste load and this to be logged/registered. Identification of suitable waste disposal site with enough capacity to hold additional waste to be produced by the proposed construction activities. Use of recycled material is encouraged. Guidelines regarding management of waste on site have been outlined in the EMP. Retain mature trees on and around the site where possible. Cluster construction activities on site on a specific area to avoid "sprawl". Unwanted material and litter will be removed on frequent basis. 	Medium (-)	Site and Local	Short- term	Partial Mitigation Definite	Low (-)
Workers Conduct	 Construction workers on site disrupting adjacent land uses by creating noise, generating litter, and possible loitering. 	Ensure strict control of laborers, minimizing working hours to normal working times, control littering, and ensure no overnight accommodation is provided.	Low (-)	Local	Short- term	Full Mitigation Definite	Low (-)
Employment Generation	The subproject will provide employment opportunities for local people during construction.	 The use of labor intensive construction measures will be used where appropriate. Employ local (unskilled) labor if 	Medium (+)	Local	Short- term	Partial Mitigation Probable	High(+)

Environmental	Summary of Implic	ations and Mitigation	Assessment of Environmental Impacts			;	
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
	 Expectations regarding new employment will be high especially among the unemployed individuals in the area. Laborers gathering at the site for work can be a safety and security issue, and must be avoided. The training of unskilled or previously unemployed persons will add to the skills base of the area. 	 possible. Training of labor to benefit individuals beyond completion of the subproject. Recruitment of labors will take place offsite. 					
Archaeological and Cultural Characteristics	 The proposed development will not require demolition of Archeological Survey of India (ASI)- or state-protected monuments and buildings. 	 Ensure that construction staff members are aware of the likelihood of heritage resources being unearthed and of the scientific importance of such discoveries. ASI or the State Department of Archaeology will be contacted if any graves be discovered and all activities will be ceased until further notice. ASI or the State Department of Archaeology will be contacted if any heritage resources or objects, defined in the Act, be discovered and all activities will be ceased until further notice. Any heritage object found will not be moved without prior consultation with ASI or the State Department of Archaeology and all activities will be ceased immediately. No structures older than 100 years will be allowed to be demolished, altered or destructed without a permit from 	Low (-)	Local	Short- term	Full Mitigation Definite	Low (-)

Environmental	Summary of Implications and Mitigation			Assessment of Environmental Impacts					
Aspect	Potential Impacts	Mitigation	Significance	Geographic	Duration	Mitigation	Significance		
			before	Spatial		C C	After		
			Mitigation	Scale			Mitigation		
		ASI or the State Department of							
		Archaeology.							

C. Operation and Maintenance Phase

168. **Table 39** presents an indication of what activities and facilities are likely to be undertaken during operation and maintenance of the subproject, including the associated inputs and outputs.

during Operation and Maintenance Phase	Table 39: Summary of Activities and Facilities, Resource Use, and Produce	d Outputs
	during Operation and Maintenance Phase	

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
 Signages Safety barriers Lighting Noise and vibrations Litter collection Maintenance activities Repairing and maintenance of pipelines, pumps and machinery, Maintenance of OHTs Eradication and control of invasive vegetation species Auxiliary activities and Infrastructure Markets and shops 	 Manual de-weeding for eradication and control of invasive vegetation species Labor Vehicles and equipment used for inspections and maintenance Aggregate and other material used during repairing of pipelines, machinery and maintenance of OHTs and tube wells 	 Vehicle exhaust emissions Dust Potential for water resource contamination Visual exposure of water supply infrastructure Waste/worn out material removed during maintenance Noise and vibrations Lighting

169. The following table (**Table 40**) outlines potential impacts during the operation and maintenance phase gathered from a process that included a review of available documentation, verified during the site visit, i.e. how, where and when the proposed development can interact and affect the environment significantly, and details what mitigation measures may be taken to counteract these impacts

Environmental		Summary of Implic	mplications and Mitigation		Assessment of Environmental Impacts					
Aspect		Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation		
Climate	•	The corrosive nature of climatic conditions may impact the water supply infrastructure.	Regular maintenance of the water supply infrastructure.	Low (-)	Site	Medium- term	Partial Mitigation Probable	Low (+)		
Geology	•	Unattended leakages of pipelines and seepage of water under the ground may cause collapse of side walls of nearby structures.	Regular monitoring and maintenance of the water supply infrastructure.	Low (-)	Site	Long- term	Full Mitigation Possible	Low (-)		
Land Uses	•	With rehabilitation of water supply system, the presently water scarce areas can be put to their utmost possible use. The proposed project is expected to facilitate an integrated development approach to the area thereby improving the overall quality of life. The proposed development is expected to bring about positive economic benefits in the medium- to long- term. Local businesses and educational facilities, etc. are likely to benefit from the subproject.	Regular maintenance and monitoring of the water supply infrastructure so as to ensure that its functional capacity and efficiency does not reduce.	High (+)	Site and Local	Long- term	Full Mitigation Possible	High (+)		
Health and Safety	•	Improvement of water supply system is expected to significantly enhance the quantity and quality of the supplied water. Reduction in leakages will ensure adequate supply of potable drinking water minimizing contamination risks with corresponding reduction in health risks to the citizens.	Undertake regular monitoring and maintenance of water supply infrastructure.	High (+)	Local	Long- term	Partial Mitigation Probable	High (+)		

Table 40: Summary of Anticipated Potential Environmental Impacts During Operation and Maintenance Phase

Environmental	Summary of Implic	Summary of Implications and Mitigation				ental Impacts	5
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Aesthetics, Landscape Character, and Sense of Place	The subproject is considered to be compatible with the surrounding landscape and is not likely to impact negatively on the existing visual quality or landscape character of the area; rather it is expected to improve the general environment through adequate supply of potable water in the subproject area.	 The tube wells and OHTs proposed to be constructed under this subproject will be similar in construction and design to existing tube wells and OHTs in the area. Monitor housekeeping, littering and illegal dumping. 	Low (+)	Site and Local	Long- term	Partial Mitigation Probable	Medium (+)

D. Cumulative Environmental Impacts

170. **Table 41** presents the cumulative impacts which are impacts that result from the incremental impact of the subproject activity on a common resource when added to the impacts of other past, present, or reasonably foreseeable future activities. Cumulative impacts are identified, predicted in the same level of detail as the impacts discussed above.

E. Assessment of No-Go (No Build) Option

171. **Table 42** outlines potential impacts associated with the "No-Go" option. The No-Go option involves no additional commitment of resources. Choosing the No-Go option has the same effect as if the decision never occurred.

Environmental	Summary of Implications and Mitic	Assessment of Environmental Impacts						
Aspect	Potential Impacts		Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Significant enhancement in water production and storage facilities in water deficient areas.	• Construction of new tube wells and OHTs and replacement of worn out pumping machinery of tube wells and pumping stations shall ensure adequate supply of potable water to the water deficient areas.	•	Refer to tables above	High (-)	Site/Local	Long- term	Full Mitigation Definite	High (+)
Significant reduction in water losses due to worn out transmission lines.	 Laying of new rising mains and distribution mains and replacement of wornout pipelines shall ensure significant reduction in water losses. This will also reduce the health risks associated with contamination of water due to leakages in water supply pipelines. 	•	Refer to tables above	High (-)	Site/Local	Long- term	Full Mitigation Probable	High (+)
The rationalization and reorganization of water supply system	 It is important to provide better water supply facilities so as to ensure adequate supply of potable water to the user end. The proposal for rehabilitation of water supply facilities goes a long way in achieving some of the goals of a good urban water supply system. 	•	Refer to tables above	High (-)	Site/Local	Long- term	Full Mitigation Definite	High (+)
Minimization of non revenue water losses	 Metering of connections shall substantially reduce the non revenue water losses in the selected areas. 	•	Refer to tables above	Medium (-)	Site/Local	Long- term	Full Mitigation Definite	Medium (+)
Landuse	 It is expected that improvement in the water supply system of the water deficient areas will act as a catalyst for overall development of the area. 	•	Refer to tables above	High (-)	Site/Local	Long- term	Partial Mitigation Definite	High (+)

Table 41: Summary of Anticipated Potential Cumulative Environmental Impacts

Environmental	Summary of Implications and Miti	gation		Assessment of	Environmen	tal Impacts	
Aspect	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Climate	No obvious impacts	• n/a					
Air Quality	 Will remain the same No impacts on sensitive receptors during construction 	None	Medium (-)	Local	Long- term		Medium (-)
Geology	No obvious impacts	• n/a					
Drainage and hydrology	No obvious impacts	● n/a					
Land Use	• The water deficient areas shall continue facing the same impacts and their development shall be hindered.	None	High (-)	Local	Long- term		High (-)
Traffic	No obvious impact	• n/a					
Health and Safety	 Subproject areas will continue facing health risks owing to degradation in water quality due to leakages in pipelines. 	None	High (-)	Local	Long- term		High (-)
Noise Pollution	 Noise pollution will remain the same. No impacts on sensitive receptors during construction. 	None	Medium (-)	Local	Long- term		Medium (-)
Aesthetics, Landscape Character and sense of place	 Likely to deteriorate as sanitation of the area depends largely on availability of water supply. 	None	Medium (-)	Local	Long- term		Medium (-)

Table 42: Summary of Anticipated Potential Environmental Impacts of the No Build Options

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Public participation during the preparation of the IEE

172. The public participation process included identifying interested and affected parties (stakeholders); informing and providing the stakeholders with sufficient background and technical information regarding the proposed development; creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments and concerns) with regard to the proposed development; giving the stakeholders feedback on process findings and recommendations; and ensuring compliance to process requirements with regards to the environmental and related legislation.

173. The following methodologies have been used for carrying out public consultation:

- Local communities, individuals affected and owners and employees of affected commercial establishments who are directly or indirectly affected were given priority while conducting public consultation.
- Walk-through informal group consultations in the proposed subproject area.
- The local communities had been informed through public consultation with briefing on project interventions including its benefits.
- The environmental concerns and suggestions made by the participants were listed out, discussed and suggestions were accordingly incorporated in the EMP.

174. Different techniques of consultation with stakeholders were used during project preparation (interviews, public meetings, group discussions, etc). Questionnaire was designed and environmental information was collected. Apart from this, a series of public consultation meetings were conducted during the subproject preparation. Various forms of public consultations (consultation through adhoc discussions on site) have been used to discuss the subproject and involve the community in planning the subproject design and mitigation measures.

B. Notification of Potential Interested and Affected Parties

The interested and affected parties were identified during the course of initial 175. environmental examination. Key methods employed included individual interviews, field level observations, community consultations and discussions, interviews through a predrafted interview schedule. Key respondents included project affected persons who only include owners of houses/residences and commercial shops/establishments, etc. who will suffer temporary access disruptions during subproject implementation due to the laying of pipelines, shopkeepers/businessmen from the project area in addition to daily commuters consulted randomly. In addition to a number of informal consultations conducted regularly in the project corridor, a total of 75 people, selected on a stratified basis to ensure diversified representation, were formally interviewed with the help of an interview schedule from 09.06.2011 to 19.06.2011 and 25.11.2011 to 26.11.2011. Issues discussed and feedback received along with details of date, time, location and list of participants are given in Appendix 2. To ensure that Community trusts/societies, etc. who have voluntarily donated land for the construction of few OHTs and tube wells are taken on board on various stakes and a number of one to one formal meetings were organized with their representatives. Detailed NOCs and MOUs also stand signed with them, wherein the terms and conditions stand detailed. Copies of NOCs and MOUs are

appended as **Appendix 3** and **Appendix 4**, respectively. Communication with interested and affected parties (I&APs) was by telephone and direct communication in order to obtain the necessary background information to compile this report. The records of public consultations are annexed as **Appendix 2**.

C. Future Consultation and Disclosure

176. The public consultation and disclosure program with all interested and affected partied will remain a continuous process throughout the subproject implementation and shall include the following:

i. Consultation during detailed design

177. Focus-group discussions with affected persons and other stakeholders to hear their views and concerns, so that these can be addressed in subproject design wherever necessary. Regular updates on the environmental component of the subproject will be kept available at the PMU office of ERA.

178. ERA will conduct information dissemination sessions at important locations in the subproject area and solicit the help of the local community leaders/prominent citizens to encourage the participation of the people to discuss various environmental issues.

179. The PMU, with assistance of DSC/PSC will conduct information dissemination sessions in the subproject area. During EMP implementation DSC, PSC and PMU shall organize public meetings and will apprise the communities about the progress on the implementation of EMP in the subproject works.

ii. Consultation during construction

180. Public meetings with affected communities (if any) and other stake holders to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and

181. Small-scale meetings to discuss and plan construction work with local communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

iii. Project disclosure

182. A communications strategy is of vital importance in terms of accommodating traffic during road closure, if any. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure, if any, together with the proposed detours will be communicated via advertising, pamphlets, road signages, etc. Public information campaigns via newspaper/radio/TV, etc. wherever required, to explain the subproject details to a wider population. Public disclosure meetings at key project stages to inform the public of progress and future plans.

183. For the benefit of the community the Summary of IEE will be translated in the local language and made available at: (i) ERA office; (ii) District Magistrate Office; and, (iii) PMU/PIU. It will be ensured that the hard copies of IEE are kept at such placed which are conveniently

accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE will be placed in the official website of the ERA and the official website of ADB after approval of the IEE by ADB. The PIU will issue Notification on the locality-wise start date of implementation of the subproject. The notice will be issued by the PIU in local newspapers one month ahead of the implementation works. Copies of the IEE will be kept in the PMU/PIU office and will be provided to any person willing to consult the IEE.

VII. GRIEVANCE REDRESSAL MECHANISM

184. Redressal of grievances shall be the responsibility of ERA. In this regard an efficient Grievance Redressal Mechanism will be kept in place that will assist the affected persons in resolving queries and complaints. The Grievance Redressal Mechanism will follow the following approach:

- If the affected person has any complaint or grievance, he/she is free to lodge his/her complaint with the Project Manager, PIU, JKUSDIP, ERA who will make efforts to address the complaint on ground level itself. The Project Manager will make efforts to redress the grievance within one week from the receipt of the grievance.
- In case the affected person is not satisfied or his grievance is not redressed he can take the matter to Director Safeguards who will ensure that grievance is redressed within two weeks.
- If Director Safeguards cannot resolve the compliant or the affected person is not satisfied with resolution/ decision, he/she can take the matter to the Chief Executive Officer of ERA.
- Affected persons, at any moment of time are free to approach the court of law at their own will and expenses.

185. Besides the grievance redressal mechanism of the subproject, state has online grievance monitoring system known as 'Awaz-e-Awam' through which affected persons can also lodge their complaints. The affected persons can lodge their complaints online at http://www.jkgrievance.nic.in.

Apart from the above detailed mechanism for the grievances received at the level of 186. ERA, the provision shall be kept in the EMP of the sub-project wherein the contractor will depute one Environmental Safeguard Officer who shall be responsible for implementation of EMP, reporting and grievance redressal on day-to-day basis. The grievances/complaints received at the level of contractor shall be recorded on the Complaints Register and the same shall be forwarded to the DSC (Engineer of the Contract) within 48 hours along with the details of action taken to redress the grievance. The Team Leader of DSC shall immediately try to resolve the issues and forward the details to the Project Manager of PIU. If the action taken by Contractor and DSC is found to be inadequate, then necessary instructions shall be issued by the Project Manager, PIU for implementation of rectification measures. Project Manager PIU shall report the matter to Director Safeguards along with the details on action taken. In order to facilitate the public in general to approach the authorities, in case of grievances/complaints, information boards with contact details of Contractor, Team Leader of DSC, Assistant Project Manager of PIU, Deputy Project Manager of PIU and Project Manager of PIU shall be displayed at all the sub-project sites.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

187. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between the DSC (Engineer), contractors, and PIU/ PMU/ PSC. The EMP identifies three phases of development as: (i) site establishment and preliminary activities; (ii) construction phase; and (iii) post construction/operational phase.

188. The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) providing a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensuring that safety recommendations are complied with.

189. A copy of the EMP must be kept onsite during the construction period at all times. The EMP will be made binding on all contractors operating on the site and will be included in the Contractual Clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance. It shall be noted that the Supreme Court of India²³ mandates that those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventive measures to reduce or prevent further pollution and/or environmental damage. (The polluter pays principle).

190. The Contractor is deemed not to have complied with the EMP if:

- within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention of clauses;
- if environmental damage ensues due to negligence;
- the contractor fails to comply with corrective or other instructions issued by the Engineer/PMU/PIU within a specified time; and
- the Contractor fails to respond adequately to complaints from the public.

A. Institutional Arrangement

191. The subproject will be implemented and monitored by the Project Implementation Unit (PIU) of ERA, which will be supported by Design and Supervision Consultant (Engineer) and overall management support shall be provided to ERA by Project Support Consultants (PSC). ERA will be the executing agency.

192. The Safeguard unit of ERA in PMU will monitor the implementation of environmental covenants with assistance of Engineer (DSC) and PSC.

193. ERA shall be responsible for ensuring compliance to environmental requirements of the ADB as well as central/state governments and reporting the same to ADB. An Environmental Management Plan (EMP) will be a part of contract with the civil works contractors engaged for

²³ Writ petition no 657 of 1995. The Supreme Court, in its order dated 4 February 2005, that "The Polluter Pays Principle means that absolute liability of harm to the environment extends not only to compensate the victims of pollution, but also to the cost of restoring environmental degradation. Remediation of damaged environment is part of the process of sustainable development."

execution of the works. The supervision and implementation of EMP shall be the responsibility of DSC with ERA as monitoring agency (with assistance of PSC). All the statutory environmental clearances (at national, state and local levels) if required (by ERA or by the civil works contractor) for the implementation of the subproject would be obtained in compliance with the national, state and local laws and regulations and in accordance with ADB's environmental policy and guidelines.

194. ERA (PMU and PIU)

This agency:

- complies with all applicable legislation and is conversant with the requirements of the EMP;
- assesses all activities requiring special attention as specified and/or requested by the Engineer (DSC) and/or Safeguards Unit of ERA for the duration of the Contract;
- ensures that the Contractor conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, as advised by the Engineer and/or Safeguards Unit of ERA;
- may, on the recommendation of the Engineer and/or Safeguards Unit of ERA, through the Executing Agency order the Contractor to suspend any or all works on site if the Contractor or his subcontractor/ supplier fails to comply with the said environmental specifications.

195. Project Support Consultants (PSC)

This agency:

- is conversant with the requirements of the EMP and all applicable legislation.
- monitors the implementation of EMP on site and recommends requisite measures in case of non-compliances to ERA.
- conducts monitoring through environmental monitoring laboratory in consultation with Safeguards Unit of ERA and the Engineer.

196. The Engineer (DSC)

This agency:

- complies with all applicable legislation and is conversant with the requirements of the EMP;
- arranges information meetings for and consults with interested and affected parties about the impending construction activities;
- maintains a register of complaints and queries by members of the public at the site office. This register is forwarded to the Project Manager of PIU on weekly basis.
- enforces and monitors compliance with the requirements of EMP on site;
- assesses the Contractor's environmental performance in consultation with the Environmental Expert (of DSC);
- documents in conjunction with the Contractor, the state of the site prior to commencing construction activities.

197. Environmental Expert of Engineer (DSC)

This individual:

- briefs the Contractor on the requirements of the environmental specification and/ or EMP, as applicable;
- advises the Engineer on the interpretation, implementation and enforcement of the environmental specifications and other related environmental matters;
- monitors and reports on the performance of the contractor/project in terms of environmental compliance with the EMP to the Engineer and ERA; and
- provides technical advice relating to environmental issues to the Engineer.

198. The Contractor

This individual/agency:

- complies with all applicable legislation, is conversant with the requirements of the EMP, and briefs staff about the requirements of same;
- ensures any sub-contractors/ suppliers, who are utilized within the context of the contract, comply with the environmental requirements of the EMP. The Contractor will be held responsible for non-compliance on their behalf;
- supplies method statements for all activities requiring special attention as specified and/or requested by the Engineer or Environmental Expert (of Engineer) during the duration of the Contract;
- provides environmental awareness training to staff;
- bears the costs of any damages/ compensation resulting from non-adherence to the EMP or written site instructions;
- conducts all activities in a manner that minimizes disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment.
- ensures that the Engineer is informed in a timely manner of any foreseeable activities that will require input from the Environmental Expert (of Engineer).
- appoints one full time Environmental Safeguard Officer for implementation of EMP, community liaison, reporting and grievance redressal on day to day basis.
- receives complaints/grievances from the public, immediately implements the remedial measures and reports to the Engineer (DSC) within 48 hours.

B. Capacity Building

199. Training and orientation programmes shall be organized by the Environmental Experts of Engineer (DSC), PSC and ERA for the contractors, laborers, and technical and office staff of the contractors, site engineers of DSC and the relevant staff of the PIU for building their capacity with regards to principles and procedures of environmental management, pollution abatement measures, public consultation and participation, health and safety measures, grievance redressal mechanism and implementation of EMP.

- 200. Table 43 outlines the site establishment and preliminary activities.
- 201. **Table 44** outlines management of construction activities and workforce.
- 202. **Table 45** outlines the post-construction activities.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Legislation, permits and agreements	In all instances, ERA, service providers, contractors and consultants must remain in compliance with relevant local and national legislation.	All	Prior to moving onto site and during construction
		Proof of compliance to Air Act must be forwarded by the contractor to PMU/PIU (in relation to hot mixing, batch mix plants, stone crushers, diesel generators, etc.)	Engineer	Prior to moving onto site and during construction
		A copy of the EMP must be kept on site during the construction period	Environmental Expert of Engineer (EE)	At all times
2.	Access to site ²⁴	Access to site will be via existing roads. The Contractor will need to ascertain the existing condition of the roads and repair damage due to construction.	Engineer	Prior to moving onto site and during construction
		The Local Traffic Police Department shall be involved in the planning stages of the road closure and detour and shall be available on site for the monitoring of traffic in the early stages of the operations during road closure.	Engineer	Prior to moving onto site
		The Local Traffic Department must be informed at least a week in advance if the traffic in the area will be affected.	Engineer	Prior to moving onto site
		The location of all affected services and servitudes must be identified and confirmed.	Engineer	Prior to moving onto site
		All roads for construction access must be planned and approved by the Engineer and its Environmental Expert ahead of construction activities. They shall not be created on an ad-hoc basis.	Engineer	Prior to moving onto site and during construction.
		No trees, shrubs or groundcover may be removed or vegetation stripped without the prior permission of the Engineer/Environmental Expert.	Engineer/EE	Before and during construction.
		Agreed turning areas for haulage vehicles are to be formalized and used by the Contractor. No turning maneuvers other than at the designated places shall be permitted.	Engineer	Prior to moving onto site.
		Contractors shall construct formal drainage for all temporary haulage roads in the form of side drains to prevent erosion and discharge of run-off.	Engineer	Prior to moving onto site.
3.	Setting up of construction camp ²⁵	Choice of site for the Contractor's camp requires the Engineer's permission and must take into account location of local residents, businesses and existing land uses, including flood zones and slip / unstable zones. A site plan must be submitted to the Engineer for approval.	Engineer and EE	During surveys and preliminary investigations and prior to moving onto the site
		The construction camp may not be situated on a floodplain or on	Engineer and EE	During surveys and

Table 43: Site Establishment and Preliminary Activities

²⁴ Access to site and traffic management shall be done in accordance to the directions of Engineer and the Traffic Management Plan (**Appendix-2 to EMP**). ²⁵ Careful planning of the construction camp can ensure that time and costs associated with environmental management and rehabilitation are reduced.

Activity	Management/Mitigation	Responsible for Monitoring	Frequency
	slopes greater than 1:3.		preliminary investigation s and prior to moving onto the site
	If the Contractor chooses to locate the camp site on private land, he must get prior permission from both the Engineer and the landowner.	Engineer	During site establishment and ongoing – weekly inspections
	In most cases, on-site accommodation will not be required. The construction camp can thus be comprised of: site office ablution facilities designated first aid area eating areas staff lockers and showers (where water and waterborne sewers are available) storage areas batching plant (if required) refueling areas (if required) maintenance areas (if required) crushers (if required)	Engineer	During set-up
	Cut and fill must be avoided where possible during the set up of the construction camp.	Engineer	During site set-up
	The camp must be properly fenced of and secured	Engineer	During site establishment and ongoing –weekly inspections
	The Contractor shall make adequate provision for temporary toilets for the use of their employees during the Construction Phase. Such facilities, which shall comply with local authority regulations, shall be maintained in a clean and hygienic condition. Their use shall be strictly enforced.	Engineer	During site establishment and ongoing – weekly inspections
	Under no circumstances may open areas or the surrounding bushes be used as a toilet facility.	Engineer	Ongoing
	Bins and / or skips shall be provided at convenient intervals for disposal of waste within the construction camp.	Engineer	During site set-up and ongoing
	Bins shall have liner bags for efficient control and safe disposal of waste	EE	Ongoing
	Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged.	EE	During site set-up and ongoing

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
4.	Establishing equipment lay-down and storage area ²⁶	Choice of location for equipment lay-down and storage areas must take into account prevailing winds, distances to adjacent land uses, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.	EE	During site set-up
		Storage areas shall be secure so as to minimize the risk of crime. They shall also be safe from access by children / animals etc.	EE	During site set-up
		It is very important that the proximity of residents, businesses, schools, etc. is taken into account when deciding on storage areas for hazardous substances or materials. Residents living adjacent to the construction site must be notified of the existence of the hazardous storage area.	EE	During site set-up
		Equipment lay-down and Storage areas must be designated, demarcated and fenced if necessary.	EE	During site set-up
		Fire prevention facilities must be present at all storage facilities.	EE	During site set-up
		Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage areas. These pollution prevention measures for storage shall include a bund wall high enough to contain at least 110% of any stored volume. The Contractor shall submit a method statement to the Engineer for approval	EE	During site set-up and ongoing
		These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources.	EE	During site set-up and ongoing
		Fuel tanks must meet relevant specifications and be elevated so that leaks may be easily detected.	Engineer and Contractor	During site setup and monitored
		Material safety data sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances to be used on site. Where possible and available, MSDSs shall additionally include information on ecological impacts and measures to minimize negative environmental impacts during accidental releases or escapes.	Engineer and Contractor	Ongoing
		Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. The contractor must ensure that its staff are made aware of the health risks associated with any hazardous substances used, have been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.	EE and Contractor	Ongoing
1		Contractors shall submit a method statement and plans for the storage	Engineer and EE	Prior to establishment of

²⁶ Storage areas can be hazardous and unsightly and can cause environmental pollution if not designed and managed carefully.

	1	-		
	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		of hazardous materials and emergency procedures.		storage area
5.	Materials management – sourcing ²⁷	Contractors shall prepare a source statement indicating the sources of all materials (including topsoil, sands, natural gravels, crushed stone, asphalt, clay liners, etc), and submit these to the Engineer for approval prior to commencement of any work.	Engineer and EE	On award of contract
		Where possible, a signed document from the supplier of natural materials shall be obtained confirming that they have been obtained in a sustainable manner and in compliance with relevant legislation.	EE	On receipt of natural materials
		Where materials are borrowed (mined), proof must be provided of authorization to utilize these materials from the landowner/material rights owner and the Department of Geology and Mining.	EE	On receipt of borrowed (mined) materials
6.	Education of site staff on general and environmental conduct ²⁸	Ensure that all site personnel have a basic level of environmental awareness training.	EE and Contractor	During staff induction and ongoing
		Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their task.	EE and Contractor	During staff induction, followed by ongoing monitoring
		No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor.	EE and Contractor	During staff induction, followed by ongoing monitoring
		All employees must undergo safety training and wear the necessary protective equipments and clothing.	EE and Contractor	During staff induction, followed by ongoing monitoring
		 A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: no alcohol/drugs on site; prevent excessive noise; construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bushes as a toilet facility); no fires permitted on site; trespassing on private/commercial properties adjoining the site is forbidden; other than pre-approved security staff, no workers shall be permitted to live on the construction site; and proverker may be forced to do work that is potentially dangerous 	EE and Contractor	During staff induction, followed by ongoing monitoring

 ²⁷ Materials must be sourced in a legal and sustainable way to prevent offsite environmental degradation.
 ²⁸ These points need to be made clear to all staff on site before the subproject begins.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		or that he/she is not trained to do.		
6.	Social impacts ²⁹	Open liaison channels shall be established between the Site owner, the developer, operator, the contractors and interested and affected parties such that any queries, complaints or suggestions can be dealt with quickly and by the appropriate person(s).	Contractor and EE	Prior to moving onto site and ongoing
		A communications strategy is of vital importance in terms of accommodating traffic during road closure. The road closure together with the proposed detour needs to be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.	Engineer and EE	Prior to moving onto site and ongoing
		Advance road signage indicating the road detour and alternative routes. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/ complaints.	Engineer and EE	Prior to moving onto site and ongoing
		Storage facilities, elevated tanks and other temporary structures on site shall be located such that they have as little visual impact on local residents as possible.	Engineer and EE	During surveys and preliminary investigations and site set-up.
		In areas where the visual environment is particularly important (e.g. along commercial/ tourism routes) or privacy concerns for surrounding buildings 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 construction.	Engineer and EE	During surveys and preliminary investigations and site set-up.
		Special attention shall be given to the screening of highly reflective materials on site.	EE	During site set-up
7.	Noise impacts	Construction vehicles are to be fitted with standard silencers prior to the beginning of construction.	Contractor	Prior to moving onto site and ongoing
		Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers, etc) will be used as per operating instructions and maintained properly during site operations	Contractor	Ongoing
8.	Dust/air pollution ³⁰	Vehicles travelling along the access roads must adhere to speed limits to avoid creating excessive dust.	EE	Ongoing
		Camp construction / haulage road construction – areas that have been stripped of vegetation must be dampened periodically to avoid excessive dust.	EE	Ongoing – more frequently during dry and windy conditions
		The Contractor must make alternative arrangements (other than fires) for cooking and / or heating requirements. LPG gas cookers may be used provided that all safety regulations are followed.	Engineer	Ongoing
9.	Soil erosion	The time that stripped areas are left open to exposure shall be minimised wherever possible. Care shall be taken to ensure that lead	Engineer and EE	Throughout the duration of the subproject.

 ²⁹ It is important to take notice of the needs and wishes of those living or working adjacent to the site. Failure to do so can cause disruption to work.
 ³⁰ Establishment of the camp site, and related temporary works can reduce air quality.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		times are not excessive.		
		Wind screening and stormwater control shall be undertaken to prevent soil loss from the site.	Engineer and EE	During site set-up
		Procedures that are in place to conserve topsoil during the construction phase of the subproject are to be applied to the set up phase. i.e. topsoil is to be conserved while providing access to the site and setting up the camp.	Engineer and EE	Daily monitoring during site set-up
10.	Stormwater ³¹	To prevent stormwater damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly.	Engineer	During surveys and preliminary Investigations.
		Scheduling of works to be done in accordance to the climatic conditions and the works to be carried out during dry periods so as to avoid any losses due to storm water during rains.	Engineer	During site setup and ongoing.
11.	Water quality ³² .	Storage areas that contain hazardous substances must be bunded with an approved impermeable liner.	Engineer	During site setup.
		Spills in bunded areas must be cleaned up, removed and disposed of safely from the bunded area as soon after detection as possible to minimise pollution risk and reduced bunding capacity.	Engineer and EE	During site setup.
		A designated, bunded area is to be set aside for vehicle washing and maintenance. Materials caught in this bunded area must be disposed of to a suitable waste site or as directed by the Engineer	Engineer and EE	During site setup.
		Provision shall be made during set up for all polluted run off to be treated to the Engineer's approval before being discharged into the stormwater system. (This will be required for the duration of the project.)	Engineer and EE	During site setup and to be monitored weekly
12.	Conservation of the natural environment ³³	No vegetation may be cleared without prior permission from the Engineer.	Engineer and EE	During site setup and ongoing.
		Trees that are not to be cleared shall be marked beforehand with danger tape. The Environmental Expert of Engineer (DSC) must be given a chance to mark vegetation that is to be conserved before the Contractor begins clearing the site.	Engineer and EE	During site set-up
		Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material).	EE	Ongoing in camp Site, haulage Areas
13.	Set-up of waste	The excavation and use of rubbish pits on site is forbidden.	EE	Ongoing

 ³¹ Serious financial and environmental impacts can be caused by unmanaged stormwater.
 ³² Incorrect disposal of substances and materials and polluted run-off can have serious negative effects on groundwater quality.
 ³³ Alien plant encroachment is particularly damaging to natural habitats and is often associated with disturbance to the soil during construction activities. Care must be taken to conserve existing plant and animal life on and surrounding the site.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
	management procedure			
		Burning of waste is forbidden.	EE	Ongoing
14.	Cultural environment	Prior to the commencement of construction, all staff need to know what possible archaeological or historical objects of value may look like, and to notify the Engineer/Contractor shall such an item be uncovered.	EE	During site set-up And ongoing.
15.	Security and safety	Lighting on site is to be set out to provide maximum security and to enable easier policing of the site, without creating a visual nuisance to local residents or businesses.	Engineer	During site set-up
		Material stockpiles or stacks, such as, pipes must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	Engineer and EE	Ongoing
		Flammable materials shall be stored as far as possible from adjacent residents / businesses.	Engineer and EE	Ongoing
		 All interested and affected parties shall be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples are: stringing of power lines earthworks / earthmoving machinery on steep slopes above houses / infrastructure risk to residences along haulage roads / access routes 	Engineer and EE	24 hours prior to activity in question

DSC = Design and Supervision Consultant; EE = Environmental Expert of DSC/Engineer

Table 44: Management of Construction and Workforce Activities

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Access to site	Contractors shall ensure that all side drains and scour check walls on access and haul roads are functioning properly and are well maintained.	Engineer	Weekly and after heavy rains.
		Contractors shall ensure that access roads are maintained in good condition by attending to potholes, corrugations and stormwater damage as soon as these develop.	Engineer	Weekly inspection.
		If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have been spilt.	Contractor	When necessary
		Unnecessary compaction of soils by heavy vehicles must be avoided; construction vehicles must be restricted to demarcated access, haulage routes and turning areas.	Contractor	Ongoing monitoring.
		Cognizance of vehicle weight / dimensions must be taken when using access constructed out of certain	Engineer	Ongoing monitoring.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		materials. e.g. paved surfaces / cobbled entranceways.		
2.	Maintenance of construction camp and work site	The Contractor must monitor and manage drainage of the camp site to avoid standing water and soil erosion.	Engineer	Ongoing monitoring.
		Run-off from the camp site must not discharge into neighbors' properties.	Engineer	Ongoing monitoring.
		Toilets are to be maintained in a clean state and shall be moved to ensure that they adequately service the work areas.	Contractor	Weekly inspection
		The Contractor is to ensure that open areas or the surrounding bushes are not being used as toilet facility.	Contractor	Weekly inspection
		The Contractor shall ensure that all litter is collected from the work and camp areas daily.	Contractor	Ongoing monitoring.
		Bins and/or skips shall be emptied regularly and waste shall be disposed of at the pre-approved site. Waybills for all such disposals are to be kept by the Contractor for review by the Engineer/EE.	Contractor and Engineer	Weekly inspection
		Eating areas shall be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness.	Contractor	Daily monitoring.
		The Contractor shall ensure that his camp and working areas are kept clean and tidy at all times.	Contractor and Engineer	Weekly monitoring
3.	Staff conduct	The Contractor must monitor the performance of construction workers to ensure that the points relayed during their induction have been properly understood and are being followed. If necessary, the EE and/or a translator shall be called to the site to further explain aspects of environmental or social behavior that are unclear.	Contractor and Engineer	Ongoing monitoring.
		The rules that are explained in the worker conduct section, must be followed at all times	Contractor and Engineer	Ongoing monitoring.
4.	Dust and air pollution ³⁴	Vehicles travelling to and from the construction site must adhere to speed limits so as to avoid producing excessive dust.	Engineer	Ongoing monitoring.
		A speed limit of 30km/hr must be adhered to on all dirt roads.	Engineer	Ongoing monitoring.
		Access and other cleared surfaces including backfilled tranches must be dampened whenever possible and especially in dry and windy conditions to avoid excessive	Engineer	Ongoing monitoring.

³⁴ Main causes of air pollution during construction are dust from vehicle movements and stockpiles, vehicle emissions and fires.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		dust.		
		Where dust is unavoidable in residential or commercial areas, screening will be required utilizing wooden supports and shade cloth.	Engineer	As directed by the engineer.
		Vehicles and machinery are to be kept in good working order and to meet manufacturers specifications for safety, fuel consumption, etc.	Contractor	Ongoing monitoring.
		Should excessive emissions be observed, the Contractor is to have the equipment seen to as soon as possible.	Engineer	As directed by the engineer.
		No fires are allowed on site except for the burning of firebreaks.	Engineer	Ongoing monitoring.
5.	Soil erosion	Once an area has been cleared of vegetation, the top layer (normally 150mm) of soil shall be removed and stockpiled in the designated area.	Contractor	Ongoing monitoring.
		The full length of the works shall not be stripped of vegetation prior to commencing other activities. The time that stripped areas are exposed shall be minimized wherever possible.	Engineer and Contractor	Ongoing monitoring.
		Top soiling and revegetation shall commence immediately after the completion of an activity and at an agreed distance behind any particular work front.	Contractor	As each activity is completed.
		Stormwater control and wind screening shall be undertaken to prevent soil loss from the site.	Engineer	Ongoing monitoring.
		Side tipping of spoil and excavated materials shall not be permitted – all spoil material shall be disposed of as directed by the Engineer.	Engineer	Ongoing monitoring.
		Battering of all banks shall be such that cut and fill embankments are no steeper than previous natural slopes unless otherwise permitted by the Engineer. Cut and fill embankments steeper than previous ground levels shall be revegetated immediately on completion of trimming or shall be protected against erosion using bioengineered stabilization measures.	Engineer and Contractor	As the cut and fill activity is completed.
		All embankments, unless otherwise directed by the Engineer, shall be protected by a cut off drain to prevent water from cascading down the face of the embankment and causing erosion.	Engineer	Immediately after the creation of the embankment/stripping of vegetation.
6.	Stormwater	The Contractor shall not in any way modify nor damage the banks or bed of streams, rivers, wetlands, other open water bodies and drainage lines adjacent to or within the designated area, unless required as part of the construction project specification. Where such	Contractor	Ongoing monitoring.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		 disturbance is unavoidable, modification of water bodies shall be kept to a minimum in terms of: removal of riparian vegetation opening up of the stream channel 		
		Earth, stone and rubble is to be properly disposed of so as not to obstruct natural water pathways over the site i.e. these materials must not be placed in stormwater channels, drainage lines or rivers.	Engineer	Monitoring throughout the duration of the project.
		There shall be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed.	Engineer and Contractor	Monthly inspection.
		The use of high velocity stormwater pipelines shall be avoided in favor of open, high friction, semi-permeable channels wherever feasible.	Engineer and Contractor	As directed by the engineer
		Stormwater outfalls shall be designed to reduce flow velocity and avoid streambank and soil erosion.	Engineer and Contractor	As directed by the engineer
		During construction, un-channeled flow must be controlled to avoid soil erosion. Where large areas of soil are left exposed, rows of straw / hay or bundles of cut vegetation shall be dug into the soil in contours to slow surface wash and capture eroded soil. The spacing between rows will be dependent on slope.	Engineer and Contractor	As surfaces become exposed.
		Where surface run-off is concentrated (e.g. along exposed roadways/tracks), flow shall be slowed by contouring with hay bales or bundled vegetation generated during site clearance operation. If the area must be used for construction vehicles, berms may be used instead. The berms must be at least 30 cm high and well compacted. The berms shall channel concentrated flow into detention ponds or areas protected with hay bales for flow reduction and sediment capture.	Engineer and Contractor	Ongoing monitoring.
7.	Water quality ³⁵	Mixing / decanting of all chemicals and hazardous substances must take place either on a tray or on an impermeable surface. Waste from these shall then be disposed of to a suitable waste disposal site.	Contractor and Engineer	Regular monitoring (refer to the environmental monitoring program)
		Every effort shall be made to ensure that any chemicals or hazardous substances do not contaminate the soil or ground water on site.	Contractor	Regular monitoring (refer to the environmental monitoring program)

³⁵ Water quality is affected by the incorrect handling of substances and materials. Soil erosion and sediment is also detrimental to water quality. Mismanagement of polluted run-off from vehicle and plant washing and wind dispersal of dry materials into rivers and watercourses are detrimental to water quality.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		Care must be taken to ensure that run-off from vehicle or plant washing does not enter the surface/ground water. Wash water must be passed through a three-chamber oil-grease trap prior to being discharged as effluent.	Contractor	Regular monitoring (refer to the environmental monitoring program)
		Site staff shall not be permitted to use any stream, river, other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities. Municipal water (or another source approved by the Engineer) shall instead be used for all activities such as washing of equipment or disposal of any type of waste, dust suppression, concrete mixing, compacting etc.	Contractor	Regular monitoring (refer to the environmental monitoring program)
		Emergency contact numbers of the SPCB shall be referred to in order to deal with spillages and contamination of aquatic environments.	Engineer and Contractor	As necessary
8.	Conservation of natural environment	As the work front progresses the Contractor is to check that vegetation clearing has the prior permission of the Engineer.	Engineer	Ongoing monitoring.
		Only trees that have NOT been marked beforehand are to be removed, if cutting of trees is required.	Contractor	Ongoing monitoring.
		Gathering of firewood, fruit, plants, crops or any other natural material on site or in areas adjacent to the site is prohibited.	Contractor	Ongoing monitoring.
		The hunting of birds and animals on site and in surrounding areas is forbidden.	Contractor	Ongoing monitoring.
		Immediate revegetation of stripped areas and removal of aliens by de-weeding must take place. This significantly reduces the amount of time and money that must be spent on alien plant management during rehabilitation.	Contractor	Ongoing monitoring.
		Alien vegetation encroachment onto the site as a result of construction activities must be controlled during construction.	Contractor	Twice-monthly monitoring.
		Where possible, cleared indigenous vegetation shall be kept in a nursery for use at a later stage in the site rehabilitation process.	Contractor	As the work front progresses.
9.	Materials management	Stockpiles shall not be situated such that they obstruct natural water pathways.	Engineer and Contractor	Location as directed by the engineer
		Stockpiles shall not exceed 2m in height unless otherwise permitted by the Engineer.	Engineer	Location as directed by the engineer
		If stockpiles are exposed to windy conditions or heavy rain, they shall be covered either by vegetation or cloth, depending on the duration of the project. Stockpiles may	Contractor	As necessary

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		further be protected by the construction of berms or low brick walls around their bases.		
		Stockpiles shall be kept clear of weeds and alien vegetation growth by regular de-weeding.	Contractor	Monthly monitoring
		All concrete mixing must take place on a designated, impermeable surface.	Contractor	Ongoing monitoring.
		No vehicles transporting concrete to the site may be washed on site.	Contractor	Ongoing monitoring.
		No vehicles transporting, placing or compacting asphalt or any other bituminous product may be washed on site.	Contractor	Monthly monitoring.
		Lime and other powders must not be mixed during excessively windy conditions.	Contractor	As necessary
		All substances required for vehicle maintenance and repair must be stored in sealed containers until they can be disposed of / removed from the site.	Contractor	Ongoing monitoring.
		Hazardous substances / materials are to be transported in sealed containers or bags.	Engineer and Contractor	Ongoing monitoring
		Spraying of herbicides / pesticides shall not take place under windy condition.	Contractor	As necessary.
10.	Waste management	Refuse must be placed in the designated skips / bins which must be regularly emptied. These shall remain within demarcated areas and shall be designed to prevent refuse from being blown out by wind.	Contractor	Ongoing monitoring.
		In addition to the waste facilities within the construction camp, provision must be made for waste receptacles to be placed at intervals along the work front.	Contractor	Ongoing monitoring.
		Littering on site is forbidden and the site shall be cleared of litter at the end of each working day.	Contractor	Ongoing monitoring.
		Recycling is to be encouraged by providing separate receptacles for different types of wastes and making sure that staff is aware of their uses.	Contractor	Ongoing monitoring.
		All waste must be removed from the site and transported to a disposal site or as directed by the Engineer. Waybills proving disposal at each site shall be provided for the Engineer's inspection.	Engineer and Contractor	Checked at each site meeting.
		Construction rubble shall be disposed of in pre-agreed, demarcated spoil dumps that have been approved by the Engineer, or at disposal sites.	Engineer and Contractor	Ongoing monitoring.
		Waste from toilets shall be disposed of regularly and in a responsible manner. Care must be taken to avoid contamination of soils and water, pollution and nuisance to adjoining areas.	Contractor	Weekly monitoring.
		Hazardous waste disposal must be carried out by the	Contractor and Engineer	Ongoing monitoring.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		Contractor in a responsible manner at approved site. Waybills for this shall be provided.		
		A sump (earth or other) must be created for concrete waste. This is to be de-sludged regularly and the cement waste is to be removed to the approved disposal site.	Engineer and Contractor	Ongoing monitoring.
11.	Social impacts ³⁶	Contractor's activities and movement of staff to be restricted to designated construction areas.	Engineer	Ongoing.
		Should the construction staff be approached by members of the public or other stakeholders, they shall assist them in locating the Engineer or Contractor, or provide a number on which they may contact the Engineer or Contractor.	Engineer and Contractor	Ongoing monitoring.
		The conduct of the construction staff when dealing with the public or other stakeholders shall be in a manner that is polite and courteous at all times. Failure to adhere to this requirement may result in the removal of staff from the site by the Engineer.	Engineer	Ongoing monitoring.
		Disruption of access for local residents, commercial establishments, institutions, etc. must be minimized and must have the Engineer's permissions.	Engineer	Ongoing monitoring.
		Provide walkways and metal sheets where required to maintain access for people and vehicles.	Contractor	Ongoing monitoring
		Increase workforce in front of critical areas such as educational institutions, places of worship, business establishment and health care establishments to shorten the duration of impacts.	Contractor	Ongoing monitoring
		Consult businesses and institutions regarding operating hours and factoring this in work schedules.	Engineer and Contractor	At least 1 week prior to the activity taking place.
		The Contractor is to inform neighbors in writing of disruptive activities at least 24 hours beforehand. This can take place by way of leaflets placed in the postboxes giving the Engineer's and Contractor's details or other method approved by the Engineer. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Engineer and Contractor	At least 24 hrs prior to the activity taking place.
		The project contractor will ensure that there is provision of alternate access to business establishments during the construction so that there is no closure of these shops or any loss of clientage.	Engineer and Contractor	Ongoing monitoring

³⁶ Regular communication between the Contractor and the interested and affected parties is important for the duration of the contract.

Activity	Management/Mitigation	Responsible for Monitoring	Frequency
	Contractor shall submit to Engineer the confirmation obtained from the business/shop owner that such access was provided during project execution on the specified format titled "Confirmation from Operator of Commercial establishment/shop for provision of temporary Access by Contactor". This format has been appended as Appendix-1 to EMP.	Engineer	On completion of works at each site
	Lighting on the construction site shall be pointed downwards and away from oncoming traffic and nearby houses.	Engineer	Ongoing monitoring.
	The site must be kept clean to minimize the visual impact of the site.	Engineer	Weekly monitoring.
	If screening is being used, this must be moved and re- erected as the work front progresses.	Engineer	Ongoing monitoring.
	Machinery and vehicles are to be kept in good working order for the duration of the project to minimize noise nuisance to neighbors.	Contractor	Ongoing monitoring.
	 Notice of particularly noisy activities must be given to residents / businesses adjacent to the construction site. Examples of these include: noise generated by jackhammers, diesel generator sets, excavators, etc. drilling dewatering pumps 	Engineer and Contractor	At least 24 hrs prior to the activity taking place.
	Noisy activities must be restricted to the times given in the Project Specification or General Conditions of Contract.	Engineer	Ongoing monitoring.
	The Engineer and Contractor are responsible for ongoing communication with those people that are interested in / affected by the project.	Engineer and Contractor	
	A complaints register (refer to the Grievance Redressal Mechanism) shall be housed at the site office. This shall be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. This register is to be tabled during monthly site meetings.	Contractor and Engineer	Monthly monitoring.
	Interested and affected parties' need to be made aware of the existence of the complaints book and the methods of communication available to them.	Engineer and Contractor	Ongoing monitoring.
	 Queries and complaints are to be handled by: - documenting details of such communications submitting these for inclusion in complaints register bringing issues to Engineer's attention immediately 	Contractor	Ongoing monitoring.

	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		• taking remedial action as per Engineer's instruction		
		Selected staff are to be made available for formal consultation with the interested and affected parties in order to: • explain construction process • answer questions	Contractor	Ongoing monitoring.
		Contractor shall immediately take the necessary remedial action on any complaint/grievance received by him and forward the details of the grievance along with the action taken to Engineer within 48 hours of receipt of such complaint/grievance.	Engineer	Ongoing monitoring
12.	Cultural environment	All the staff and labourers of the Contractor be informed about the possible items of historical or archaeological value which include old stone foundations, tools, clayware, jewellery, remains, fossils etc.	Engineer and EE	As required.
		If something of this nature be uncovered, ASI or State Department of Archaeology shall be contacted and work shall be stopped immediately.	Engineer and EE	As required.
13.	Environment Safeguard Officer	Contractor shall appoint one Environment Safeguard Officer who shall be responsible for assisting contractor in implementation of EMP, community liaison, consultations with interested/affected parties, reporting and grievance redressal on day-to-day basis.	Engineer and EE	Person to be appointed before start of construction activities and remain available through the project duration.

ASI = Archeological Survey of India; EE = Environmental Expert of Engineer (DSC); SPCB= State Pollution Control Board

Table-45: Post Construction Activities

	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Construction camp	All structures comprising the construction camp are to be removed from site or handed over to the property owner/ community as per mutual agreement (if established on private/community land).	Engineer	Subproject completion
		The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up.	Engineer	Subproject completion
		All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top-soiled and re-grassed using the guidelines set out in the revegetation specification that forms part of this document.	Engineer	Subproject completion
		The Contractor must arrange the cancellation of all temporary services.	Engineer	Subproject completion
2.	Vegetation	All areas that have been disturbed by construction activities (including the construction camp area) must be	Engineer	Subproject completion

	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
		cleared of alien vegetation.		
		Open areas are to be re-planted as per the revegetation specification.	Engineer	Subproject completion
		All vegetation that has been cleared during construction is to be removed from site or used as much as per the revegetation specification, (except for seeding alien vegetation).	Engineer	Subproject completion
		The Contractor is to water and maintain all planted vegetation until the end of the defects liability period and is to submit a method statement regarding this to the Engineer.	Engineer	Subproject completion
3.	Land rehabilitation	All surfaces hardened due to construction activities are to be ripped and imported materials thereon removed.	Contractor	Subproject completion
		All rubble is to be removed from the site to an approved disposal site. Burying of rubble on site is prohibited.	Contractor	Subproject completion
		The site is to be cleared of all litter.	Contractor	Subproject completion
		Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Engineer.	Contractor	Subproject completion
		All embankments are to be trimmed, shaped and replanted to the satisfaction of the Engineer.	Engineer and Contractor	Subproject completion
		Borrow pits are to be closed and rehabilitated in accordance with the pre-approved management plan for each borrow pit. The Contractor shall liaise with the Engineer regarding these requirements.	Engineer	Subproject completion
		The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials.	Contractor	Subproject completion
4.	Materials and infrastructure	Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Engineer.	Engineer	Subproject completion
		All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer.	Engineer	Subproject completion
		All leftover building materials must be returned to the depot or removed from the site.	Contractor	Subproject completion
		The Contractor must repair any damage that the construction work has caused to neighboring properties.	Contractors	As directed by the Engineer.
5.	General	A meeting is to be held on site between the Engineer, EE and the Contractor to approve all remediation activities and to ensure that the site has been restored to a condition approved by the Engineer.	Engineer and EE	On completion of the construction and maintenance phases
		Temporary roads must be closed and access across these blocked.	Engineer and EE	On completion of construction
1		Access or haulage roads that were built across	Engineer and Contractor	On completion of

Activities	Management/Mitigation	Responsible for Monitoring	Frequency
	watercourses must be rehabilitated by removing temporary bridges and any other materials placed in/or near to watercourses. Revegetation of banks or streambeds must be as necessary to stabilize these and must be approved by the Engineer.		construction
	All areas where temporary services were installed are to be rehabilitated to the satisfaction of the Engineer	Engineer and Contractor	On completion of construction

EE = Environmental Expert of Engineer (DSC)
B. Environmental Monitoring Programme

203. **Table 46** outlines the environmental monitoring program to ensure implementation of the management and mitigation measures specified in the EMP. The table shall be read within the context of the body of the entire EMP.

Aspect	Parameter	Standards	Location	Duration /	Implementation	Supervision
				frequency		
1. Site establis	nment and preliminary ac		1			
permits and agreements	Establishment and Consent to Operate (in relation to hot mixing, wet mixing, batching plant, stone crushers,	Water Act Noise Act	-	moving onto site and during construction	Contractor	PMU/PSC
	and diesel generators, etc.)					
	Copy of EMP	EARF and ADB SPS	Subproject site, offices, website, library, etc.	At all times	Contractor, Engineer and EE	PMU/PSC
Access to site	Existing conditions	EMP	All access and haul roads	Prior to moving onto site	Engineer, EE and Contractor	PMU/PSC
	Road closures and traffic rerouting	Traffic management plan and EMP	All affected roads	One week in advance of the activity	Engineer and EE	PMU/PSC
	Notifications and road signages	Traffic management plan and EMP	All affected roads	One week in advance of the activity	Engineer and EE in coordination with the Contractor and Traffic Police	PMU/PSC
Construction camp	Approval of location and facilities	EMP	As identified	Prior to moving onto site	Contractor with the Engineer and EE	PMU/PSC
Equipment lay- down and storage area	Approval of location and facilities	EMP	As identified	Prior to moving onto site and during site set-up	Contractor with the Engineer and EE	PMU/PSC
Materials management – sourcing	Approval of sources and suppliers	EMP	As identified	Prior to procurement of materials	Contractor with the Engineer and EE	PMU/PSC
Education of site staff	Awareness level training - Environment - Health and safety	EMP and records	-	During staff induction, followed by schedule as determined	Contractor with the Engineer and EE	PMU/PSC
Social impacts	Public consultations, information disclosure, communication strategy	EARF, ADB SPS and EMP	Subproject site	Prior to moving onto site and ongoing	Contractor with the Engineer, EE, PIU/PSC	PMU
	GRM register	EMP	Subproject site	Prior to moving onto site and ongoing	Contractor with the Engineer, EE, PIU	PMU/PSC
Noise quality	Baseline data for noise level in dB(A) L _{eq}	National noise standards	Once before start of construction works at 3	Once prior to site set-up	Contractor	Engineer/ EE/ PMU/PSC

 Table 46: Environmental Monitoring Program

Aspect	Parameter	Standards	Location	Duration /	Implementation	Supervision
			tube well	nequency		
			construction			
			sites and 2			
			roplacement			
			Siles as			
			Identified by			
A. 11			Engineer.			
Air quality	Baseline ambient data	National	Once before	Once prior to	Contractor	Engineer/ EE/
	for particulate matters	ambient air	start of	site set-up		PMU/PSC
	10 and 2.5 (PM ₁₀ ,	quality	construction			
	PM _{2.5}), sulfur dioxide	standards	works at 3			
	(SO_2) , nitrogen dioxide		tube well			
	(NO ₂)		construction			
			sites, 2 OHT			
			sites and 2			
			pipe			
			replacement			
			sites as			
			identified by			
			Engineer.			
Soil erosion	Soil erosion	EMP	As identified	During site	Contractor with	PMU/PSC
	management		by the	set-up and	the Engineer and	
	measures		engineer	throughout the	FE	
	medeulee		onginoon	duration of the		
				subproject		
Stormwater	Stormwater	EMD	As identified	During site	Contractor with	DMIL/DSC
Stornwater	management		As identified	builing site	the Engineer and	FINIO/F3C
	management		by the	set-up and		
	measures		engineer	throughout the	EE	
0		E 145	.	subproject	0 1 1 11	D. 41 / D. 0.0
Conservation	Existing conditions	EMP	Supproject	Prior to site	Contractor with	PMU/PSC
of natural			sites	set-up	Engineer and EE	
environment						
Waste	Disposal sites	EMP	As	Prior to site	Contractor with	PMU/PSC
management			determined	set-up and	Engineer and EE	
procedure				ongoing		
				throughout the		
				subproject		
Cultural	Chance finds	ASI Act and	As	Prior to site	Contractor with	PMU/PSC
environment		EMP	determined	set-up and	Engineer and EE	
				ongoing	-	
				throughout the		
				subproject		
2. Construction	phase	•				
Access to site	Qualitative	Pre-subproject	All access	Refer to EMP	Contractor	Engineer
	characteristics	condition and	and haul	(table on		5
		FMP	roads	management		
				of construction		
				and workforce		
				activities		
Construction	Qualitative	Pro-subproject	Camp site	Prior to site	Contractor	Engineer
camp	characteristics	condition and	Camp Sile	sot-up and	Contractor	LIGINEE
camp				ongoing		
				through out the		
				auboroiost		
Otoff and I i	Oite reaction		Outburgers' 1		Contro star	Facility and the
Statt conduct	Site records	EMP	Supproject	Ungoing	Contractor	⊨ngineer
	(accidents, complaints)	1	SITES	1	1	1

Aspect	Parameter	Standards	Location	Duration / frequency	Implementation	Supervision
Air quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	National ambient air quality standards	3 locations near tube well construction sites, 2 locations near OHT construction sites and 2 locations near pipe replacement sites as specified by the Engineer (DSC).	Once in every six months at tube well and OHT sites and once in every three months at pipe replacement sites during subproject execution	Contractor	Engineer/ EE/ PMU/PSC
Soil erosion	Soil erosion management measures	EMP	Subproject sites	Ongoing	Contractor	Engineer
Stormwater	Soil erosion management measures	EMP	Subproject sites	Ongoing	Contractor	Engineer
Conservation of natural resources	Vegetation conditions	EMP	Subproject sites	Ongoing	Contractor	Engineer
Materials management	Qualitative characteristics	EMP	Subproject sites	Ongoing	Contractor	Engineer
Waste management	Qualitative characteristics	EMP	Subproject sites	Ongoing	Contractor	Engineer
	Disposal manifests	EMP	Subproject sites	Ongoing	Contractor	Engineer
Social impacts	Public consultations, information disclosure, communication strategy	EARF, ADB SPS and EMP	Subproject sites	Ongoing	Contractor with the Engineer, EE, PIU	PMU/PSC
	GRM register	EMP	Subproject sites	Ongoing	Contractor with the Engineer, EE, PIU	PMU/PSC
Cultural environment	Chance finds	ASI Act and EMP	Subproject sites	Ongoing	Contractor	Engineer
Noise quality	Noise level in dB(A) L _{eq}	National noise standards	3 locations near tube well construction sites, 2 locations near OHT construction sites and 2 locations near pipe replacement sites as specified by the Engineer (DSC).	Once in every six months at tube well and OHT sites and once in every three months at pipe replacement sites during subproject execution	Contractor	Engineer/ EE/ PMU/PSC
Construction	Pre-existing conditions	EMP	Construction	Subproject	Contractor	Engineer
camp			camp	completion		

Aspect	Parameter	Standards	Location	Duration /	Implementation	Supervision
-				frequency	•	-
Vegetation	Pre-existing conditions	EMP	Subproject	Subproject	Contractor	Engineer
			sites	completion		
Land	Pre-existing conditions	EMP	Subproject	Subproject	Contractor	Engineer
rehabilitation			sites	completion		
Materials and	Pre-existing conditions	EMP	Subproject	Subproject	Contractor	Engineer
infrastructure			sites	completion		
General	Records	EMP	Subproject	Subproject	Contractor with	PMU/PSC
			sites	completion	Engineer and EE	
Operation ar	nd maintenance (defect li	ability period)				
Air quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	National	Once at 10	Once in 6	Contractor	Engineer/ EE/
		ambient air	locations	months		PMU/PSC
		quality	near			
		standards	constructed			
			OHIS and			
			tube wells (5			
			each) and 3			
			locations			
			near pipe			
			replacement			
			Siles as			
			specified by			
Noise quality	Noise level in $dB(\Lambda)$ I	As per national	(DSC).	Once in 6	Contractor	Engineer/EE/
Noise quality			locations	months	Contractor	PMII/PSC
		standards	near	montais		
		otanidardo	constructed			
			OHTs and			
			tube wells (5			
			each) and 3			
			locations			
			near pipe			
			replacement			
			sites as			
			specified by			
			the Engineer			
			(DSC).			

EE= Environmental Expert of Engineer (DSC)

C. Environmental Management and Monitoring Cost

204. The Contractor's cost for site establishment, preliminary activities, construction, and defect liability activities will be incorporated into the contractual agreements, which will be binding on him for implementation. The air quality and noise level monitoring of construction and defect liability phases will be conducted by the contractor.

205. The operation phase mitigation measures are again of good operating practices, which will be the responsibility of implementing agency (ERA). The air quality and noise level monitoring during the operation and maintenance phase will be conducted by the environmental laboratory of ERA, therefore there are no additional costs.

206. The activities identified in environmental monitoring program mainly includes site inspections and informal discussions with workers and local people and this will be the responsibility of PMU and PSC with the assistance of DSC, costs of which are part of project management.

207. **Table 47** presents the estimated cost to implement the EMP.

Component	Description	Number	Cost per Unit	Cost	Source of
Legislation, Permits and Agreements	Consent to Establish and Consent to Operate for plants and machinery of the contractor.	As required	Not Applicable	Not Applicable	These consents are to be obtained by contractor on his own cost.
Public consultations and information disclosure	Information disclosure and consultations during preconstruction and construction phase.	As required	Lump sum	300,000	
Providing access to commercial establishments and properties.	Providing access, in case of access disruptions, to affected properties.	As per requirement	Contractor's liability	Not applicable	Covered under engineering cost
Dust Suppression at subproject sites	Application of dust suppression measures during construction phase.	As required	Lump sum	10,00,000	Covered under engineering design and cost
Protection measures against noise pollution	Construction of noise walls (as per requirement)	As required	Lump sum	2,50,000	Covered under engineering design and cost
Traffic management	Safety Signboards, delineators, traffic regulation equipments, flagman, temporary diversions, etc	Wherever required throughout subproject corridor	Contractor's liability	Not applicable	Covered in engineering cost
Baseline Monitoring	Site preparation and preliminary activities				
Air	Once before start of construction works at 3 locations near tube well construction sites, 2 locations near OHT construction sites and 2 locations near pipe replacement sites as identified by DSC	7 samples	7,000 per sample	49,000	Covered under engineering design and cost
Noise	Once before start of construction works at 3 locations near tube well construction sites, 2 locations near OHT construction sites and 2 locations near pipe replacement sites as identified by DSC	7 samples	1,000 per sample	7,000	Covered under engineering design and cost
Construction Monitoring					
Air	Once in six months at 3 locations near tube well construction sites and 2 locations near OHT construction sites as identified by DSC (for two years)	36 samples	7,000 per sample	2,52,000	Covered under engineering design and cost

Table 47: Indicative Cost for EMP Implementation

Component	Description	Number	Cost per Unit	Cost	Source of
			(INR)	(INR)	Funds
	Once in three months				
	replacement sites				
	identified by DSC (for				
	two years)				
Noise	Once in six months at	36 samples	1.000 per	36.000	Covered under
	3 locations near tube		sample		engineering
	well construction sites				design and cost
	and 2 locations near				_
	OHT construction sites				
	as identified by DSC				
	(for two years)				
	Once in three months				
	at 2 locations near pipe				
	replacement sites as				
	identified by DSC (for				
	two years)				
Defect Liability					
Period	Once at 10 leastions	10	7.000	01.000	Covered under
All		13 samples	7,000 per	91,000	covered under
	and Tube Wells (5		Sample		design and cost
	each) and 3 locations				design and cost
	near pipe replacement				
	sites as identified by				
	the DSC.				
Noise	Once at 10 locations	13 samples	1,000 per	13,000	Covered under
	near constructed OHTs		sample		engineering
	and Tube Wells (5				design and cost
	each) and 3 locations				
	sites as identified by				
	the DSC.				
Any unanticipated	Mitigation of any	Lump sum	10,00,000	10,00,000	
impact due to	unanticipated impact				
subproject	arising during				
implementation	construction phase and				
	defect liability period.			20000000	
				2998000	
			101AL (05D)	03/01.23	

Total Cost of EMP implementation = INR 29,98,000/-

{ Cost of environmental management covered under engineering cost and provisional sum of the subproject =INR 16,98,000/-

Independent cost of environmental management (not covered under engineering cost)

⁼ INR 13,00,000/- 3^{37}

³⁷ These costs are covered works contracts.

IX. CONCLUSION AND RECOMMENDATIONS

208. The process described in this document has assessed the environmental impacts of all elements of the proposed subproject for rehabilitation of water supply system in Jammu City. Potential negative impacts were identified in relation to pre-, construction and operation of the improved infrastructure, but no environmental impacts were identified as being due to either the subproject design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

209. The public participation processes undertaken during project design ensured stakeholders are engaged during the preparation of the IEE. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

210. The subproject's Grievance Redressal Mechanism will provide the citizens with a platform for redressal of their grievances and describes the informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance.

211. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between the DSC (Engineer), contractors, PIU and PMU/PSC. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with.

212. A copy of the EMP will be kept on site during the construction period at all times. The EMP will be made binding on all contractors operating on the site and will be included within the Contractual Clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

213. The subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

214. Therefore, as per ADB SPS, the subproject is classified as Environmental Category B and does not require further Environmental Impact Assessment.

Rapid Environmental Assessment (REA) Checklist

Country/Project title:	India/J&K U	rban S	ector [Development Investment Programme
Sector division:	Water Suppl	у		
Screening ques	tions	Yes	No	Remarks
a. Project siting				
Denselv populated?		✓		Jammu City is densely populated
 Heavy with development activities? 		~		The area comprises of residential structures, commercial establishments and army installations. The developmental activities such as construction works are ongoing at an average pace.
 Adjacent to or within any environmentally sensitive areas? 			~	None of the subproject component sites are adjacent to or within any environmentally sensitive area. The nearest environmentally sensitive area is Ram Nagar Wildlife Sanctuary at a distance of about 320m from the outer periphery of the sub project area (from proposed tube well site at New plot).
Cultural heritage site			~	None of the subproject component sites are within or adjacent to any cultural heritage site. The archaeologically protected monument closest to sub project area is 'Peer Mitha tomb' at about 0.44km distance from outer periphery of sub project area (from proposed tube well site at Wazarat Road).
Protected area			~	None of the subproject component sites are within or adjacent to any protected area.
Wetland			✓	Not applicable
Mangrove			✓	Not applicable
Estuarine			✓	Not applicable
Buffer zone of prot	ected area		~	None of the subproject component sites are within or adjacent to buffer zone of protected area.
 Special area for probiodiversity 	otecting		~	None of the subproject component sites are in special area for protecting biodiversity.
 Bay 			✓	Not applicable
b. Potential environmenta Will the project cause	al impacts			
 Pollution of raw water sup upstream wastewater disc communities, industries, a soil erosion runoff? 	pply from charge from agriculture, and		~	No such impact is anticipated. The water source for tube wells is underground water in deep water aquifers. Exploitation of surface water sources is not in the scope of the subproject.
 Impairment of historical/cumonuments/areas and los these sites? Hazard of land subsidence 	ultural ss/damage to		✓ ✓	No historical/cultural/ monuments/ areas exist within or in close vicinity of the subproject components. Hence no such impacts are anticipated. The archaeologically protected monument closest to sub project area is 'Peer Mitha tomb' at about 0.44km distance from outer periphery of sub project area (from proposed tube well site at Wazarat Road).
excessive ground water p	umping?			water table (Phreatic or unconfined). The area of Jammu has surplus exploitable ground water potential as per hydro-geological assessment study

Screening questions	Yes	No	Remarks
			carried out by Central Ground Water Board (CGWB) and Project Management Consultant of ADB loan 2151-IND (2007). It has been indicated in the reports that the present ground water extraction in the area is only 17.62% of the total available potential; and the area thus lies in the safe category of ground water development. Therefore, any hazard of land subsidence due to the proposed subproject is not anticipated.
 Social conflicts arising from displacement of communities? 		~	No such impact is anticipated as the subproject will not involve any displacement of population.
 Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters? 		✓	No such conflicts are anticipated. Abstraction of surface water for distribution is not proposed under this subproject. The ground water is not being tapped for any other purpose except drinking in the project area.
 Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)? 		~	Ground water obtained from the tube wells is normally free from pathogens and will be supplied after disinfection. Regular water quality monitoring is carried out by the line department (PHED) to minimize threat to public health. Further, the tube wells will be deep and sufficiently away from any possible source of ground water contamination.
 Delivery of unsafe water to distribution system? 		✓	Not anticipated. Proper care shall be taken during designing so that such situation does not arise. Overhead tanks will supply disinfected water to distribution network. The line department (PHED) has a well-established system of water quality monitoring at reservoirs and also at the user end.
 Inadequate protection of intake works or wells, leading to pollution of water supply? 		~	No such situation is anticipated in present case as raw water withdrawal is proposed from ground.
 Over pumping of ground water, leading to salinization and ground subsidence? 		✓ 	No such impact is anticipated. The ground water abstraction has been planned after ensuring adequate availability in the ground water aquifer for withdrawal. The area of Jammu has surplus exploitable ground water potential as per hydro-geological assessment study carried out by Central Ground Water Board (CGWB) and Project Management Consultant of ADB loan 2151-IND (2007). It has been indicated in the reports that the present ground water extraction in the area is only 17.62% of the total available potential; and the area thus lies in the safe category of ground water development.
 Excessive algal growth in storage reservoir? 		~	The storage reservoirs will be covered on top and shall be regularly disinfected, hence no algal growth in the reservoirs is anticipated.
 Increase in production of sewage beyond capabilities of community facilities? 		✓	No such impact is anticipated. Sewage volumes shall undoubtedly increase but this increase will not be beyond the existing community facilities. Moreover, the additional volume of water finding its way into the sewage shall dilute the actual concentration of contaminants.
 Inadequate disposal of sludge from water 		✓ _	Water treatment plants shall not be involved in this
 Inadequate buffer zone around pumping 		✓	The existing pumping stations are away from the

Screening questions	Yes	No	Remarks
and treatment plants to alleviate noise and other possible nuisances and protect facilities?			human settlements and are already screened by proper enclosures. No treatment plant is proposed under sub-project.
 Impairments associated with transmission lines and access roads? 	~		Temporary impairments with transmission lines and access roads are anticipated during laying of new and replacement of worn out pipes in the subproject area.
 Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals. 		~	No such impact is anticipated. Chlorine gas is not planned to be used for disinfection. Currently, bleaching powder is being used for disinfection of drinking water.
 Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants? 		~	No such impact is anticipated.
 Dislocation or involuntary resettlement of people? 		~	There is no dislocation or involuntary resettlement of people.
			The land for construction of few tube wells and OHTs has been voluntarily provided by the community/religious trusts. Only the land earmarked by these religious bodies/ community shall be used and no damage to the existing properties is anticipated.
			However, minor disruptions to access of a few commercial and residential establishments are anticipated during the execution of civil works. This shall be temporary and site specific in nature coinciding with the duration of works.
 Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups? 		V	No such impact is anticipated.
 Noise and dust from construction activities? 	~		Minor noise and dust from construction activities is anticipated which shall be localized and temporary in nature coinciding only with the duration of construction activities.
 Increased road traffic due to interference of construction activities? 	✓		Slight increase in road traffic due to movement of construction vehicles can be anticipated. But, this shall be temporary in nature with negligible impact. This will be limited to construction phase only and the works will be carried out during lean traffic periods. This will ensure no adverse impact due to construction traffic.
 Continuing soil erosion/silt runoff from construction operations? 		~	No soil erosion is anticipated. Trenches will be filled back and restored to original conditions after completion of day's work. The land below overhead tanks will be leveled properly after completion of construction works.
 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? 		~	Only disinfected water will be supplied to the consumers. The PHE department has a well established system of regular collection and analysis of water samples for preventing any such impact.
 Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals? 		~	No such impact is anticipated. The raw ground water is found to be non-corrosive in nature. However, prescribed amounts of corrective chemicals are used by PHED for disinfections to

Screening questions	Yes	No	Remarks
			avoid any such impacts.
 Accidental leakage of chlorine gas? 		~	Not applicable. Bleaching powder is being used for disinfection of water instead of chlorine gas.
 Excessive abstraction of water affecting downstream water users? 		~	No such impact is anticipated as water source for
Competing uses of water?		~	Ground water is not used for any other purpose except for drinking water supply in the project area.
 Increased sewage flow due to increased water supply 	V		A slight increase in sewage flow is anticipated due to increase in water supply. However, the additional volume of water finding its way into sewage shall be beneficial, as it shall dilute the actual concentration of contaminants.
 Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant 	~		A slight increase in the volume of sullage is expected due to increased water supply. However, the actual concentration of contaminants shall get diluted with this increase in water supply.
 Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? 		✓	No such impact is envisaged.
 Social conflicts if workers from other regions or countries are hired? 		~	No such conflicts are anticipated. Preference will be given to local laborers and migratory labour shall be employed in unavoidable circumstances only.
 Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction? 		~	No such impact is anticipated.
Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		V	No such impact is anticipated, in case of the proposed sub-project, as the structural elements of the sub-project are away from community habitations.

Climate change and disaster risk questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.		No	Remarks
 Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes? 		✓	The area is not subject to floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and localized climate changes. However, the sub-project area falls in seismic zone-IV as per seismic zone map of India.

 Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)? 	Ý	No	
 Are there any demographic or socio-economic aspects of the project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)? 	V	No	
 Could the project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)? 	¥	No	

Public Consultation

Sub Project: Rehabilitation of water supply system in Jammu City.

Various issues related to the proposed subproject were discussed at various locations throughout the subproject corridor. Discussions were held with the parties directly and indirectly affected by the subproject execution as well as the general public of the subproject area. The problems faced by them along with their suggestions/concerns were recorded and the same have been given due consideration during formulation of the project design, IEE and EMP.

The participants, in general were in favour of the upcoming subproject. However, they were concerned about the temporary problems which are expected to arise during construction stage such as traffic related issues, loss of access and increase in air pollution due to dust emissions. People are ready to extend all types of support during execution of the project. The details of the public consultation are detailed below:

Issues discussed

- > Awareness and extent of knowledge about the subproject.
- Information on the benefits of the subproject in terms of economic and environmental enhancement.
- Information on perceived benefits from the proposed subproject including augmentation in water supply, reduction in water losses, enhanced quality of the potable water, etc.
- Information on perceived losses from the proposed subproject during execution stage in terms of temporary disturbance in traffic, loss of access to residences, commercial establishments/shops, institutions, etc. and increase in air and noise pollution, etc. during construction.
- Presence of any historical/cultural site in the vicinity.
- > Presence of any protected area/wetland in or adjoining the construction site.
- Information on economic development in terms of creation of an important urban facility and generation of direct employment during the execution of the subproject.
- Information on the relevant entitlements to people affected viz a viz their respective losses.

Summary of public consultation dated 15-10-2010 to 25-10-2010 and 25.11.2011 to 26.11.2011 at different locations in the subproject area

S.No.	Issues Discussed	Feedback received	Remarks		
1	Problems faced due to absence of the proposed facility under the subproject	 The quality and quantity of the water supplied at present is not adequate. The water supply lines have degraded which requires immediate replacement. It is also resulting in leakages and water losses. Due to worn out pipelines, leaking is a persistent problem which results in contamination of water and loss of pressure at the user end. Relatively higher areas don't get regular water supply and they face scarcity of water especially in summers. There is acute shortage of water supply in 	The participants in general were of the view that the proposed rehabilitation is the need of the hour and welcomed the subproject and ensured their full support.		

S.No.	Issues Discussed	Feedback received	Remarks
2	Awareness and extent of knowledge about the subproject	 the newly established settlements. All the areas don't get water supply at par with each other. New settlements mostly in the peripheries of the city lack proper water production and water storage infrastructure. In some areas, people have to rely on supply of portable water through tankers (both government and private). Machinery of most of the existing pumping stations and tube wells has outlived which reduces their efficiency and production. Generally, most of the people consulted were well aware about the proposed subproject as ample information for the same has been disseminated during similar subprojects executed by J and K ERA under its earlier loan from ADB and by other line departments. 	Public consultation in different forms like one to one consultation, circulations of questionnaire, group discussions, etc. need to be a continuous process and EA will ensure this process throughout the project execution.
2	Information on the perceived benefits of the subproject in terms of economic and environmental enhancement	 General benefits perceived by the people are summarized as follows: Improvement in the water supply scenario will solve the issues and problems related to the unsatisfactory quantity and quality of the water supplied. It is hoped that adequate provisions will be made for satisfactory and standardized filtration and purification of the water which will be supplied in future. The improvement in the water supply will provide safety to the people as they will be not at the risk of water borne diseases. Replacement of worn out pipelines will address the problems of water losses and contamination. Areas on higher elevation and new settlements will get highly benefited with the proposed subproject. The replacement of worm out machinery in the existing pumping stations and tube wells will increase their efficiency and production. Proposed infrastructure will ensure overall health and hygiene of the people in the subproject area. 	People impacted directly or indirectly due to subproject implementation should be adequately compensated. During implementation, maximum efforts should be made to minimize hindrances of public access by providing alternative access to roads, streets and homes. The work should be carried out at a fast pace so that the duration of access disruption is minimized. People suggested an efficient operation and maintenance system after the completion of the project.
4	Information on perceived losses from the proposed subproject during execution stage in terms of disruptions in traffic, temporary access disruptions during execution and air and noise pollution, etc.	People opined that potential temporary impacts of access disruption for residences, shops/commercial establishments, and institutions, etc. should be mitigated through good construction practices and an effective environment and contractors construction plan which should ensure providing walkways and metal sheets to maintain access across trenches, increasing the workforce in front of shops/commercial establishments, consulting business and institutions regarding operating hours and factoring this in work schedules,	Effective mitigation measure should be in place so that problems related to traffic disruptions; air and noise pollution are minimized.

S.No.	Issues Discussed	Feedback received	Remarks
		providing advance information on works to be undertaken including appropriate signages etc.	
5	Presence of any historical/cultural site in the vicinity	There is no historical/cultural site in the corridor of the subproject.	However there are some sensitive receptors which include few educational
6	Presence of any protected area/wetland in or adjoining the construction site.	There is no protected area in the corridor of the subproject.	institutions, health centers, religious places etc. in the project area for which proper mitigation measures relevant to the location and nature of the receptor will be kept in place during project execution and same will be part of EMP.
8	Information on economic development in terms of reduction in problems due to inefficient water supply system and generation of direct employment during the execution of subproject	People were well aware about the benefits of the subproject which proposes rehabilitation of the water supply system in Jammu City. It will ensure efficient water supply facility thereby an overall healthy environment, health and hygiene in the subproject area and reduce many problems faced at this stage and indirect economic benefits thereof. In addition, people at large were aware about the fact that during the execution of subproject a large number of skilled/semi- skilled/unskilled people shall get employment and thus were in favour of construction works.	

List of Participants

S.	Name	Occupation	Address	Date
No				
1.	Mr. Prabudayal	Businessman	Qtr. No177, Sarwal Colony, Jammu	19-06-2011
2.	Tej Krishan	Businessman	Lane 1, K. B. Nagar, Bantalab	09-06-2011
3.	Girdhari Lal	Government employee	Lane No. 1, Lakshmi Nagar, Banatalab	09-06-2011
4.	Sham Lal Bhagat	Retired Government	K. B. Nagar, Bantalab	09-06-2011
		employee		
5.	Vikram Kumar	Manager	Lane-17, Jawahar Nagar, New Plot	09-06-2011
6.	Pratap Singh	Businessman	Prem Nagar, New Plot	09-06-2011
7.	Gopal Sharma	Government employee	Ashram, New plot	09-06-2011
8.	Vinod Suri	Businessman	111-Krishna Buiding, New Plot, Jammu	09-05-2011
9.	O. P. Sharma	Journalist	180-D, Talli Morh, Old Janipur, Jammu	09-06-2011
10.	Sukhdev Kumar	Shopkeeper	Bambi Karyana Store, New Plot	09-06-2011
11.	Chuni Shah Gupta	Shopkeeper	Subash Cheese Corner, New Plot	09-06-2011
12.	Rajnesh	Shopkeeper	137, Jawahar Nagar, New Plot	09-06-2011
13.	Madan Gupta	Shopkeeper	Madan Cloth House, New Plot	09-06-2011
14.	Ramesh Sharma	Shopkeeper	Main Road, New Plot	09-06-2011
15.	Subash Chander	Businessman	Dheeraj Communications, New Plot	09-06-2011
16.	Bahadur Singh	Ex-serviceman	46/1-Sec-D, Sainik Colony	16-06-2011
17	Surinder Singh	Businessman	Babbu Traders New Plot	00-06-2011
18	Akash Luthra	Businessman	Kings Choice, New Plot	09-06-2011
10.	Mohinder Singh	Government employee	K B Nagar Bantalah	09-06-2011
20	Subash Chander	Retired Central	21 Lane-1 K B Nagar Bantalah	09-06-2011
20.	Oubash Chander	Government employee	ZT, Lane-T, K. D. Wayar, Dantalab	03-00-2011
21.	Pritam Kumar Sharma	Businessman	Shanti Nagar, Janipur	09-06-2011
22.	Vikas Rattan	Businessman	Reliance Motors, New Plot, Jammu	19-05-2011

S. No	Name	Occupation	Address	Date
23.	Raieev Verma	Government employee	168/5, Roop Nagar, Jammu	19-05-2011
24.	K. R. Magotra	Retired Central Government employee	F-21/B, New Plot, Jammu	09-06-2011
25.	Ch. Mohd. Shafi	Sarpanch	Janipur Colony, Jammu	19-05-2011
26.	Gurdeep Singh	Retired Bank Officer	223-Shopping Centre, Bakshi Nagar, Jammu	19-05-2011
27.	Kewal Krishan Sapru	Retired Government employee	241-Shopping Centre, Bakshi Nagar, Jammu	19-05-2011
28.	Suman Nargotra	House wife	199, Rajinder Nagar, Bantalab, Jammu	19-05-2011
29.	Shambu Nath Mehta	Retired Government employee	17-Rajinder Nagar, JDA Housing colony, Bantalab, Jammu	17-06-2011
30.	Kuldeep Singh	Technical Officer	233, Rajinder Nagar, Phase-I, JDA Colony, Bantalab	14-06-2011
31.	Ritesh Gupta	Shopkeeper	177 Sarwal Colony, Jammu	19-05-2011
32.	Varun Abrol	Student	23/3, Roop Nagar, Jammu	19-05-2011
33.	Rajeev Kohli	Shopkeeper	17-Gujjar Mohalla, Janipur Colony	19-05-2011
34.	Shama Kumari	Aanganwari Worker	38-Extn. Janipur, Jammu	19-05-2011
35.	Ashwani Gupta	Businessman	24-Extn. Janipur Colony	19-05-2011
36.	Sunil Sharma	Engineer	26/1, Channi Himmat	19-12-2011
37.	U. C. Manchanda	employee	27/1, Channi Himmat	19-12-2011
38.	Huku Bakshi	Student	193/5, Channi Himmat	19-12-2011
39.	Rajesh Gupta	Businessman	255/5, Channi Himmat	19-12-2011
40.	Sharad Puri	Businessman	28/1, Channi Himmat	19-12-2011
41.	Vivek Jain	Businessman	102/1, Channi Himmat	19-12-2011
42.	M. K. Gupta	Retired Government employee	275/2, Channi Himmat	19-12-2011
43.	Dr. Naresh Khajuria	Doctor	286/5, Channi Himmat	19-12-2011
44.	Dr. Manvati	Doctor	32/6, Channi Himmat	19-12-2011
45.	Dr. Bhopesh Khajuria	Doctor	208/5, Channi Himmat	19-12-2011
46.	Babbal Singh	Businessman	224/1, Channi Himmat	19-12-2011
47.	Farooq Khan	Businessman	Plot 78, Sec-1, Channi Himmat	19-12-2011
48.	Ayub Khan	Divisional Forest Officer	77/1, Channi Himmat	19-12-2011
49.	Ruby Khan	Business	Begum Collection Tawi Shopping Complex, Shop No-9	19-12-2011
50.	Joginder Gupta	Retired Government employee	89/1-A, Channi Himmat	19-12-2011
51.	Parveen Beloria	Employee of Indian Oil Corporation	83/1-A, Channi Himmat	19-12-2011
52.	Hema Mahajan	Housewife	32/7 Channi Himmat, Jammu	16-02-2011
53.	Praveen Kumar Gupta	Self employed	Channi Himmat	16-06-2011
54.	V. K. Gupta	Retired Engineer	269/6, Channi Himmat	16-06-2011
55.	G. K. Bakshi	Retired Geologist	10/11-B, Bakshi Nagar, Jammu	19-06-2011
56.	Jolly Kumar	Carpenter	Dilli, Near Atman College of Education, Jammu	25-11-2011
57.	Naresh Sharma	Businessman	Dilli, Near Atman College of Education, Jammu	25-11-2011
58.	S. Ranjit Singh	Toyota Employee	Dilli, Near Atman College of Education, Jammu	25-11-2011
59.	Sohan Lal	Private job	Dilli, Near Atman College of Education, Jammu	25-11-2011
60.	Bansi Lal	Retired Government employee (PHE)	Dilli, Post Office Channi Himmat, Jammu	25-11-2011
61.	Ashok Kumar	Private job	Dilli, Post Office Channi Himmat, Jammu	25-11-2011
62.	Sadhu Ram	Tube well operator	Dilli, Post Office Channi Himmat,	25-11-2011

S.	Name	Occupation	Address	Date
110			Jammu	
63.	Bodh Raj	Shopkeeper	Dilli, Post Office Channi Himmat, Jammu	25-11-2011
64.	Rajesh Kumar	Government employee (Housing Board)	Dilli, Post Office Channi Himmat, Jammu	25-11-2011
65.	Subash Sharma	Property dealer	Dilli, Post Office Channi Himmat, Jammu	25-11-2011
66.	Susheel Sharma	Government employee (Teacher)	Dilli, Post Office Channi Himmat, Jammu	25-11-2011
67.	Dr. Javed Akhtar Chib	Doctor	D-33, Matto Colony, Trikuta Nagar Extn., Jammu	25-11-2011
68.	Smt. Sarla Bhatt	Retired Professor from Kashmir University	C-49, Matto Colony, Trikuta Nagar Extn, Jammu	26-11-2011
69.	T. R. Sharma	Central Government employee	D-42, Matto Colony, Trikuta Nagar Extn, Jammu	26-11-2011
70.	Dr. Ravi Jayee	Retired Government employee	6, Matto Colony, Trikuta Nagar Extn., Jammu	26-11-2011
71.	Farid Ahmad Mir	(not disclosed)	C-33, Matto Colony, Trikuta Nagar Extn, Jammu	26-11-2011
72.	Hira Lal Kaul	Government employee	C-22, Matto Colony, Trikuta Nagar Extn, Jammu	26-11-2011
73.	Shukal Chopra	Government employee	D-35, Matto Colony, Trikuta Nagar Extn, Jammu	26-11-2011
74.	M. L. Swaroop	Self employed	D-3, Matto Colony, Trikuta Nagar Extn, Jammu	26-11-2011
75.	Bhawna Raina	Government employee	Matto Colony, Trikuta Nagar Extn, Jammu	26-11-2011

One to one consultations have also been carried with the respondents from the following properties which will have temporary access disruption during the laying of rising and distribution main pipelines.

Lis	t of	Sho	ps/Comn	nercial	Establishments
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S. No	Affected person/property	Impact		
Channi Himmat Distribution starting point near OHT/PDD Office, Channi Himmat Sector 1				
1.	Yours Beauty parlour	Temporary access		
2.	Gazi Nursery Flower Shop	Temporary access		
3.	Nursery Flower Shop Near Baba Nursery	Temporary access		
4.	Baba nursery	Temporary access		
5.	Medi Aids Nursing Home	Temporary access		
6.	Ajanta Provisional Store	Temporary access		
7.	JK Importer Nursery, Plot 12 C, Channi Himmat	Temporary access		
8.	Koshaliya Nursery Opposite JK Importer Nursery	Temporary access.		
9.	Nidan Diagnostic Lab	Temporary access.		
10.	Tyre Repair Shop C/o Sahi's	Temporary access.		
11.	Sardari Lal Dogra's Tea Stall	Temporary access		
12.	Govind Ram's Dhaba	Temporary access		
13.	Prashotam Singh's Dhaba	Temporary access		
14.	Om Prakash Sharma Tyre Repairing Shop	Temporary access		
15.	Mulk Raj & Sons Grocery Shop	Temporary access		
16.	Guru Har Kishan Medicare, Shop No. 7, Sector 2	Temporary Access		
17.	Gautham medicos	Temporary Access		
18.	Thapa Chicken and Egg Store	Temporary Access		
19.	Jai Shankar Pan House	Temporary Access		
20.	Karan STD Booth	Temporary Access		
21.	Satyam Driving Institute	Temporary Access		
22.	Om Digital Studio, Sector 3	Temporary Access		

S. No	Affected person/property	Impact
23.	Lovely Digital Photo Studio	Temporary Access
24.	Iges Institute of Nursing	Temporary Access
25.	Jaidata Property Dealers	Temporary Access
26.	Sharma Sweet Shop	Temporary Access
27.	Anmol Stationery	Temporary Access
28	Shakti Cement Store	Temporary Access
20.	Dinish Building Material	Temporary Access
30	Surva Milk	Temporary Access
30.	Aircal Mabila Shan	
20	Ricel Nobile Shop	
32.	Diy Dakeis Medern Sepitation	
33.		
34.		Temporary access
35.	SNS GYM	Temporary access
36.	Divya Driving Institute	Temporary access
37.	Life Spring Beauty Store	Temporary access
38.	Apollo Bone and Joint Clinic C/o Dr S. S. Padha	Temporary access
39.	Mahajan Departmental Store	Temporary access
40.	Sharma General Store	Temporary access
	Shops from right and left side lanes in Sector 1,	, Channi Himmat
41.	Oyster Boutique, 272/2 Channi Himmat	Temporary access
42.	Canvenio Provisional Store near house No 4, Sector 2,	Temporary access
	Channi Himmat	
43.	Richis Provisional Store Opposite 362/1	Temporary access
44.	Gemini Point ,17/2 Channi Himmat	Temporary access
	Main road Channi Himmat parallel to railway line le	eft and right sides
45.	STD/ISD/PCO shop	Temporary access
46	Ranjeet Drycleaners	Temporary access
47	Shiva Autoworks	Temporary access
/18	Cycle & Tyre repairing shop c/o Mr. Deepak	
40.	lowel Tea Stall	Temporary access
 5 0	Ankush Auto Works c/o Mr. Kalu	Temporary access
50.	Asela Automobiles (closed)	
51.	Assia Automobiles (closed)	
52.	Assia Automobiles	
53.	Manajari Electricais	
54.	Asian Sanitary c/o IVIr. Ajay Gupta	Temporary access
55.	Asian Tour & Traveis	Temporary access
56.	G.K. Traders c/o Mr. Kameshwar	Temporary access
57.	Vicky Electricals c/o Mr. Vikash Chopra	Temporary access
58.	Baba's Grocery c/o Mr. Neeraj	Temporary access
59.	Adequate Fashion Looks c/o Mr. Kamod Sharma	Temporary access
60.	C. H. Distributors	Temporary access
61.	Frozen Treats	Temporary access
62.	Mahajan Property	Temporary access
63.	Bombay Dyeing	Temporary access
64.	Veg Non Veg food Shop	Temporary access
65.	Aircel Mobile	Temporary access
66.	Aarati Agencies	Temporary access
67.	Best Parlour	Temporary access
68.	Mobile Accessories Shop	Temporary access
69	Laxmi Glass House	Temporary access
70	Shake Up Provision Shop	Temporary access
70.	Sweet World	Temporary access
70	Mahajans shon	Temporary access
72	Thana Cycle Shon	Temporary access
73.	Sai Building Material	
14. 75		
/5.		
/6.	Reliance Communications	remporary access
77.	Sangam Departmental Store	lemporary access

S. No	Affected person/property	Impact
78.	Whirlpool Appliances Shop	Temporary access
79.	P K Shoes	Temporary access
80.	Chopra Sanitary	Temporary access
81.	Juice Corner	Temporary access
82.	V K Automobiles	Temporary access
83.	Shiva Grocery	Temporary access
84.	Dr. Sanyogitary's Shop	Temporary access
85.	Nanda Mithai Cage	Temporary access
86.	Maha Laxmi Departmental Store	Temporary access
87.	AGS Fashion Clothing	Temporary access
88.	Singh Food Junction	Temporary access
89.	Mahajans Shop	Temporary access
90.	Habib Beauty Saloon	Temporary access
91.	Gori Shanker Medicare	Temporary access
92.	Bags and More Shop	Temporary access
93.	Vishal Provisional Store	Temporary access
94.	National Builders	Temporary access
95.	Rohit Provisional Store	Temporary access
96.	Chowdhary Milk Products	Temporary access
97.	Sunflame C/o Parth Gift and kitchen Store	Temporary access
98.	Amar Ply Board and Hardware	Temporary access of 5 m
99.	Jai Hind Tower Dhaba (food Shop)	Temporary access
100.	Evalechnology	Temporary access
101.	Family Corner	Temporary access
102.	Tummy Says Yummy food Shop	Temporary access
103.		Temporary access
104.	M S Agencies	Temporary access
105.		
106.	H P Gas Shop	
107.	Ritchen Collection	
100.	Aroro Entorprison	
109.	M/s Poul Enterprises	
110.	Sizzlers Restaurant	Temporary access
112	Tandoor Nights Restaurant	Temporary access
112.	Splash Furniture	Temporary access
110.	Dilli distribution mains starting point near bridge of	over Gangval drain
114.	2 No. Kabadi (scrap) Shops	Temporary access
115.	Aiay Kirvana Store	Temporary access
116.	Jimmy Properties	Temporary access
117.	4 No. Kabadi (Scrap) Shops after jimmy Properties	Temporary access
118.	Om Shri Laxmi Medicate	Temporary access
119.	Pajotra Mobile Shop	Temporary access
120.	Jyoti Box Maker	Temporary access
121.	Sayana Ladies Tailors	Temporary access
122.	Om Electrical Opposite Temple	Temporary access
123.	Narinder Kumar's STD Shop	Temporary access
124.	Bengal Flower Accessories	Temporary access
125.	M/s Kunal Medicos	Temporary access
126.	Jyoti Building Materials	Temporary access
127.	Joinery Shop near Royal Apartment	Temporary access
128.	TR Provision Store near Royal Apartment	Temporary access
129.	Sunny Beauty Saloon near Royal Apartment	Temporary access
130.	Sunil Dry Cleaners	Temporary access
131.	M/s Gupta Departmental Store	Temporary access
132.	Ms Pradeep Traders	Temporary access
133.	Rronak Interiors	Temporary access

S. No	Affected person/property	Impact		
Fruit market, Narwal, rising main				
134.	Dhaba C/o Pritam Singh	Temporary Access		
135.	Sai Service Station	Temporary Access		
136.	Madina Tyre Shop(Tyre Repair	Temporary Access		
137.	Sanju Punjabi Dhaba C/o Transport Nagar	Temporary Access		
138.	Rakesh Kumar Temporary Vegetable Stall C/o Transport	Temporary Access		
139	M/s Rai Tyre Store Co. C/o Main Road Narwal	Temporary Access		
140	Sharma Medical Hall C/o Main Road Narwal	Temporary Access		
141	Raiu's Shop C/o Main Road Narwal	Temporary Access		
142.	Deepu's Auto-repair Shop, Main Road Narwal	Temporary Access		
143.	Halal Meat Shop C/o Main Road Narwal	Temporary Access		
144.	Sharma Tea Stall	Temporary Access		
145.	R K Photo Flash C/o Main Road Narwal	Temporary Access		
146.	Sharma Puniabi Tailor C/o Main Road Narwal	Temporary Access		
	Wazarat road, rising main			
147.	Allied Trading Corporation (Samsung)	Temporary Access		
148.	Rambir Watch Co.	Temporary Access		
149.	Mahavir Trading Co.	Temporary Access		
150.	Benson Engineering & Diesel Sets Pvt. Ltd.	Temporary Access		
	New Plot, rising main			
151.	Bhat Medical Store C/o Chunni Lal Bhat	Temporary Access		
152.	Shanti Garments	Temporary Access		
153.	Sharma General Store	Temporary Access		
154.	Krishna Building	Temporary Access		
155.	Satish Karyana Store	Temporary Access		
156.	Bhawani Studio	Temporary Access		
157.	Sharma Marble House	Temporary Access		
158.	Lakshmi Property Dealer	Temporary Access		
159.	Tailors Shop near Lakshmir Property Dealer	Temporary Access		
160.	Max Diagnostic Centre 2 nd Floor	Temporary Access		
161.	Leela's Studio	Temporary Access		
162.	Beauty Parlour near Leela's Studio	Temporary Access		
163.	Painters Shop	Temporary Access		
164.	Chnagotra Egg and Chicken Corner	Temporary Access		
165.	Subash Cheese Corner	Temporary Access		
166.	National Network	Temporary Access		
167.	Natraj Studio C/o Rajesh Sharma	Temporary Access		
168.	Prince Photocopy Shop	Temporary Access		
169.	Abrol Stationery House	Temporary Access		
170.	Fresh Juice Shop	Temporary Access		
171.	Madan Cloth House	Temporary Access		
172.	Sharma Provision Store	Temporary Access		
173.	Dheeraj Communications	Temporary Access		
174.	Gupta Sweet Shop	Temporary Access		
175.	Standard Quality (Dayal House) Stationery Shop	Temporary Access		
176.	A K Traders	Temporary Access		
177.	Jewellery Shop near AK Traders	Temporary Access		
178.	Decorative Items Shop near A K Traders	Temporary Access		
179.	Jandyal Sweet Shop	Temporary Access		
180.	Babu Iraders	Temporary Access		
181.	Shoodh Eye Centre	Temporary Access		
182.	Nidan Diagnostics	Temporary Access		
183.	Jewellery Shop	Temporary Access		
184.	Gupta Enterprises(Retrigerator Repairing Shop)	Temporary Access		
185.	Anand Stove Works	Temporary Access		
186.	Madan Steel Works	Temporary Access		
187.	Goodwill Spare & Service Centre (Car Washing)	Temporary Access		

S. No	Affected person/property	Impact
188.	Vikram Designer Shop	Temporary Access
189.	Vishal Bar & Restaurant	Temporary Access
190.	Verma Jewelers	Temporary Access
191.	Vivida Mobile Repairing Shop	Temporary Access
192.	Jain General Store	Temporary Access
193.	Parvati Textiles	Temporary Access
194.	Mattoo Dispensary	Temporary Access
195.	Malhotra Bartan Store	Temporary Access
196.	Guru Ravi Dass Workshop	Temporary Access
	Bikram Chowk, distribution main	
197.	Maruti Medical	Temporary Access
198.	Mahalaxmi Medical Store	Temporary Access
199.	Kesjav Chemicals	Temporary Access
200.	Dogra Watch Houase	Temporary Access
201.	Balgotra Vaishno Bhaba	Temporary Access
202.	Balgotra Bakery	Temporary Access
203.	Jandyal General Store	Temporary Access
204.	Gurmeet Bakers	Temporary Access
205.	Balgotra Fast Food	Temporary Access
206.	Balgotra Baishno Dhaba	Temporary Access
207.	Grocery Shop	Temporary Access
208.	Purshotam & Brothers Stationery Shop	Temporary Access
209.	Sharma Sweets	Temporary Access
210.	Stationery Shop near Sharma Sweets	Temporary Access
211.	STD Shop	Temporary Access
212.	Bansi Wine Shop	Temporary Access
213.	Shoe Shop	Temporary Access
214.	Saloon	Temporary Access
215.	Cigarette Shop	Temporary Access
216.	Dhaba near Durga Mandir	Temporary Access

List of Residences

S. No	Affected person/property	Impact
C	Channi Himmat distribution starting point near OHT/PDD Office, Channi	Himat Sector 1
1.	Residential House near PDD office	Temporary access.
2.	Residential House after nursing home	Temporary access
3.	Residential House near PNB ATM and Bank	Temporary access
4.	Residential House of D S Sharma, H No 11, Sector 6, Channi Himmat	Temporary access
5.	Residential House after Koshaliya Nursery	Temporary access.
6.	Residential House C/o Kapoor Villa	Temporary access
7.	House of Ravi Kher and Kunal Kher, Sec 8/1, Channi Himmat	Temporary access
8.	Serweshwar Niwas, House No 7, Sec 1, Channi Himmat	Temporary access
9.	Residential House after open plot	Temporary access
10.	Anand Kunj, 4/1 Channi Himmat	Temporary access
11.	Satchitananda C/o Gulathia's, 21/6 Channi Himmat	Temporary access
12.	House No 2/1 Channi Himmat	Temporary access
13.	House No 23 A, Sector 6	Temporary access
14.	Kuldeep Khudda (IPS), House No 1/A, Sector 1, Channi Himmat	Temporary access
15.	House no 52/5	Temporary access
16.	House no 53/5 C/o Malti Niwas	Temporary access
17.	House no 61/5 C/o Sarla Kutir	Temporary access
18.	House no 62/5	Temporary access
19.	House no 63/5	Temporary access.
20.	Residential House opposite Sardari Lal Dogra's Tea Stall	Temporary access
21.	Residential House No 78/5 C/o Dr Amit Gupta	Temporary access
22.	Residential House of Raj Kumar Arora	Temporary access
23.	Residential House near Sharma Sweet Shop	Temporary access
24.	House near Modern Sanitation	Temporary access

S. No	Affected person/property	Impact
25.	Dr. Romesh Khajuria, 145/3	Temporary access.
26.	House No 146/3 Channi HImmat Dream House	Temporary access
27.	4/458. Residential House	Temporary access
28.	Residential house opposite 4/458	Temporary access
29.	House no 459/4	Temporary access
30.	House Wani and Co.	Temporary access
31.	House no 529/4. Opposite Mahaian Departmental Store	Temporary access
32.	House no 157/3	Temporary access
33.	House no 158/3	Temporary access
34	House no 531/4	Temporary access
35	House no 162/3	Temporary access
36	House No 533/4	Temporary access
37	House opposite No 533/4	Temporary access
38	House no 535/4	Temporary access
	Residences from right and left side lanes in Sector 1 Channi H	immat
30	House Opposite House No 1 A /1	Temporary access
40	House No 275 /2	Temporary access
41	House of S Aiit Singh No 275/2	Temporary access
41.	Trivarutham House No 273/2	Temporary access
42.	House Opposite House no 273/2	Temporary access
40.	49/1 House of Dr. H.L. Goswami	Temporary access
45	55/1 House of Ashok Gunta (Ramni Niwas)	Temporary access
46	K C Bhagat House No 5, Sector 2, Channi Himmat	Temporary access
40.	House No 61/1	Temporary access
	House opposite House No 61/1	
	House No 62/1 Nainiwas C/o Er Gurudey	
50	House opposite House No 62/1 Nainiwas C/o Er. Gurudev	Temporary access
51	Samreet Singh House No 8/2 Channi Himmat	Temporary access
52	House No 64/1	Temporary access
53	House near House No 64/1	Temporary access
54	Nanda Niwas 66/1	Temporary access
55.	House, Opposite Nanda Niwas 66/1	Temporary access
56.	Sdhiana House No 362/1	Temporary access
57.	Richis Provisional Store, Opposite 362/1	Temporary access
58.	Gemini point, 17/2 Channi Himat	Temporary access
59.	House of Prof R L Sharma. House no 18/2	Temporary access
60.	House No 3. Sector 5. Ishar Niwas	Temporary access
61.	House No 4/5	Temporary access
62.	House No 7, Dr. Sudarshan Kumar Gupta	Temporary access
63.	Raj Niwas, House No 8/5	Temporary access
64.	House No 9/5	Temporary access
65.	Gupta House C/o Sudhir Gupta, House no 10/5	Temporary access
66.	Nirmala Kutir, 163/6	Temporary access
67.	House No 11/5	Temporary access
68.	Thakur House no 12/5	Temporary access
69.	House No 13/5	Temporary access
70.	House No 15/5, S K Sawnney	Temporary access
71.	House No 16/5, Satya Prabu Kutir	Temporary access
72.	Khajuriya Bhawan C/o Officers Mess CRPF	Temporary access
73.	House No 21/5	Temporary access
74.	House No 24/5	Temporary access
75.	Sulaikha Niwas	Temporary access
	Dilli distribution mains starting point near bridge over Gangyal	drain
76.	House No 500/7	Temporary access
77.	Sri Dham C/o Goels, Sector 7 Extension, near Peer Baba Mandir	Temporary access
78.	House near Goels House	Temporary access
79.	House, opposite 4 no. shops	Temporary access
80.	Residential House, near mobile shop	Temporary access

S. No	Affected person/property	Impact
81.	Residential House after Sayana Ladies Tailors	Temporary access
82.	House of Radha Swami Prem Nath, Adarsh Vihar	Temporary access
83.	House No 165	Temporary access
84.	House no 187/B	Temporary access
85.	2 Shops (closed)	Temporary access
86.	House no 185/AB	Temporary access
87.	Jandiyal Niwas, House no 183, Adarsh Vihar	Temporary access
88.	Residential House near Rronak Interiors	Temporary access
	Wazarat road, rising main	
89.	House of J C Kohli C/o Wazarat Road	Temporary Access
90.	Siddharta Showroom Farments, Wazarat Road	Temporary Access
91.	Residential House near Siddharta Showroom	Temporary Access
92.	House No WW 3200 of Sh Harpal Singh C/o Tehsil Road Jammu (3m	Temporary Access
	Wide Gate)	
93.	House, near House No 3200	Temporary Access
94.	Ministers Residence	Temporary Access
95.	Government Quarters	Temporary Access
96.	Chief Secretary Residence	Temporary Access
	New Plot, rising main	
97.	Residential House near PHE Complex	Temporary Access
98.	House of Dr. Madam Gandotra	Temporary Access
99.	House of Aushotosh Khajuria	Temporary Access
100.	Vishesh Gupta, House No 20, New Plot	Temporary Access
101.	M L Gupta, House no 28	Temporary Access
102.	Sh. Suresh Mahajan, House no 38 E, New Plot	Temporary Access
103.	Dev Raj, House no 38 D, New Plot	Temporary Access
104.	House of Varun Singh	Temporary Access
105.	Residential House near Madan Cloth House	Temporary Access
106.	Residential House near Jandyal Sweets Shop	Temporary Access
107.	Residential House near Nidan Diagnostics	Temporary Access
108.	Residential House near Nidan Diagnostics	Temporary Access
109.	Residential House near car accessories shop	Temporary Access
110.	Residential House near Gupta Enterprises	Temporary Access
111.	Residential House near Madan Steel Works	Temporary Access
112.	Residential House near Madan Steel Works	Temporary Access
113.	House No 155, Prem Nagar	Temporary access
114.	House near Vishal Bar and Restaurant	Temporary access
115.	Residential House no 404	Temporary access
116.	Residential House near Verma Jewelers	Temporary access
117.	Residential House near Missionaries of Charity Church	Temporary access

List of institutions, religious places, offices, etc.

C	Channi Himmat distribution starting point near OHT/PDD Office	ce, Channi Himmat, Sector 1
S. No	Property	Impact
1.	PNB ATM and Bank	Temporary access
2.	Temple near Transformer	Temporary access.
	Properties in right and left side lanes in Sector 1.	, Channi Himmat
3.	Playway Nursery School	Temporary access
4.	Buds Playing School	Temporary access
	Main Road Channi Himmat parallel to railway line, lo	eft and right sides
5.	Bank inside TNT Complex	Temporary access
6.	Banquet Hall near Habib Saloon	Temporary access
7.	Temple on main Road Channi Himmat	Temporary access
	Dilli distribution mains starting point near bridge o	ver Gangyal drain
8.	Government Girls Middle School Dilli	Temporary access
9.	Sri Radha Krishna Mandir, Dilli	Temporary access
10.	Vivekananda Modern School Dilli	Temporary access
11.	Jodhamal Public School	Temporary access

12.	Temple Shiv Mandir near Bye pass	Temporary access				
	Fruit market Narwal					
13.	Madr-e-Meherbaan Institute of Health Sciences	Temporary Access				
14.	Shri Prachin Hunuman Mandir, Transport Nagar	Temporary Access(Construction to be				
		avoided on Tuesday due to weekly				
		gathering)				
15.	UCO Bank C/o main Road Narwal	Temporary Access				
16.	Postal Stores Depot Jammu C/o main Road Narwal	Temporary Access				
	Wazarat road, rising main					
17.	Gujjar Bakkarwal Hostel					
18.	St. Pauls Church C/o Wazarat Road	Temporary Access				
19.	Paid Parking for 2 wheelers(Near D C office Crossing)	Temporary Access(Construction at				
		spot to be carried on Sunday)				
	New Plot, rising main					
20.	PHE Complex, New Plot	Temporary Access				
21.	Srinath Bhagat Satsang Ashram	Temporary Access				
22.	Secular Party of India Office near Bhawani Studio	Temporary Access				
23.	Khadi Gram Udyog Sewa Santhan Office	Temporary Access				
24.	Ashok Institute of Elementary Teacher Training	Temporary Access				
25.	Little Champs Play School	Temporary Access				
26.	Swami Pauls Meditation Home	Temporary Access				
27.	Missionaries of Charity Church	Temporary Access				
	Bikram Chowk, distribution main					
28.	Temple opposite Kala Kendra	Temporary Access				

Summary:

- 1. The various issues related to proposed subproject have been discussed at various locations throughout the subproject corridor.
- 2. Some of the local people are aware about the upcoming work. Most of the people are in favour of the upcoming subproject.
- 3. The quality and quantity of the water supplied at present is not adequate.
- 4. The water supply lines have degraded which requires immediate replacement. It is also resulting in leakages and water losses.
- 5. Due to worn out pipelines, leaking is a persistent problem which results in contamination of water and loss of pressure at the user end.
- 6. Relatively higher areas don't get regular water supply and they face scarcity of water especially in summers.
- 7. There is acute shortage of water supply in the newly established settlements.
- 8. All the areas don't get water supply at par with each other.
- 9. New settlements, mostly in the peripheries of the city, lack proper water production and water storage infrastructure.
- 10. In some areas people have to rely on supply of potable water through tankers (both government and private).
- 11. Machinery of most of the existing pumping stations and tube wells has outlived which reduces their efficiency and production.
- 12. Improvement in the water supply scenario will solve the issues and problems related to the unsatisfactory quantity and quality of water supplied.
- 13. The people hoped that adequate provisions will be made for satisfactory and standardized filtration and purification of the water which will be supplied in future.
- 14. The improvement in the water supply will provide safety to the people as they will be not at the risk of water borne diseases.
- 15. Replacement of worn out pipelines will address the problems of water losses and contamination.

- 16. Areas on higher elevation and new settlements will get highly benefited with the proposed subproject.
- 17. The replacement of the worm out machinery in the existing pumping stations and tube wells will increase their efficiency and production
- 18. Proposed infrastructure will ensure overall health and hygiene of the people in the subproject area.
- 19. Public desired for implementation of better measures to reduce noise, dust and air pollution during the construction phase.
- 20. Provision of temporary access, during construction, to properties affected should be provided.
- 21. People also wished that local people especially skilled and unskilled people be given opportunities during the project tenure in different construction activities.
- 22. People expected that their all problems shall be addressed and solutions for them shall be implemented during the subproject execution.
- 23. People are ready to extend all types of support during execution of the subproject.
- 24. People suggested that adequate safety measures should be in place during the execution of civil works.
- 25. ERA reiterated its commitment that the requisite environmental management measures shall be incorporated in EMP and public consultation shall be a regular process during all stages of the subproject to solve any issues arising out of the proposed works.

Signature sheets of the people consulted during consultation are as under:

LIST OF PARTICIPANTS IN PUBLIC CONSULTATION Ale SUBPROJECT NAME: allon of LOCATION OF MEETING/CONS TION: FruitM beatrous. Rod. Difform DATE AND TIME: 08.06.2011 Signature Occupation Name and Address SI. No NV 1 10 6 an 2 खारीद 3 N 240721 4 Reliet 5 6 7 DEEPAI Worker Deepo 8 Stall Worker Tea Sharma chand 9 R.K. photo grapher Ratesh 10 Tailor Tails JAD Jagdesh chen

SI. No	Name and Address	Occupation .	Signature
11	Benson Engineering E Diesel Genselfig To Vikyou Kohli	Shopf Frenkry	(bly
12	Show tol Niwas Ceener Kehlppd.	Resident-	Jur -
13	S. harpal singh H.NO. W. J. 200 Tehvil Road; Jammu	Resident	Japeron
14	Vijay Singh	Enspects pHED, Newplot	Spilling
15	Regarpal the schand	Scrivia Man PHE New plat	Rasad
16	Robit Shorma	WELKER, PHED New plat	ferrit
17	Bhanes pratap singh	Super viser, PHED New plat	Super
18	S.C. Dhan Abhitosh Khagunia	shop owner	Ash
19	chunilal Bhutt	Medical Shop owner	front
20 /	A Cropal Skanna C/a shrind Bhagwett satisang	for choras	Cut

LIST OF PARTICIPANTS IN PUBLIC CONSULTATION SUBPROJECT NAME: John Litation of Dater Softing System in Jangery-LOCATION OF MEETING/CONSULTATION: NEW PLOT after Road Crossing DATE AND TIME: 09.06.2011

SI. No	Name and Address	Occupation	Signature
1	K.R. MANGOTRA	REZ- Gove Service	Burgt Q
2	Basanti C/o shanti Crosments-	house wite	Sarah
3	Knithen Kunnar story Alashina Clo charma General stores	Ship owner	Kalsha
4	Vipan land Clo Bhasan Stutic, Kristia	Puto gath	AB
5	SukhDer Kumar 4/0 Bambe Kirana glores knig	OWNER	Ju
6	Churin shah Gupta suBarh C/o subarh cheere comer, Now plat	OWNER	S
7 .	· C/o Natraj gludito, New plat	OWNER	heri
8	Razinesh c/o presh juice comer	OWNER	Robe
9	Madan gupta Clo Madan cloth house	OWNER 7	and mo
10	Romest Sharma C/o sharma provision days	OWNER	Kshar

SI.	Name and Address	Occupation	Signature
11	Subhash chander	OWNER	Subor
12	Sahil gupta C/o Fandhush sweet shot	worker	Sehl G
13	BABBU (surinder singh) Vo BABBU TRADER.	OWNER	Sunter
14	Rajeth Clo chemithe Druggist 1-	OWNER	biest
15	AKASH Linthra	OWNER (- Juz
16	Group Sanjay Crupta 40 Crupta Finter prises	OWNER	E.J
17	Partop Single 40 Anond Store working	OWNER .	Ros
18	Madan a SC(0 Madan steel works	OWNER	Rober
19	& Cropal Kishan 40 Goodwill Maruti Scrypices	Manager	Copal Udis
20	chaman lal co/o Jai general stars	OWNER	A

LIST OF PARTICIPANTS IN PUBLIC CONSULTATION

SUBPROJECT NAME: Rehabilitation of Dater Suffly System in Jam Cit LOCATION OF MEETING/CONSULTATION: Bantalab, Jurgapagar DATE AND TIME: 10.06.2011 (Various locations).

SI.	Name and Address	Occupation	Signature
1	Mahendra fingh. K. N. Nergan ; Butalete.	hout some	24
2	Kanwal Krishan C/O C.S. Communication	Owner.	Kthatter
3	Subhash chander Resident	RED CPWD	Estare area is
4	Tej kighen Resident	Business	Tei Korg
5	Crindhari Lal Resident	Crayt Service	Se
6	shan lad Bhuitt Resident	house wife	A Bastral
7	surender Pcl cbast : shop owner.	Shop o weener.	13ml
8	Ashoh Kumar Resident	Shop owner Tailor	Sto HKL and
9	han lavel gupton	shop owner	Off
10	Rovi Kumon Resident	shop owner	Rell

SI.	Name and Address	Occupation	Signature
1	sham la Salhotra	Shopowner	Shurel
12	shabti Singhi Resident	Shopowner	hom
13	sund kumar	Shop owner	Sunil 5
14	Mohinder Singh Resident	Shop owner	Horder
15	Jai Parkesh malthetra	Shopoware	- Jailarka
16	S.K. Khajuria Resident	shop owner	W
17	Mr. Kuldip Singh Resident	shopowner	- store
18	Mr. Mohan Singhi president	Shop owner	- Dawn
19	Ma Robit Sharma	Shop owner	P
20	Mr. Kalan	5/spowens	- २७ी०

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LIST OF PARTICIPANTS IN PUBLIC CONSULTATION

SUBPROJECT NAME: Philipilition of water supply system LOCATION OF MEETING/CONSULTATION: Shabtinggar; Ray pu DATE AND TIME: [][[][][]]

SI.	Name and Address	Occupation	Signature
10	Balji Resident F23/1	Ret Persona	Left ?
2	Autore No3.	Accountant	AN
3	Houskay 377 Love No3	Reta Persona	1. OF
4	Porveen Kuman 281 Lone N.3	Driver '	Paston
5	Rolpt Kumor Sharma 379 B Lore No 3	Private engloyed	Horris
6	Sect singh Resident	Stop owner	i Tret
7	Ind Bridge connal 20ad	Rice rull.	Mark
8	Park sayal resident	s.o held. Education	rept R
9	Vijay Kumar Resident H.No Sob	Tent House	482
10	RobertKiemae	Book shop	per:

SL. No	Name and Address	Occupation	Signature
11	vichos Pogra Asidet	anstore .	stors
12	Munshi hami Resident GMC-136	shop owner	Joahan
3	Dalip Kamae Resident	Richsbaue	geelu
14	Bansi la Resident	Tea stall owner	वन्द्रभी
15	Aman Kumar	employee secretarite.	Ima
16	Babu ram Resident of rajpura.	Ret ainy offical	Dung
17	Bishan lal Resident grajpun	shopowner	0.07
18	Komleh gupta Resident subash nogar	Housewije	Office
19	M.L. Roma Resident	hetd Enge	Jest
20	Togender Singh Jamwed	Notarcy	Fingh

LIST OF PARTICIPANTS IN PUBLIC CONSULTATION SUBPROJECT NAME: Rich chilitation of water supply system in 5 a minuterity LOCATION OF MEETING/CONSULTATION: Vario is Points of subosh nogar DATE AND TIME: 12/06/2011

SI. No	Name and Address	Occupation	Signature
1	Rovi Kumar	shop owner "	Jour 1
2	RIL Bhat	Chevist shop owner	
3	vished Sammaad	shop our nee	On
4	Decidae Singh	Richshare priver	D'és
5	AJay manuati	Вияпеотан	N
5	Amarneth	Shopowner	Drite.
7 .	Ponan Gupta Resident	Houseweije	(Just)
8	Ramesh Kumar Resident	shop owner	Blus
9			
10			

NOCs for Over Head Tanks (OHTs) and Tube Wells

Office of the Superintending Engineer PHE Mech. Urban Circle Jammu.

The Project Manager (U) JKUSDIP, J&K ERA Jammu.

No: SEMU/Ts-320/4/7148-51 dated: 24-11-10

Sub:- NOC for drilling of tube well at land site at Nai Basti.

Ref:- i) This office letter No:- SEMU/Ts-320II/5578-82 dated:-05-10-10.

ii) Letter No: JMC/RB/2317-19 dated:-12-10-2010 from Jammu Municipal Corporation. Sir,

This office is in receipt of NOC from JMC regarding drilling of tube well at land site at Nai-Basti, Jammu vide letter as referred above at S.No. (ii), a copy of which is enclosed for your record and reference.

The NOC of the said land site is conveyed as per the site plan enclosed and subject to the conditions laid therein.

Yours faithfully,

Encl:- NOC/Site plan - 2 Lvs.

uperintending Engineer HE Mech. Urban Circle Jammu.

Copy to the :-

1. Chief Engineer PHE Department Jammu

2. Executive Engineer PHE City Division No Jammu for information and necessary action.

3. Asstt. Commissioner (Rev), Municipal Corporation, Jammu for information.

Office of the Superintending Engineer Frie meen.

Janunu.

The Chief Engineer

PHE Department Jammu.

No: SEMU/TS-320 (T-2) 4813-15

dated; 04/09/2010

Sub:- NOC in favour of Land for 20 Nos. Tube wells & 20 Nos. OHTs.

Ret:- ERA letter vide No:- PM/JKUSDIP/ERA/J/3233-34 dated:-04-09-2010.

Sir.

As discussed, it is to intimate that 6 Nos. of tube wells and 9 Nos. of OHTs are to be constructed by ERA on the land sites owned by PHE Department. The Department has no objection for construction of same. The detail of the sites are as under:-

Tube wells.

| CPS Narwal (East)

2. Ambica Colony (East)

3. CPS Bakshi Nagar (West)

DEHE Complex Sarwal Khad (West) in leiu of ITI Akhnoor road

5. CPS Channi Himmat (East) in leiu of Dilli

6, Baadhu Rakh (East) in leiu of Greater Kailash

OHTS

1. Greater Kailash (East)

2 Dilli (East)

J. Deshmesh Nagar (East)

4. Gandhi Nagar Block -- A (East)

5. New Basti (East)

6. CPS Bantalab . (West)

7. Illrd Stage Janipur (West)

PHE Station Sector -7 Channi Himmat (East)in leiu of Sector -3 Channi Himmat
 PHE Complex Sarwal Khad (West) in leiu of Shanti Nagar Tophsherkhania

It is to intimate that for 8 Nos. of Tube wells and 7 Nos. of OHTs, site clearances/NOC has been forwarded directly to ERA as informed by ERA officials.

The remaining 6 Nos. of Tube wells and 4 Nos. of OHTs are to be constructed over the land owned by JDA / Govt, land for which matter already stands discussed with concerned Departments and handing over of land is under process and stat be intimated at the earliest.

Yours faithfully,

Superintending Engineer PHE-Mech. Urban Circle Jammu.

Copy to thei-

Project Manager, JKUSDIP, ERA Jammu for information.

Executive Engineer PHE City Division No-I/II Jammu for information and necessary action.
Office of the Vice Chairman, Jammu Development Authority, Vikas Bhawan Rail Head Complex, Jammu.

To,

The Superintending Engineer, PHE Mech. Urban Circle, Jammu.

No. CTP/JDA/ 'Sol - 06.

dated:- 5/10/2010

Sub: No Objection Certificate for drilling of Tube Well and Construction of OHTs at JDA land.

Your letter No. SEMU/TS-320-II/5239-43 dated 24-09-2010. Ref;

Sir,

Kindly refer your letter on the subject cited above, I am to convey that JDA has No objection for drilling of Tube Well & construction of OHTs at the following sites;

1) Rajinuer Nagar phase-I (park)

2) EWS colony Roop Nagar sector-1 (park)

'The location of these sites is marked on the plan is enclosed. ,

Yours faithfully,

Encl: (2) lvs.

1

Chief Town Planner Jammu Development Authority Jammu.

Copy to the:

1)	Vice Chairman, JDA Jammu for information please.
2)	Chief Engineer, PHE Department Jammu.
3)	Director Central JKUSDIP, ERA J&K Jammu.
4)	Project Manager JKUSDIP, ERA Jammu.
5)	Superintending Engineer, JDA Jammu .



GOVERNMENT OF JÁMMU AND KASHMIR/ Ph:-2476523 DIRECTORATE OF HORTICULTURE PLANNING & MARKETING (DIRCETOR AGRICULTURE MARKETING, APMC) CAMP JAMMU

NO: -DHPM/CJ/2010/505-11 Dated: - 07.08.2010

The Director ERA Jammu

Subject:- No Objection Certificate of land for construction of 1 No.Tube Well & 1 No.OHT at Fruit Market Jammu.

Ref:- Project Manager (JKUSDIP) ERA No.PM/JKUSDIP/ERA/J/3043-45, dt 02.08.2010

Sir,

In reference to above mentioned letter of Project Manager ERA regarding no objection certificate from our department for providing land in the premises of Fruit &Vegetable Market Narwal for construction of 1 No. Tube well & 1 No. Over Head Tank.

In this connection the approval of department to the above job is conveyed. You are requested to direct the concerned officers to take an early action as there is scarcity of drinking water in the busy F&V Market Narwal Jammu

ours Faithfull (M.S.Qasba) Director Horticulture (P&M) J&K Govt.

No: (MFJKUSOIP) ERATOJ 3091

Copy to the:-

1. Chief Engineer P.H.E Department Jammu for information.

- Project Manager (JKUSDIP) ERA for inf. & necessary action.
 - 3. Chief Executive Officer APMC Narwal Mandi Jammu.
 - 4. Ex. Engineer Horticulture (P&M) for information.

ો જ અન્ય ંગવાં છે. આ દેવ

5. Ex. Engineer PHE Division Gandhi Nagar Jammu for information.

6. DPM (W/S) for information & necessary action.

M. No. 9419212193. OFFICE OF THE PRABANDHAK COMMITTEE BAWA KAILAKH NA THATHAR - RAIPUR Dated 18-12-09. Ref. No. the Executive Engineer. P.H.E City Dirinton Ist. Jamma: -54611 Consent for providing land for construction of Cred Head Tank. Sis, FACE OF THE As per the division Laker de the Presandthe consider . Keeping is view the Seaseity of water is the Astron premisses we have decicked to Provide land approxitatelly of 10 Marlos for construction of over head Task which Shall be constructed by The DHE Dept We hope on behave of your govel self that besides providing water supply I the conversion. - weality our permisses sequire mut will be full filled . Thanking you. partially syon's smeetly die Philandhak lomonitee Bana kowlakh night Rathas Raipus. apprechanced Find Minne

Sainik Co-op. House Building Society Ltd. Jammu. (Registered under Co-op. Societies Act XXVIII of 1960) and No. Non-Agri/Housing/Jmu-51 dt 21 Dec. 1970) P. O. SAINIK COLONY, JAMMU. Apr. 2011 Dated/ Ref. No. SCHES/ 44 fo, CE Project Manager(JKUSDIP) (PHa) J&K Economic Reconstruction Agency Urban Circle Jammu 38 A/B Gandhinagar Jammu SUBJECT : A CENECTION CERTIFICATE OF LAND FOR DIGJING TOBE WELL AND UHT IN SAINIA COLONY JAMMU Sir, It is hereby intimated that the society will have 1 . no objection, if your Deptt constructs the tube wells and CHT in Sainik colony as under :-PN/JSKUSDIP/EPA/D/4620 20 (a) Tube well (Defunct) in Sector '?' in Park No FF-2 (b) Tube well in Sector 'G' near cause way dividing A, B, C & D, E, F, G Sectors on Bundh/Shud. (c) CHr in Park No DP-1 in Sector 'D'. Yours faithfully. an wal Lt Col(ketd) Secretary DowCryc Copy to 1-Exective Engineer (PHE) City Division II Jammu

Office of the Superinten	iding Engi Jamn	neer Pl m.	HE Mech, Urba	n Circle
The Project Manager JKUSDIP, J&K ERA Jammu.				4 N
No: SEMU/Ts-320/23438		dated;-	24-09-2018	
Sub:- NOC in favour of land for 20	No. T/wells.	41		
Ref This office letter No:SEMU/Ts-2	320(1-2)/461	3-16 dat	(ed:-04-09-2010.	
 Sir. In continuation to our letter ref addition to already provided for drillin 	erred above, g of T/wells	please fi	ind herewith mentio	med below sites in
 Y. PHE Complex New Plot in lie has already commenced by ER 2. Janipur Stage –III Paloura PHE 3. Church at Wazarat Road near O 4. D/C Block, PHE Land, 5. Rakh Bahu, PHE Land 6. Malik Market inside Idd Gah. (a) 7. Bathindi PHE Complex, (b) - 8. Panama Chowk, PHE Complex, (c) - 8. Panama Chowk, PHE Complex, (c) - 8. Batala, Bathindi (d) Channi Kamala PHE land. 	eu of EWS s A (Trench-I) Complex. Chief Ministe	er Reside	Roop Nagar in wh	ich T/well drilling
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			: Yours fai	thfully,
1856 . All selve			PHE Mech Jan	ding Engineer , Urban Circle amu.
i copy to mili				
 Director (Central) JKUSDIP, ERA J Chief Engineer PHE Department Jan Executive Engineer PHE City Divisi letter No:2613 dated:-24-09-2010. Executive Engineer PHE City Divisi letter No:PHEC/II/2032, 33 datach 2 	ammu for in nmu for info on No-I Jan sion No-II J.	formatio semation imu for i ammu fo	on please. please. nformation. This is or information. This	in reference to his is reference to his
uned2	10002010.			

1-8 -11V-15 Affidavit K 238884 We the following persons of Ward No. 60/ Village Paloura Committee do hereby solemnly affirm & declare as under:-1. That we have no objection for construction of Tube wells at Plorka Near Raina Hr. Sec. School Paloura and Near Baba Sidh Goria by ERA Authorities. ä 2. That we have no objection for construction of O.H.T's Near Shishu Smadhia near Paloura Pond and 2nd near stage: 3 Moh. Gujjar Paloura by ERA Authorities. 3. We further affirm & declare that assortions made are true to the best of my knowledge and belief and nothing has been concealed or suppressed. DEPONENT 1. 54 1/2 Stylah Sh Naven anth Rel Gerade 6. So lot 2 ampail Swall ANHAS \$10 Ld. SA montex Markes E

RE ID. नम्मवका%मोर 30 U नानजुडाशल M 697056 6 AFFIDAVIT I, Pawan Singh S/O Late Sh. Khushal Singh R/O Paloura -173 Tch. & Distt. Jammu do hereby solemnly affirm and declare 5500 1523 33 s under: -That the deponent is the exclusive owner in possession of land measuring 3(THALS) KANALS 10(THA) MARLAS bearing Khasma No. 747 situated at Faloura, Teh. & Distt. Jammu. That PHE Deptt. has approached the deponent for 2. construction of Tube Well for to provide drinking water facilities to the inhabitants of the area. That the aforementioned deptt. needs/requires land 3. to the extent of Two Marlas for construction of Tube Well Men Brehingquet when Palound That the deponent has agreed to give Two Marlas of 4. land bearing Eh.No. 747 situated at falours for the construction of Tube well. Further the deponent will have no objection if the Tube Well is constructed 12:5 and deponent will not claim any compensation from the department. NLUT ŧ. Verification: -Verified at Jamma on this 15th day of april 2010 that the averments made above are trubend correct to the best of my knowledge. & belief. E For . ONLYT

APPENDIX-4

MOUs for Over Head Tanks (OHTs) and Tube Wells



6. That the Second Party shall install Tube Well and construct. Pump Room, and take all possible precautions to avoid damage to land and assets adjacent to the proposed area of work. The second party shall not have the right to use the roof of the Pump Room so constructed.

7. That both the Parties hereto agree that the installed Tube well and the Pump Room so constructed/developed shall be for public benefit only.

That both the Parties hereto agree that the structure to be crected would be in harmony of the surrounding buildings.

9. That the Second Party agrees that the operation of the plant and machinery will not cause disturbance to the occupants of the adjoining buildings and the noise level will be kept within permissible limits and for any public nuisance due to noise or otherwise the second party will be solely responsible.

10. That the Second Party agrees that at the request of the First Party, the operation of the plant and machinery would be temporarily suspended during meetings/programmes etc. with two days prior notice from First Party.

 That the Second Party agrees that provisions would be made in DPR (Detailed Project Report) to provide Direct benefit (Provision of water supply/tap free of cost, etc.) to the First Party.

 That in case the project is closed the land shall be restored to the owner i.e. First Party in its original position.

13. That in case of violation of any clause of this agreement by the Second Party the Party No. 1 will have the right to take the vacant possession of the land from the Second Party.

14. That the provisions of the MEMORANDUM OF UNDERSTANDING will come into force and effect from the date of signing of this deed.

15. IN WITNESS WHEREOF the Parties hereto have signed this deed on the day and the year first above written.

Sr. No.	Description of land owned	Description of land permitted for installation of Tube Well and construction of Pump Room. 10x10 Feet i.e. 100 Square Feet (9.29 Square Meters) which is approximately .051 % of the total land is granted for the purpose. The portion of the Land is open and used for religious and community functions.	
\$,	The Land is used as a Church Campus of ST. Paul's Church (Diocese of Amritsetr, CNI). Total quantum of land under their ownership in the said location is approximately 35 Kanal 14 Marta (18080 Square Meters).		

Signature of the First Party Signature of the Second party Solan Cal REV. SOHAN LAL Presbyler in Charge Economic Reconstruction Agency St Paul's Church (C N.J. Janua/Seagar Residency Road, wifeesses: 180.001 (J&K) Wide Shumpon ERA Vine a Secretary St. Paul's Church (C.N.I + Jammu.

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	P 020776
MEMORANDUM OF UNDERST	ANDING (MOU) B 020375
This memorandum of understanding is made on	25HK day of MAY 2011
between COMMITTEE JAMIA MASJID, Malik Mark	ket, Channi Rama, Bypass, Jammu
Economic Reconstruction Agency(JSK ERA), thro	ugh Mr. Khalid Muzaffar, Director
Central (here in after referred to as "the Second Part Water Single Sectors of January Child Science Part	y") for Sub Project 'Rehabilitation of
Kashmir Urban Sector Development Investment Pros	gramme(JKUSDIP) -Tranche II.
THESE ORESENT INTINGS AS FOLLOWS	
THESE PRESENT WITNESS AS FOLLOW:	
1. That the First Party is the landowners with trans	ferable right of the 5 Marla (128.50
Settement as 254 and 190)	as listed below in Ward No.
E 49 of Jammu Municipal Corporation, tehal Jan	mnu_district_Jammu
2. That the First Party has taken part in the consul	tative process conducted under the
Development Bank Assisted Jammus Kashmir Urb	an Sector Development Investment
Program (JKUSDIP) -Tranche II) and has unders	tood the benefits of obtaining the
Improvement of water supply System of Jammu City.	
3. That the First Party hereby grants to the Second	I Party, out of their free will, above
said land as detailed in the list below for the installat Pump Room and sump tank, and development of	ion of Tube Well and construction of the Behabilitation of water supply
system in Jammu City, for the benefit of the people a	nd the public at large.
4. That the First Pady would not claim any competi-	sation against the above said grant
of land.	and the second second second second
5. That the Second Party access to accept the ab	ove grant of land for the numbers
Intentioned in Clause 3.	
# 6. That the Second Party shall install Tube Well and	d construct. Pump Room and sump
tank and take all possible precautions to avoid dan	rage to land and assets adjacent to
g the proposed area of work.	
7. That both the Parties hereto agree that the installe	d Tube well and the Pump Room so
 constructed/developed shall be public premises. 	
11 (Sec)	

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これのこれ 20.00 **MINES** WENT रम्य व कांश्ववीर । HE नान जडांशल MEMORANDUM OF UNDERSTANDING (MOU) B 020543 This memorandum of understanding is made on <u>26-M</u> day of <u>MAY</u> 2011 between Panch Mandir Committee, Green Belt Park, Channi Himmat Housing Colony, Sector - 2, on the one part (hereinafter referred to as "the First Party"), and Jammu and Kashmir Economic Reconstruction Agency(J&K ERA), through Mr. Khalid Muzaffar, Director Central (here in after referred to as "the Second Party")for Sub Project. "Rehabilitation of Water Supply System at Jammu City", Asian Development Bank Assisted Jammu & Kashmir Urban Sector Development Investment. Programme(JKUSDIP) -Tranche II. THESE PRESENT WITNESS AS FOLLOW: 1. That the First Party is the landowners with transferable right of the 2 Marta (50.60 Square Meters) of land which is part of 4 Kanals (2024 Square Meters) allotted to Panch Mandir Committee vide Government Order No: 168 - HUD of 2000. Dated 19-07-2000 in Ward No. 50 of Jammu Municipal Corporation. , district Jammu ummail, liame 3 2. That the First Party has taken part in the consultative process conducted under the requirements of the Rehabilitation of water supply system in Jammu City (Asian Development Bank Assisted Jammu & Kashmir Urban Sector Development Investment Programme (JKUSDIP) -Tranche II) and has understood the benefits of obtaining the improvement of water supply System of Jammu City. 3. That the First Party hereby grants to the Second Party, out of their fee will, above said land as detailed in the list below for the installation of Tube Well and construction of Pump Room, and development of the Rehabilitation of water supply system in Jammu City, for the benefit of the people and the public at large. t 4. That the First Party would not claim any compensation against the above said grant of land. 5. That the Second Party agrees to accept the above grant of land for the purposes mentioned in Clause 3. 6. That the Second Party shall install Tube Well and construct. Pump Room, and take all possible precautions to avoid damage to land and assets adjacent to the proposed area of work. 7. That both the Parties hereto agree that the installed Tube well and the Pump Room so constructed/developed shall be public premises. Portek Month Committees Charatt Human J AM 511 Nuseer

8. That both the Parties hereto agree that the structure to be erected would be in harmony of the surrounding buildings.

 That the First Party hereto agrees to provide access to the Second Party to land during construction and during Operation and Maintenance of building and plant and machinery.

10. That the Second Party agrees that the operation of the plant and machinery will not cause disturbance to the occupants of the adjoining buildings and the noise level will be kept within permission limits.

11. That the Second Party agrees that at the request of the First Party, the operation of the plant and machinery would be temporarily suspended during meetings/ congregation, etc. Such suspensions shall be however limited to a maximum of 3 hours in a week with two days prior notice from First Party.

 That the Second Party agrees that provisions would be made in DPR (Detailed Project Report) to provide Direct benefit (Provision of water supplyitep free of cost, etc.) to the First Party.

 That the provisions of the MEMORANDUM OF UNDERSTANDING will come into force and effect from the date of signing of this deed.

14. IN WITNESS WHEREOF the Parties hereto have signed this deed on the day and the year first above written.

SI.No	Description of land Owned	Description of land Granted for installation of Tube Well and construction of Pump Room.
1	The Land is used as a temple compus of Panch Mandir Committee in Green Belt Park, Channi Himmat Housing Colony, Sector - 2. Total quantum of land under their ownership in the said location is 4 Kanal (2024 Square Meters).	2 Mada (50.80 Square Meters) Le. 2.5 % of the land granted for the purpose. The portion of the Land is open and not used for any productive purposes.

Signature	of the First Party	Signature of the	Second party
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	MEMORANDUM OF UNDERSTANDING (MOU) B 020378
8	This memorandum of understanding is made on <u>24-8</u> day of <u>May</u> 2011 between BAWA KAILAGH NATH J, Prabanchak Committee Asthan, Thatter-Raipur, Jammu on the one part (hereinsfter referred to as 'the First Party'), and Jammu and Kashmir Economic Reconstruction Agency(J&K ERA), through Mr, Khalid Muzatter, Diructor Central (here in after referred to as 'the Second Party')for Sub Project Rehabilitation of Water Supply System at Jammu City', Asian Development Bank Assisted Jammu & Kashmir Urban Sector Development Investment Programme(JKUSDIP) -Tranche II.
1	THESE PRESENT WITNESS AS FOLLOW:
	I. That the First Party is the landowners with transferable right of the <u>10 Maria (253</u> Square Meters) of land bearing Khasra No. <u>290</u> as listed below n tehsil <u>Jammu</u> district <u>Jammu</u>
	2. That the First Party has taken part in the consultative process conducted under the equirements of the Rehabilitation of water supply system in Jammu City (Asian Development Bank Assisted Jammu & Kashmir Urban Sector Development Investment Programme (JKUSDIP) -Tranche II) and has understood the benefits of obtaining the mprovement of water supply System of Jammu City.
3	That the First Party hereby grants to the Second Party, out of their free will, above aid land as detailed in the list below for the construction of a Over Head Tank, for Rehabilitation of water supply system in Jammu City, for the benefit of the people and the public at large.
	 That the First Party would not claim any compensation against the above said grant fland.
5	. That the Second Party agrees to accept the above grant of land for the purposes rentioned in Clause 3.
1 p	That the Second Party shall construct 1 Over Head Tank, and take all possible recautions to avoid damage to land and assets adjacent to the proposed area of work.
1 7. s	. That both the Parties hereto agree that the Over Head Tank so constructed/developed hall be public pramises.
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8. That both the Parties hereto agree that the structure to be erected would be in harmony of the surrounding buildings. 9. That the First Party hereto agrees to provide access to the Second Party to land during construction and during Operation and Maintenance of the Over Head Tank and machinery. 10. That the Second Party agrees that the operation of the Over Head Tank will not cause disturbance to the occupants of the adjoining buildings and the noise level will be kept within permission limits. 11. That the Second Party agrees that at the request of the First Party, the operation of the Over Head Tank and machinery would be temporarily suspended during meetings/ congregation, etc. Such suspensions shall be however limited to a maximum of 3 hours in a week with two days prior notice from First Party. 12. That the Second Party agrees that provisions would be made in DPR (Detailed Project Report) to provide Direct benefit (Provision of water supply/tap free of cost, etc.) to the First Party. 13. That the provisions of the MEMORANDUM OF UNDERSTANDING will come into force and effect from the date of signing of this deed. 14 IN WITNESS WHEREOF the Parties hereto have signed this deed on the day and the year first above written. Description of land Granted for SI.No Description of land Owned construction of Over Head Tank. The Land is used as a temple campus of 10 Maria (253 Square Meters) Le. 1 Bawa Kailakh Nath Ji, Prabandhak approximately 34 % of the total Committee Asthan. Total quantum of land is granted for the purpose. land under their ownership in the said The portion of the Land is open location is approximately 146 Kanal and not used for any productive (73800 Square Meters). purposes. Signature of the Second party Signature of the First Party 24 ALLANS Ditertan Optical Recent Record Agence nine Bet DOUBLE LONG San Talab Witnesses Viellen Kr. Shore P.K. Bali Dy PM eri SCODAN 5. а

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1	MEMORANDUM OF UNDERSTANDING (MOU) 8 0203	77
1	This memorandum of understanding is made on 246, day of MAY 2011	13
1	between MISSIONARIES OF CHARITY, Shanti Bhavan, Rehari - 5, Tali More, Jammu - 180005 on the one part (hereinafter referred to as 'the First Party'); and Jammu and	
1	Kashmir Economic Reconstruction Agency(J&K ERA), through Mr. Khalid Muzaffar, Director Central (here in after referred to as "the Second Party")for Sub Project	
	"Rehabilitation of Water Supply System at Jammu City", Asian Development Bank Assisted Jammu & Kashmir Urban Sector Development Investment	
	Programme(JKUSDIP) -Tranche II.	
1	THESE PRESENT WITNESS AS FOLLOW:	
	That the First Party is the landowners with transferable right of the <u>2 Maria (50.60</u> <u>Square Meters)</u> of land bearing Khasra No. <u>872</u> as listed below in Ward No. <u>18</u> of Jammu Municipal Corporation, tehsil <u>Jammu</u> , district <u>Jammu</u> .	
	2. That the First Party has taken part in the consultative process conducted under the	
	requirements of the Rehabilitation of water supply system in Jammu City (Asian Development Bank Assisted Jammu & Kashmir Urban Sector Development Investment	
	Programme (JKUSDIP) -Tranche II) and has understood the benefits of obtaining the improvement of water supply System of Jammu City.	
	3. That the First Party hereby grants to the Second Party, out of their free will, above said land as detailed in the list below for the installation of Tube Weil and construction of	
	Pump Room, and development of the Rehabilitation of water supply system in Jammu City, for the benefit of the people and the public at large.	
1	 That the First Party would not claim any compensation against the above said grant of lend. 	
	5. That the Second Party agrees to accept the above grant of land for the purposes mentioned in Clause 3.	1.
	6. That the Second Party shall install Tube Well and construct. Pump Room, and take all precisive constructions to precisive and associated and associated in the precisive and associated associated associated as a social dependence of the second associated associated as a social dependence of the second as	1
8	of work.	1
8	7. That both the Parties hereto agree that the installed Tube well and the Pump Room so	
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That both the Parties hereto agree that the structure to be erected would be in harmony of the surrounding buildings.

That the First Party hereto agrees to provide access to the Second Party to land during construction and during Operation and Maintenance of building and plant and machinery.

10. That the Second Party agrees that the operation of the plant and machinery will not cause disturbance to the occupants of the adjoining buildings and the noise level will be kept within permission limits.

11. That the Second Party agrees that at the request of the First Party, the operation of the plant and machinery would be temporarily suspended during meetings/ congregation, etc. Such suspensions shall be however limited to a maximum of 3 hours in a week with two days prior notice from First Party.

 That the Second Party agrees that provisions would be made in DPR (Detailed Project Report) to provide Direct benefit (Provision of water supply/tap free of cost, etc.) to the First Party.

13. That the provisions of the MEMORANDUM OF UNDERSTANDING will come into force and effect from the date of signing of this deed.

14. IN WITNESS WHEREOF the Parties hereto have signed this deed on the day and the year first above written.

SI.No	Description of land Owned	Description of land Granted for installation of Tube Well and construction of Pump Room.
1	Missionaries of Charity, MOTHER TERESA's Sisters runs a home for the mentalty challenged. Total quantum of land under their ownership in the said location is approximately 10 Kanal 10 Marta (5308 Square Meters).	2 Maria (50.60 Square Meters) i.e. approximately .95 % of the land granted for the purpose. The portion of the Land is open and not used for any productive purposes.

Signature of the Phot Patheri -5 More, Jammu-180005 phone : 0191-2535846

Signature of the Second party

Director Carthar Toxectric Reconstruction Agence Jammuformague

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SR.M. Clausse H.C.

Witnesses: More, Jammu-180005 hone : 0191-2535846

1. Antipabert noc suppose 1 SR. HERBERT M.C.) 3. Su. M. James M. C.

(SV. JAMES.)

APPENDIX-5



Locations of proposed tube wells and over head tanks (Jammu east)

APPENDIX-6



Locations of proposed tube wells and over head tanks (Jammu west)

APPENDIX-7



Confirmation from Operator of Commercial establishment/shop for provision of temporary Access by Contactor

Name of Subproject :	 	
Name of Contractor :	 	
Name of the Affected Person :	 	
Nature of Establishment :	 	
Location of Establishment :	 	
Nature of Access Disruption :	 	
Nature of Alternate Access		
Provided by Contractor :	 	
Duration & Date of Disruption:	 _days from	to

I hereby confirm that access disruption caused to my property as per the duration and the dates mentioned above was effectively mitigated by provision of alternate access by contractor. Provision of alternate access ensured no closure or loss of clientage to my commercial establishment.

Signature of Affected person

Signature of Contractor's representative

Traffic Management Plan

A traffic management plan (TMP) has been developed to cope with road traffic disruptions likely to be encountered with the commencement of work on subproject-Rehabilitation of Water Supply System in Jammu City.

Objectives of Traffic Management Plan

The main objective of this TMP is to ensure the safety of all the road-users along the work zone and to address the following issues:

i) Safety of pedestrians, bicyclists and motorists travelling through the work zone.

ii) Protection of work force engaged in construction from dangers associated with moving traffic.

iii) Mitigation of the adverse impact to the road capacity and delays to the road users.

iv) Maintenance of access to the adjoining properties.

v) Any other issues that may delay the project works.

Operating Policies for TMP Analyze the impacts due to construction

i) Consultation with local community, business community members, Traffic Police, Line Departments, etc. regarding the mitigation measures necessary during laying of pipelines.

ii) Determination of maximum number of days for which traffic diversion is required.

iii) Determine if additional traffic control or temporary improvements are needed along the detour links.

iv) Consider how access of materials is provided to the worksite.

v) Develop a notification program to the public so that the diversion on other adjoining roads is not a surprise for road users.

Public awareness and notifications

As expected, there will be travel delays during the laying of pipelines but with proper mitigation measures its scale can be reduced if proper coordination is ensured between various utility service providers and traffic management agencies. Awareness campaign and the prior notification for the public will be a continuous activity which the project authorities will pursue to compensate for traffic delays and also to allow sufficient time for the public and residents to digest the changes to their travel plans. ERA will notify the public about the road blocks and traffic diversion through the print and radio media.

Proposed traffic management measures

This sub project is divided into different components which include:

- 1. Replacement of wornout pipelines and strengthening of distribution network
- 2. Supply and installation of domestic water meters.
- 3. Rehabilitation/replacement of worn-out machineries and electrical devices in tube wells and pumping stations.

- 4. Construction of tube wells (including civil, mechanical and electrical equipment and piping works and installation of rising mains from tube wells to overhead tanks).
- 5. Construction of overhead tanks (including mechanical and electrical equipment and piping works).

The traffic management and diversion measures are required during the execution of following two components of the sub project:

- 1. Replacement of worn-out pipelines and strengthening of distribution network, and
- Installation of rising mains from tube wells to overhead tanks which is the part of theconstruction of tube wells (including civil, mechanical and electrical equipment and piping works).

The traffic management and diversion measures will rely on providing detours/alternate approaches through existing alternate roads, in case, where road closure is required. Public will be informed of the alternate approach roads in advance. Proper barricading will be arranged for the execution of the works. Traffic management measures have been planned for two locations in the corridor of the component-Replacement of worn-out pipelines and one location in case of-Installation of rising mains from tube wells to overhead tanks and are annexed herewith. If the need for road closure/detours arises at any other spot, during subproject execution, then suitable TMP on similar lines shall be prepared and implemented.

- Channi Himmat, Sector-2, near Institute of Engineers (Diversion Plan A): During the laying of pipelines at this location which is a road junction, the traffic will be diverted to the nearest existing alternate route as shown in the diversion plan.
- Channi Himmat, Sector-1 Near PHE station (Diversion Plan B): At this junction also traffic will be diverted to the nearest existing alternate route as shown in the diversion plan.
- Sainik Colony, Ward No. 70 (Diversion Plan E): At this location, a rising main from the proposed tube well to the proposed overhead tank will cross the road junction. The traffic will be diverted, to the nearest existing alternate route as shown in the diversion plan, during the execution of the work.

Traffic Monitoring Strategy

Traffic monitoring strategy that will be implemented during the construction of the sub-project is as follows:

i) On-site visits and monitoring. On site visits will be carried out through relevant government authorities as required by project implementation unit (PIU)/ consultants/ other agencies, if any, relevant during the phase of construction for monitoring of vehicles that are diverted as part of the TMP.

ii) Adjustments to traffic signal settings. For the sub-project, temporary traffic control will be used to direct traffic around work zones during the working phase as given below:

- Different traffic signals in the form of cones, advanced warning signs, and flagmen, will be used during the construction phase.
- > All workers exposed to traffic must be attired in bright, contrasting, highly visible upper

body garments, similar to flagmen.

> Provisions for the movement of emergency vehicles in or around the construction site.

iii) Pedestrian accommodation. Every effort will be made to separate the movement of pedestrians from both the worksite activity and the adjacent traffic. Following steps will be adopted to accommodate pedestrians:

- Provide pedestrian information throughout the construction period in the form of clearly defined advanced warning signages.
- > Clearly define transition to pedestrian detour routes or alternate walking paths.
- > Barriers and channelizing devices should be visible to pedestrians.
- > Clearly separate the work area from pedestrians.

iv) Pedestrian protection

- > Positive protection to separate vehicles from pedestrians and pedestrians from work area.
- Use channelizing devices to delineate the route (must be detectable).
- Protect pedestrians from vehicular traffic (positive protection).
- > Protect pedestrians from hazards such as excavated pits, holes, cracks and debris.
- Advanced signages will be placed at intersections.

v) Adjustments necessary to public transport operators. Different diversions will be used as part of traffic management plan in order to provide a smooth functioning of traffic during construction phase of the sub-project. However, small adjustments will be necessary which are provided as follows:

- Following of diversions will increase the length of the travel therefore adjustments in terms of early departure are required from public transport operators.
- Adjustments in terms of speed at or near construction sites.
- Lane driving and avoidances of overtaking.
- Following of No Parking zones.
- Avoidance of unnecessary halting of vehicles.



Diversion Map-A- Channi Himmat, Sector-2 near Institute of Engineers



Diversion Map-B- Channi Himmat, Sector-1 near PHE Station

