

# Initial Environmental Examination

October 2013

IND: Jammu and Kashmir Urban Sector Development Investment Program-“Providing and laying of raw water transmission main from near upper reaches of Doodhganga to Kralpora Water treatment Plant”

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
CBD	-	Central Business District
CTE	-	Consent to Establish
CTO	-	Consent to Operate
DSC	-	Design and Supervision Consultancy
CPCB	-	Central Pollution Control Board
EA	-	Executing Agency
EAC	-	Expert Appraisal Committee
EARF	-	Environment Assessment and Review Framework
EC	-	Environmental Clearance
EIA	-	Environmental Impact Assessment
EMP	-	Environment Management Plan
ERA	-	Economic Reconstruction Agency
GoI	-	Government of India
GRM	-	Grievance Redressal Mechanism
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IST	-	Indian Standard Time
J & K	-	Jammu and Kashmir
JKUSDIP	-	J&K Urban Sector Development Investment Programme
MFF	-	Multi –Tranche Financing Facility
MLD	-	Million liter per day
MoEF	-	Ministry of Environment and Forests
MRH	-	Mean Relative Humidity
MSW	-	Municipal Solid Waste
MT	-	Metric ton
MTR	-	Month's Total Rainfall
NAAQS	-	National Ambient Air Quality Standards
NH	-	National Highway
NSL	-	Natural soil level
NTH	-	Non Title Holders
OM	-	Operations Manual
PIU	-	Project Implementation Unit
PMU	-	Project Management Unit
PM <sub>2.5</sub>	-	Particulate Matter below 2.5 micron particle size
PM <sub>10</sub>	-	Particulate Matter below 10 micron particle size
PMC	-	Project Management Consultancy
PUC	-	Pollution Under Control
RCC	-	Reinforced Cement Concrete
REA	-	Rapid Environmental Assessment
RSPM	-	Respirable Suspended Particulate Matter
SMC	-	Srinagar Municipal Corporation
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
ISMB	-	Indian Standard Medium Beam
ISLC	-	Indian Standard Long Beam
GSB	-	Granular Sub Base course

## WEIGHTS AND MEASURES

cm	-	Centimeter
crore	–	100 lakhs = 10,000,000
lakh	–	100 thousand = 100,000
km	–	Kilometer
Kmph	-	Kilometer per hour
lpd	–	liters per day
m	–	Meter
mg/l	–	milligrams per liter
mm	–	Millimeter
MSL	-	Mean sea level
μ	-	10 <sup>-6</sup> meter
μg/m <sup>3</sup>	–	micrograms per cubic meter
μS/cm	-	micro Siemens per centimeter
NTU	-	Nephalo turbidity unit
ppm	–	parts per million

### 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&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 3 (three) tranches over a period of 9 years. Each tranche constitutes a separate loan. Tranche I (Project-1) of JKUSDIP (Loan 2331-IND) is under implementation. One of the subprojects identified under Tranche 3, JKUSDIP is “Providing and laying of raw water transmission main from near upper reaches of Doodhganga to Kralpora Water treatment Plant in Srinagar” which will reduce the problem of water pollution and evolve in transmission of safe raw water supply from source to Water treatment Plant.
4. The major objectives are: (i) Reduction of raw water pollution and preventing contamination thereby increasing overall hygiene of the people. ii) Establishment of an efficient raw water transmission system that saves the energy cost. iii) Improvement of local environment to reduce health risks to the inhabitants in the project areas.
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)<sup>1</sup> adopted for the Tranche 2 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. Government of Jammu and Kashmir through an order had assigned J&K Economic Reconstruction Agency to take up water systems improvement works in Srinagar city and its adjoining areas. Part of these improvement works were to be executed under Multi-sector Project for infrastructure rehabilitation in Jammu and Kashmir (MPIRJK), ADB Loan 2151-IND, Out of the remaining works as mentioned above, the works proposed under Tranche 3 of JKUSDIP is: i) Providing and laying of raw water transmission main from near upper reaches of Doodhganga to Kralpora Water treatment Plant in Srinagar city. The subproject consists of Construction of 18.5 km long, 750mm and 600mm internal diameter raw water transmission main from near upper reaches of Doodh Ganga Nallah (Nowbug) to Kralpora

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<sup>1</sup> 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.

water treatment plant and also construction of RCC circular inspection well, Providing scour sluice valves at depressed points, three numbers of steel rack (bridge) over Nallah at Wathora and RCC thrust blocks.

8. Anticipated impacts during the construction period does not include disruption of services, 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 proposed site, exposure to increased noise, dust, vibrations; hazardous chemicals (such as 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 construction of the proposed raw water transmission, and ensure efficient lines of communications 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.

9. An anticipated impact during operation and maintenance does not include air pollution and noise pollution. Motor driven pumps are not required for the subproject. By introducing the proposed scheme the dependability of the project on pumping water will ease to a great extent and also the water transmission system will not get affected due to power shutdowns and the contamination of water can be prevented by transmitting through DI pipes resulting in safe and clean water in adequate quantity as economically as possible.

10. 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.

11. The subproject's Grievance Redress 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.

12. The IEE is based upon the Environmental Assessment and Review Framework (EARF) which is in consistent with the ADB's Safeguard Policy Statement (SPS) 2009. The subproject is classified as "**Category B**" for Environment and does not require further Environmental Impact Assessment (EIA). 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&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 loan. Tranche I (Project-1) of JKUSDIP (Loan 2331-IND) is under implementation. One of the subprojects identified under Tranche 3 of JKUSDIP is the "Providing and laying of raw water transmission main from near upper reaches of Doodhganga to Kralpora Water treatment Plant and Providing in Srinagar".

3. The major objectives are: (i) Reduction of raw water pollution and preventing contamination thereby increasing overall hygiene of the people. ii) Establishment of an efficient raw water transmission system that saves the energy cost. iii) Improvement of local environment to reduce health risks to the inhabitants in the project areas.

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 Rapid Environmental Assessment (REA) Checklist for raw water transmission (**Appendix 1**) was conducted for the proposed subproject "Providing and laying of raw water transmission main from near upper reaches of Doodhganga to Kralpora Water treatment in Srinagar city". 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;
- (iv) To assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, 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;



- (vi) 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 redress 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

### ADB's 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 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.

## **National and State Laws**

11. The implementation of the subprojects will be governed by Government of India (GoI) 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 GoI EIA Notification of 2006 and 2009 (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. Categories 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 Establishment (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 following 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.** 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 CFE and CFO 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. **Ancient Monuments and Archaeological Sites and Remains Rules, of 1959 and J&K Ancient Monuments Preservation (Amendment) Act of 2010.** The Act and Rules designate areas within a radius of 100 meters (m) from the "protected property" as

“prohibited area” and upto 200m from the boundary of protected 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 site, remains, and monuments protected by ASI or the State Department of Archaeology. Some archaeological, historical monuments, and religious places like Burzhama archaeological site, historical Jamia Masjid, Pathar Masjid, Hazratbal Shrine, and Chati Padshahi Gurudwara, etc. are located in Srinagar City. However the location of the subproject site is beyond the prohibited and regulated areas.

16. **Jammu and Kashmir Preservation of Specified Trees Act of 1969 and Rules of 1969;** if cutting of scheduled trees is required during preparation of sites; permission will be obtained by the ERA from the Floriculture/Sericulture/Revenue Department prior to commencement of construction works.

17. **Building and Other Construction Workers (Regulation of Employment and Conditions of service) Act of 1996 and Rules 1998.** The Government of India has enacted this Act and is also applicable to the state of J&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.

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

**Table 1: Applicable Environmental Regulations**

<b>Applicability of Acts/Guidelines</b>	<b>Compliance Criteria</b>
The EIA notification, 2006 (and its subsequent amendments in 2009) provides for categorization of projects into category <b>A</b> and <b>B</b> , based on extent of impact	The subproject is not covered in the ambit of the EIA notification as this is not covered either under Category <b>A</b> or Category <b>B</b> of the notification. As a result, the categorization, and the subsequent environmental assessment and clearance requirements, either from the state or the Government is not triggered.
The Wildlife Conservation Act, 1972, as amended and J&K Wildlife (protection) Act 1978, as amended provide for protection and management of Protected Areas	Wildlife Protection Act is not applicable to the proposed subproject.
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 ancient monuments and archeologically protected sites. The subproject area does not fall within 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	Consent to Establish (CTE) and Consent to Operation (CTO) from the J&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 work
The Jammu And Kashmir Preservation of Specified Trees Act, 1969	Permission from Sericulture/ Forest/Revenue Department / Concerned Deputy Commissioner for the scheduled Trees The Jammu and Kashmir Preservation of Specified Trees Act, 1969 is not applicable to the proposed subproject as such no Schedule tree cutting is involved
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

#### Existing Condition

19. Srinagar, the summer capital of Jammu & Kashmir, is situated at an average altitude of 1600 meter above MSL and located in the heart of oval shaped valley of Kashmir. Srinagar city is situated around 34° 05' N latitude and 74° 56' E longitudes. It is well connected by air and road. Topographically, Srinagar city is located on a flatter terrain. Most of the raw water transmission was open stream type that may likely get polluted by means of anthropogenic activities or by means of natural conditions. In order to eradicate this problem, a closed conduit raw water transmission system has to be introduced, which consist of Head works, Pipe Laying of diameter 750mm & 600mm, Construction of RCC inspection well, Providing scour sluice valves at depressed points, two numbers of steel rack (bridge) over nallah at wathora Kralpora and RCC thrust blocks.

20. Government of Jammu and Kashmir through an order had assigned J&K Economic Reconstruction Agency to take up raw water transmission systems improvement works in the adjoining areas of Srinagar city. Works to be execute under Multi-sector Project for infrastructure rehabilitation in Jammu and Kashmir (MPIRJK), ADB Loan 2151-IND, the work proposed come under Tranche 3 of JKUSDIP is: **Providing and laying of raw water transmission main from near upper reaches of Doodhganga to Kralpora Water treatment Plant in Srinagar city.** The subproject consists of Construction of 18 km long, 750mm and 600mm internal diameter raw water transmission main from near upper reaches of Doodh Ganga Nallah (Nowbug) to Kralpora water treatment plant and also construction of RCC circular inspection well, Providing scour sluice valves at depressed points, two numbers of steel rack (bridge) over Nallah at Wathora and Kralpora and RCC thrust blocks.

## Proposed subproject and Components

21. The subproject named as “Providing and laying of raw water transmission main from near upper reaches of Doodhganga to Kralpora Water treatment Plant in Srinagar city” was included in the indicative Subproject List for Multi sector project for infrastructure rehabilitation in Jammu and Kashmir (MPIRJK) under Tranche 3. The subproject consists of Construction of 18 km long, 750mm and 600mm internal diameter raw water transmission main from near upper reaches of Doodh Ganga Nallah (Nowbug) to Kralpora water treatment plant and also construction of RCC circular inspection well, Providing scour sluice valves at depressed points, two numbers of steel rack (bridge) over Nallah at Wathora and Kralpora and RCC thrust blocks.

22. The proposed tapping point is near the take off point of existing irrigation canal on Doodhganga Nallah situated at a distance of 575m (RD 0 to RD 575m) from Nowhar Bridge. For abstraction / tapping of water it has been proposed to construct RCC divide wall for a length of 50m and construction of small weir of width of 2.7m and a height of 0.90m for embedded 750mm dia pipe. The total length of pipe to be laid along the river bank near tapping point is about 575m (dia 750mm) and about 600m (dia.600mm) along the left side of Doodhganga Nallah at RD17,300m to RD17,900m) located at Handal Bagh Kralpora.

The construction of residential, commercial, and institutional establishments as well as the crude dumping of rubbish and huge quantity of Municipal Solid Wastes along the existing raw water channels, results in disturbance of natural water quality of raw water which led to the problem of water pollution and health hazard especially during rainy and winter season as huge wastes were drained into the existing raw water channel. In order to alleviate the severe problem of water pollution and associated adverse impacts on the health and socio economic profile of the community, a closed system of raw water transmission has been proposed. Completion of the subproject will considerably rehabilitate the existing problem of water pollution and associated adverse impacts on the health, hygiene and socio economic conditions of the community.

23. The subproject does not pass through or is not situated in the vicinity of any sensitive ecological area like wild life reserve, national park, wetlands or any other special area for protecting biodiversity. Various tree species including scheduled trees, herbs and shrubs are found in Srinagar city. Important tree species found in the city are Chinar (*Platanus orientalis*), Walnut (*Juglans regia*), Willow (*Salix* sp.) Poplar (*Populus* sp), Mulberry (*Morus alba*), etc. Crop trees like apple, pear, and almond are also grown in some areas of the city. The subproject does not involve cutting of any scheduled tree but some Popular, Willow Kikar (*Acacia* sp. trees mostly on government land (about 552 numbers) may likely be cut during execution of the subproject, which does not require any permission for cutting.

23. The subproject alignment is along the existing R&B road. The major objectives of subproject are: (i) Reduction of raw water pollution ii) Establishment of an efficient raw water transmission iii) Improvement of local environment to reduce health risks to the inhabitants in the project areas.

24. The primary benefit of the subproject would result in overall improved environmental conditions of the area by avoiding raw water pollution especially during rainy seasons thereby leading to better quality of life.

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

**Table 2: Description of Proposed Raw water Transmission in adjoining areas of Srinagar.**

Component	Function	Description	Location
Raw Water Transmission	By introducing the proposed scheme the dependability of the project on pumping water will ease to a great extent and also the water transmission system will not get affected due to power shutdowns and the contamination of water can be prevented by transmitting through DI pipes resulting in safe and clean water in adequate quantity as economically as possible.	The proposed subproject includes construction of complete closed raw water system which includes laying of pipeline, installation of double kinetic air valve, scour valves and other valves.	Nowhar Bridge to WTP Kralpora, Via Dadha Ompora, Chadoora.
Raw water Transmission System	<p>Increase in capacity of water transmission of Kralpora WTP. Tapping of raw water at higher reaches of Doodhganga nallah channel where the turbidity/ contamination is low for supplying Potable drinking water to Zone 4 of Srinagar city.</p> <p>The raw water transmission will be by gravity flow hence eliminating the dependability on pumping of raw water from Doodhganga nallah raw water channel subsequently reducing power cost and disruption of water supply during power shut downs.</p> <p>To meet the present as well as future demands of Potable drinking water of zone 4 of Srinagar.</p>	Subproject consists of laying of 18.5 km long DI pipes of 750mm & 600mm internal dia. raw water transmission, RCC circular inspection well, Providing scour sluice valves at depressed points, 2 nos. of steel rack (bridge) over Nallah at Wathora and Kralpora and RCC thrust blocks from near upper reaches of Doodh Ganga Nallah (Nowbug) to Kralpora water treatment plant. The proposed tapping point is near the take off point of existing irrigation canal on Doodganga Nallah situated at a distance of 575m (RD 0 to RD 575m) from Nowhar Bridge. For abstraction / tapping of water it has been proposed to construct RCC divide wall for a length of 50m and construction of small weir of width of 2.7m and a height of 0.90m for embedded 750mm dia pipe. The total length of pipe to be laid along the river bank near tapping point is about 575m (dia 750mm) and about 600m (dia.600mm) along the left side of Doodhganga Nallah at RD17,300m to RD17,900m) located at Handal Bagh Kralpora. Construction of steel pipe rack for crossing of 750mm dia.pipe and 600mm dia.pipe over Doodhganga Nallah at Zuhama, Wathore and at Kralpora near water lifting pump station. The pipe rack for crossing of pipe at Zuhama involve: cement concrete block 2 No's. of RCC in foundation with superstructure of RCC pipes upto pipe crossing level. Steel I-beam 2 No.'s for span of 13m with ISLC at 1m c/c with side railing and angle iron	Nowhar Bridge to WTP Kralpora, Via Dadha Ompora, Chadoora.

Component	Function	Description	Location
		<p>supports. For steel pipe rack at Wathora/ Kralpora shall of 2 pile foundations with pile cap and RCC column of 1000mm dia. upto the height of 7-8m at mid span and RCC abutment wall at end supports on Nallah banks.</p> <p>2No.'s ISMB 450mm×150mm with cross supports of ISLC 75×40mm at the rate of 1m c/c with side railing of angle iron/ GI pipes. Laying of DI pipes shall be along the edge of the road. The excavation shall be for a depth equal to pipe dia. and a cushion of 1m and for a width equal to dia. of pipe and 400mm. For washing of pipe scour valves shall be fitted at feasible spots i.e., Wathora and at Kralpora.</p>	
Restoration of the roads	The entire road will be restored to its earlier state if the same is damaged during the construction of sub-project.		

26. The main design features are summarized in Table 3 below.

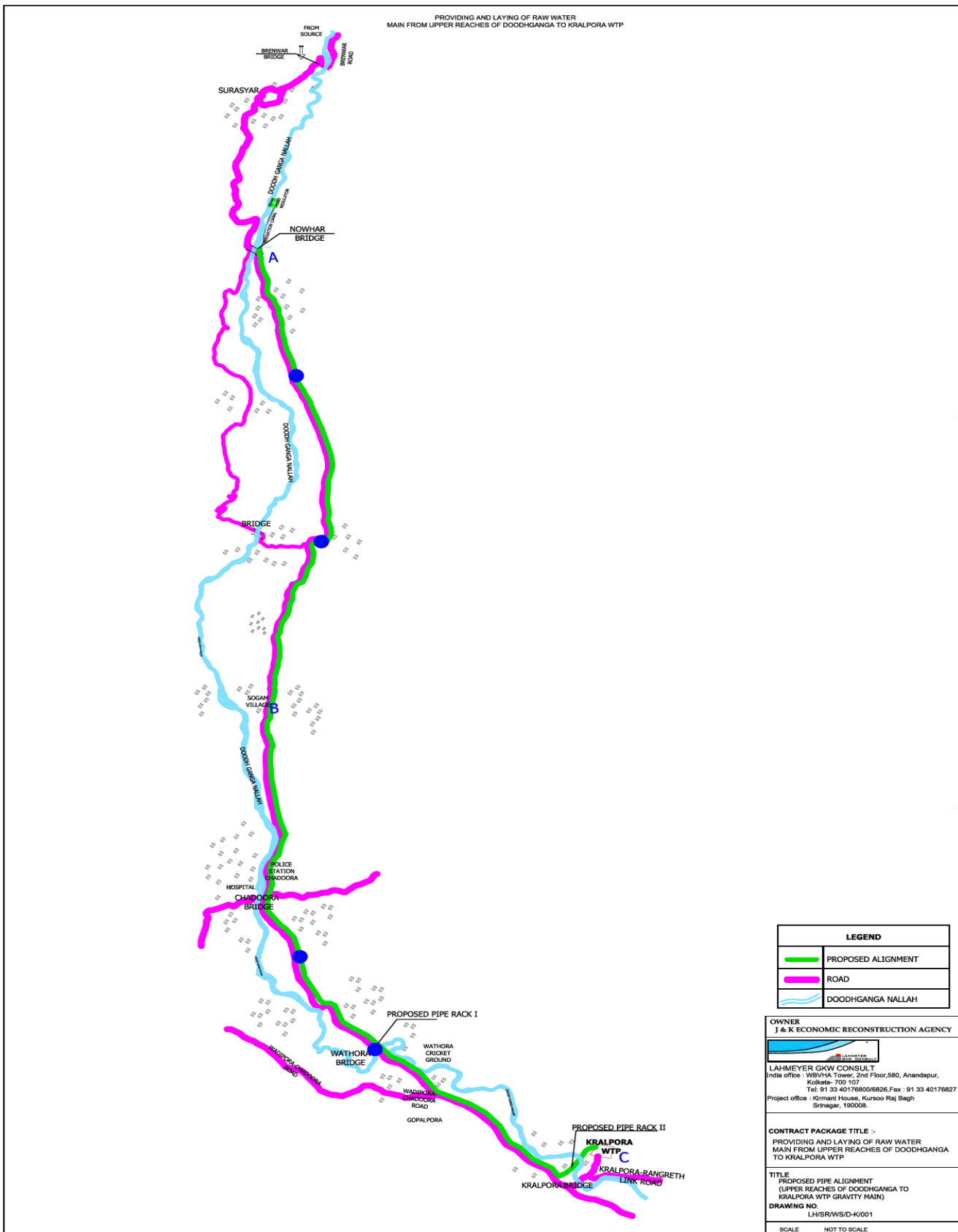
**Table 3: Design features of subproject**

Design feature	Description
Design population	Design population year 2014: 2.14 lakhs
Catchment area to be covered	Kralpora, Wanabal, Humhamma, Sanatnagar, Baghi Mehtab, Chanapora, Macho, Natipora, Nowgam, Aluchibagh partly, Burzulla, Tengpora partly, approximately 60 sq.kms
Runoff coefficient	0.40 (based on type of surface of catchments area as per IS)
Subproject components	<p>The subproject consists of Construction of 18.5 km long DI pipes K9 of 750mm &amp; 600mm internal dia. DI pipe K9 raw water transmission and RCC circular collection sump and construction of RCC divide wall at takeoff source, Providing scour sluice valves at depressed points, Construction of 3 steel pipe rack over Nallah at Zoohama, Wathora and Kralpora. RCC thrust blocks for DI bends and saddle blocks at Kralpora. Installation of air valves as per requirement and installation of pressure control valves at 2 spots along the line. Installation of electromagnetic flow meters at Nowhar, Wathora and Kralpora Treatment plant. The proposed tapping point is near the take off point of existing irrigation canal on Doodganga Nallah situated at a distance of 575m from Nowhar Bridge. For abstraction / tapping of water it has been proposed to construct RCC divide wall for a length of 50m and construction of small weir of width of 2.7m and a height of 0.90m for embedded 750mm dia pipe. The total length of pipe to be laid along the river bank near tapping point is about 575m (dia 750mm) and about 600m (dia.600mm) along the left side of Doodhganga Nallah at RD17,300m to RD17,900m) located at Handal Bagh Kralpora. Construction of steel pipe rack for crossing of 750mm dia.pipe and 600mm dia.pipe over Doodhganga Nallah at Zuhama, Wathore and at Kralpora near water lifting pump station. The pipe rack for crossing of pipe at Zuhama involve: cement concrete block 2 No's. of RCC in foundation with superstructure of RCC pipes upto pipe crossing level. Steel I-beam 2 No.'s for span of 13m with ISLC at 1m c/c with side railing and angle iron supports. For steel pipe rack at Wathora/ Kralpora shall of 2 pile foundations with pile cap and</p>

	<p>RCC column of 1000mm dia. upto the height of 7-8m at mid span and RCC abutment wall at end supports on Nallah banks.</p> <p>2No.'s ISMB 450mm×150mm with cross supports of ISLC 75×40mm at the rate of 1m c/c with side railing of angle iron/ GI pipes. Laying of DI pipes shall be along the edge of the road. The excavation shall be for a depth equal to pipe dia. and a cushion of 1m and for a width equal to dia. of pipe and 400mm. For washing of pipe scour valves shall be fitted at feasible spots i.e., Wathora and at Kralpora.</p>
Intensity of rainfall (based on rainfall analysis)	750mm average rainfall per annum
Design period/ Life span of sub project component	30 years
Seismic zonation of site	Zone "V" (Five)
Life span of sub project	30 years.



**Figure 1: Map showing the Proposed Raw water supply subproject**



## 27. Implementation Period

The Proposed construction period of the subproject is 24 months and the indicative time line of implementation is as below.

**Table-4 Implementation Period of the subproject**

Activity	Tentative Time Schedule
SAR submitted	AUGUST 2013
Completion of detailed engineering design	SEPTEMBER 2013
Issue of invitation of bids	OCTOBER 2013
Contract award	FEBRUARY 2014
Commencement of contract	MARCH 2014
Completion of Contract	FEBRUARY 2016

## 28. Alternatives of Proposed Subproject

- Option 1 - Do nothing – This will not augment transmission of unhygienic polluted raw water to Kralpora WTP address.
- Option 2 - Do Minimum – This option involves at grade improvements to slightly improve existing scenario but still does not completely augment transmission of unhygienic polluted raw water to Kralpora WTP address as the alternate possible routes does not yield the required feasibility.
- Option 3 - Current preferred option. This offers the best balanced solution by providing the desired outcomes with least impacts on environment and minimum land acquisition.

## IV. DESCRIPTION OF THE ENVIRONMENT

### A. Physical Resources

#### 1. Administrative Boundaries

29. The subproject sites are located in the built-up area of Srinagar city. Srinagar, the summer capital of Jammu and Kashmir, is situated at an average altitude of 1,600 meter above mean sea level (MSL) and located in the heart of oval shaped valley of Kashmir. Srinagar city is situated around 34° 05' N latitude and 74° 56' E longitudes. It is well connected by air and road.

#### 2. Topography, Drainage, and Natural Hazards

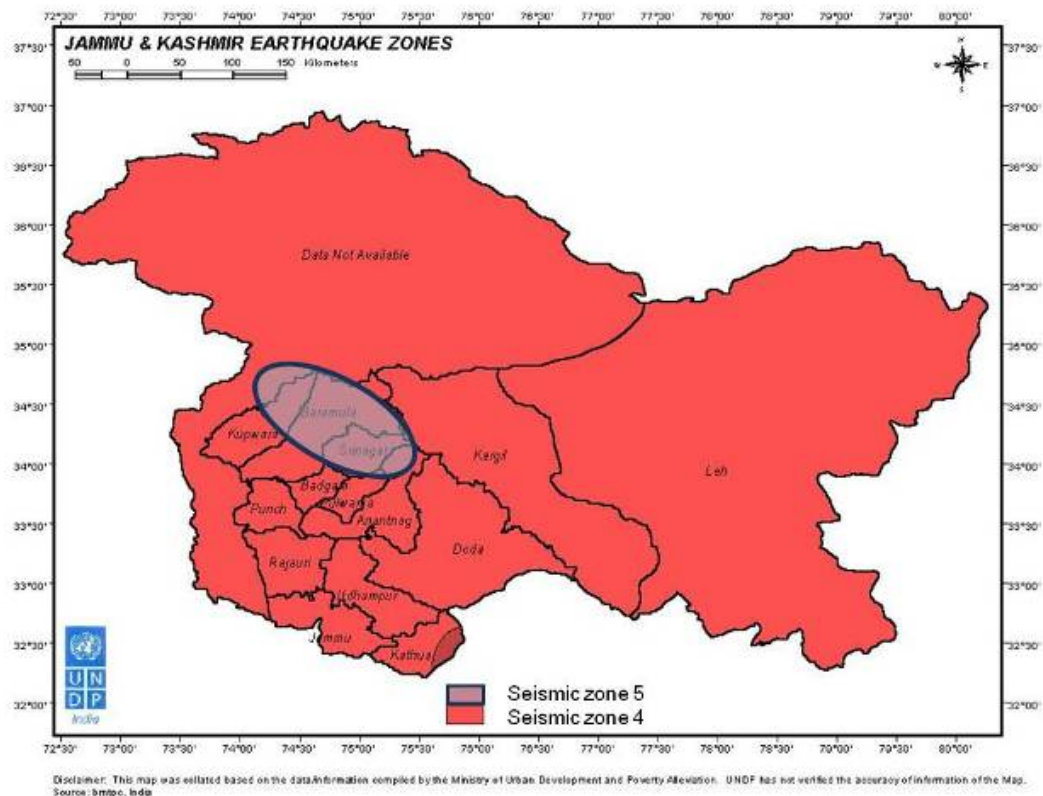
30. **Topography.** The subproject area is located in southwest direction of the Srinagar city. Physiographically, Srinagar city constitutes a part of the flood plain of Jhelum, which is largely flat and featureless with sub-recent alluvial deposits. The topography shows gentle terrain slope from East to West. General elevation of the subproject area varies between 1,585m and 1,590m above mean sea level.

31. **Drainage.** Srinagar city is located on a flatter terrain. Therefore, the drainage system of the city relies on lift system through drainage pumping stations, which lift storm water from wet well and discharge into the adjoining water bodies. Majority of the drains are covered with RCC slabs with manholes provided at suitable intervals to facilitate maintenance of the drainage system. The city has presently about sixty five drainage pumping stations.

32. As per storm water drainage master plan, Srinagar city is divided into three drainage zones. The details of the drainage zones are as below.

- Zone- I: This zone includes areas from Pampore to Gaw kadal, Dalgate to Nehru park. Civil line areas, Rajbagh, Jawahar nagar to Alochi bagh and areas across flood spill channel including Ram bagh, Natipora, Barzulla etc.
  - Zone- II: The zone includes areas from Amira kadal to Parimpora /Shallateng, including areas of New and Old Sectt. Batamalloo, Bemina, Nawa kadal, Nawa bazaar and Safa Kadal etc.
  - Zone –III: This zone includes areas from Dalgate to Noorbagh on one side and Dalgate to Naseem bagh and areas around Iddgah, Nowshera, Ali Jan road, Soura, Buchpora etc.
33. **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.
34. The state of Jammu & Kashmir is the western most extension of the Himalayan mountain range in India. Here it comprises of the Pir Panjal, Zaskar, 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 Zaskar ranges which are part of the Great Himalayan range are underlain by the Zaskar Thrust. The Kashmir Valley lies between the Pir Panjal and the Zaskar thrusts, making it very vulnerable to earthquakes. Other northern parts of Jammu & Kashmir are heavily faulted. Along the Zaskar 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.
35. The project is located in a seismically active part of Kashmir valley. Keeping in view the maximum credible earthquake magnitudes in the region, the site area is classified in **Zone-V** 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.

36. The earthquake zonation map of Jammu and Kashmir is given in **Figure-3** below:



**Figure-3: Jammu and Kashmir earthquake zones.**

37. **Floods:** In Srinagar city, the floods are not a regular phenomenon, owing to its topography and presence of natural drainage in the form of river Jhelum and numerous water channels. The construction of Doodh Ganga-flood spill channel in 1904 by then Maharaja relieved the strain on the Jhelum in the city of Srinagar there by making the city safer from floods. This flood channel takes 2/3rd of the total flow from the river thus helps the river Jhelum to regulate its water level while passing through the city thus saves it from being flooded

### Geology, Geomorphology and Soils

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

- The Panjal
- The Zaskar
- The Tertiary Groups

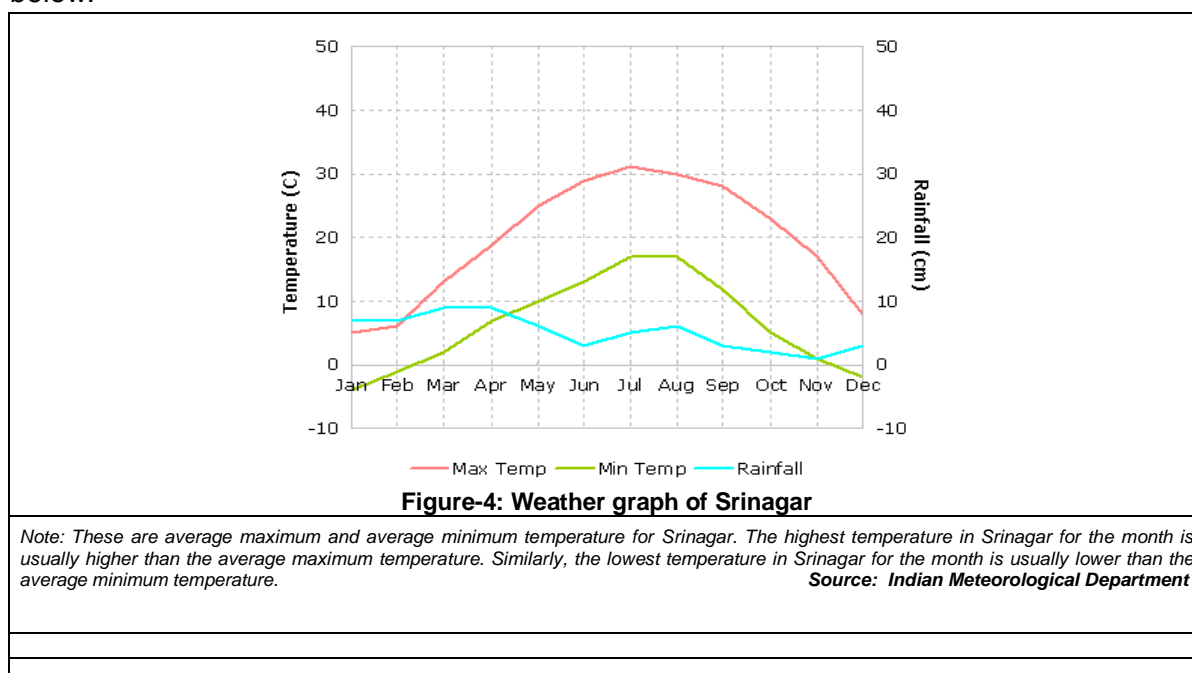
39. These three Geological divisions form the basis of the four physical divisions of the State. The Panjal forms the Outer plain, the Outer Hills and the Middle Mountains. The Zaskar includes the whole of the eastern region from Spiti and Lahol (32.170N. Latitude) to the lofty Karakoram mountains in the north. The Tertiary Groups include the valley of Kashmir and other river Valleys.

40. The oval valley of Kashmir is longitudinal. It is about 1700 m above sea level. There is a high wall of mountains round the valley. These rise to a height of 5515 metres above sea level. The only outlet of the valley is Baramulla where the Jhelum flows out through a narrow gorge. The entire drainage of the valley of Kashmir and its surrounding areas has only this outlet. In the north, Kashmir has many volcanic rock formations. These are mostly stratified and several thousand metres thick. There are many layers of sedimentary rocks which are found in Liddar valley, Baramulla district and Banihal Verinag section of the Pir Panjal range. Lime stones and shales are common. The rock layers have many fossils. Near

Yark and to the extreme north, shales have been found showing that the region was under sea in the geological past.

41. **Soils.** In the regions of Jammu and Kashmir the soils are loamy and there is little clay content in them. Poor in lime but with a high content of magnesia, the soil is treated with chemical fertilisers and enriched with green manure and legume before cultivation. There is sufficient organic matter and nitrogen content in the alluvium of the Kashmir valley as a result of plant residue, crops stubble, natural vegetation and animal excretion. The valley of Kashmir has many types of soils like: Gurti (clay), Bahil (Loam), Sekil (Sandy), Numbal (Peats), Surzamin, Lemb, Floating garden soils and Karewa soils. No wonder, in Kashmir, soil is virtually worshipped as a miracle of divinity as it is a source of wealth of the land.

42. **Climate:** The climate of Srinagar city, in general, is characterized by temperate summer and cold/mild winters. Annual rainfall in the city is of the order of less than 26 inches – most of it in winter and spring seasons. Weather Graph for Srinagar is shown in Figure -4 below.



43. **Temperature:** June, July and August are the hottest months while December and January are the coldest. The temperature varies from cold in winter with minimum temperature touching even -3.7 °C to mild hot in summers when the temperature shoots up to 30 °C. The mean maximum and minimum temperature (°C) recorded at meteorological observatory (Rambagh, Srinagar) during 2005 - 2010 are summarized in Table 5:

**Table 5: Mean maximum and minimum temperature of Srinagar city**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Year 2005</b>												
Max. Temp. (°C)	7.5	6.5	14.7	20.7	21.8	29.3	28.9	30.4	29.3	22.7	15.8	9.9
Min. Temp. (°C)	-0.3	0.7	5.3	7.1	9.9	14.4	18	16.9	13.7	5.8	-0.2	-3.3
<b>Year 2006</b>												
Max. Temp. (°C)	4.3	13.4	16	21.1	28.2	27.6	30.9	28.7	25.9	22.9	15	8.4
Min. Temp. (°C)	-1.3	3.3	4.7	7.2	13.3	14.7	19.3	18.3	12.3	8	3.5	0
<b>Year 2007</b>												
Max. Temp. (°C)	10	12	14.7	25.6	25.5	27.8	29.8	30.1	27.3	24.1	17.1	9.9
Min. Temp. (°C)	-2.5	2.9	3	8.9	11.9	16	17.8	17.8	13.3	3.9	-1.1	-2
<b>Year 2008</b>												
Max. Temp. (°C)	5.5	8.7	20	20.1	25.6	29.6	29.9	29.5	26.5			
Min. Temp. (°C)	-2.5	-1.4	5.3	7.7	11.5	18.3	19.1	17.8	11.3			

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Year 2010</b>												
Max. Temp. (°C)	10.9	9.8	20.7	21.3	22.7	25.7	28.9	28.5	26.6	23.8	18.6	11.3
Min. Temp. (°C)	-1.5	0.4	6.5	9.0	11.1	13.5	17.7	18.8	13.3	7.3	2.2	-3.7

Source: Indian Meteorological Department, Srinagar

44. **Rainfall:** The area experiences rain fall during winter and early summer from western disturbances. The month's total rainfall (MTR in millimeters) recorded at meteorological observatory at Rambagh; Srinagar during 2001 to 2010 is shown in Table 6.

**Table 6: Rainfall data of Srinagar (Month's Total Rainfall in mm)**

Months/ Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2001	21.3	46.1	56	57	37	52.8	80.8	67.8	33.5	15.9	36	18
2002	35.5	105.8	105.1	77.7	47.3	82.2	16.8	75.3	54.5	8.2	0	8.9
2003	28.7	180	173.4	127.6	91.4	20.4	97.9	19.8	62.4	8.7	14.6	59.4
2004	79.2	38.1	9.6	145.4	86.6	36.7	58.3	62.3	12	61.3	33.2	12.5
2005	86.6	188.5	104.8	48.1	63.6	8.3	115.5	15.6	16.8	18.6	14.4	0
2006	134	63.3	48.2	52.7	26.3	33.9	103.3	171.3	93.3	15.3	73.5	72.2
2007	8.1	52.6	210.3	1.5	46.2	50.9	54.9	47.4	14	0	0	15.9
2008	76.3	105	9.4	81.5	52.3	24.7	33.1	65.3	22.5	--	--	--
2010	24.1	88.9	61.0	126.8	186.4	45.3	69.8	132.1	16.9	51.4	2.0	43.0

Source: Indian Meteorological Department, Srinagar

45. **Humidity:** The humidity levels in the area are observed as maximum up to 95% in the months of July and August and minimum humidity levels between 30%–40% prevail during December and January months. The mean relative humidity (MRH %) recorded at meteorological observatory at Rambagh, Srinagar during 2006 to 2008 at 08.30 a.m. and 05:30 a.m. Indian Standard Time (IST) are presented in Table- 7 below.

**Table 7: Monthly Relative Humidity Data of Srinagar City**

Months	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
MRH % 2006	91	88	80	66	66	70	77	82	81	82	89	80
(Max and Min)	79	61	52	42	44	46	54	61	60	61	68	74
2007 (Max and Min)	90	87	77	60	71	77	75	77	77	68	81	87
	54	60	52	34	47	50	55	52	52	42	53	65
2008 (Max and Min)	89	87	69	73	70	73	75	76	76	NA	NA	NA
	70	63	40	52	53	51	53	51	49	NA	NA	NA
2010 * (Max), 8.30 hr	88	87	71	77	78	74	75	85	78	77	85	90

\* In 2010 only Mean data at 08-30 available, Source: Indian Meteorological Department, Srinagar

## 1. Air Quality

46. In the area along the proposed subproject, vehicular traffic is major contributor for air pollution. In order to establish ambient air quality in the subproject, baseline data was generated by the Environmental Monitoring Laboratory of Economic Reconstruction Agency (ERA) in June, 2013. The air quality data with respect to RSPM (PM<sub>10</sub>), SO<sub>2</sub> and NO<sub>2</sub> was measured at specified sites near the subproject area and the results are presented in Table- 8 below.

**Table 8: Ambient air quality data at various locations in subproject area**

S.N.	Location	Parameters		
		RSPM (PM <sub>10</sub> <sup>2</sup> ) (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )
1.	Dada Ompora (S4)	198.85	7.44	7.89
2.	Wathora Bridge (S5)	60.82	8.87	12.84
3.	Kralpora Pumping station (S6)	104.71	9.54	12.13
	<b>NAAQ Standards<sup>3</sup></b>	<b>PM<sub>10</sub>= 100</b>	<b>80</b>	<b>80</b>

PM<sub>10</sub>= Particulate matter below 10µ particle size, RSPM: Respirable Suspended Particulate Matter, SO<sub>2</sub>: Sulphur dioxide and NO<sub>2</sub>: Nitrogen dioxide, NAAQS: National Ambient Air Quality Standards of Govt. of India

<sup>2</sup> PM<sub>2.5</sub> will be provided later as the equipment to measure PM<sub>2.5</sub> is not yet available. The requisite equipment shall be procured by ERA and the baseline data shall be again generated for all parameters before start of works on the proposed sub-project.

<sup>3</sup> 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 16<sup>th</sup> September 2009.

**Note:** S4, S5 and S6 are site locations for air monitoring shown in map as well.

47. The result of the tests concludes that the values for RSPM are above the NAAQ standard set by the CPCB India at, Near Dada Ompora and at Kralpora Pumping Station. The primary reason for this is the heavy traffic plying in the vicinity.

48. The National Ambient Air Quality Standards have been revised by Ministry of Environment and Forests, Government of India on 16th September 2009, wherein the Respirable Suspended Particulate Matter (RSPM) has been further divided into PM10 & PM 2.5. The air quality monitoring equipment presently available with J&K ERA can measure the total particulate matter below 10 $\mu$  particle size. However, separate values for PM10 and PM2.5 cannot be determined. The requisite equipment shall be procured by ERA for separate measurement of these parameters and baseline data shall be generated for these 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

## **2. Ambient noise levels**

49. Automobiles contribute significantly to the noise pollution especially in congested areas such as crowded commercial areas and market places. Due to increasing number of vehicles, the noise pollution caused by them will soon reach alarming proportions. High level of noise pollution is created due to old age, poor maintenance and poor performance of the vehicles; narrow roads, poor geometrics, frequent jams and congestion aggravate the situation. The shortage of power coupled with unreliable and poor quality of power supply together with poor planning for the installations of generator sets and absence of acoustic treatment/enclosure, leads to excessive noise pollution. All these sources contribute significantly to noise pollution in the city in general and subproject area in particular. The following table (Table 9) depicts the levels of noise observed near the subproject sites in June, 2013. The measurements were done by Environmental Monitoring Laboratory of ERA.

**Table 9: Ambient noise quality**

S. N.	Location	Site type	Day time noise level dB(A) Leq	Day Time Noise Quality Standards <sup>4</sup> (MoEF/CPCB) (dB(A) Leq)
1.	Dada Ompora (S4)	Commercial area	52.67	65
2.	Wathora Bridge (S5)	Commercial area	63.56	65
3.	Kralpora Pumping station (S6)	Commercial area	61.21	65

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

50. The ambient noise levels along these sections were observed to be within the prescribed permissible limits.

51. The night time noise level data could not be generated owing to security reasons. Further, the execution of proposed subproject shall be done during day time only, because of same security reasons, therefore ruling out the possibility of any noise generation 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.

<sup>4</sup> 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

## B. Water Resources

52. **Surface Water:** Srinagar city is bestowed upon by nature with so many water bodies including world famous Dal Lake which is situated in the middle of the city. River Jhelum flows through the city dividing it into two parts. Other important water bodies in and around the city include Nagin lake, Anchar lake, Khushalsar, Gilsar, Hokersar (wetland), Telbal nallah, Dachigam nallah and Doodhganga nallah.

53. The water quality of Doodhganga Nallah at different location along the proposed subproject has been analyzed in June, 2013 by the environmental monitoring laboratory of ERA and is presented in **Table-10**.

**Table-10: Surface Water quality baseline data**

Sampling Site	Locations	Temperature °C	pH	Conductivity µS/cm	DO mg/l	BOD mg/l	TDS mg/l	TSS mg/l	Turbidity (NTU)
Nowhar Bridge (Near tapping point)	Upstream	13	7	59	8.4	1.2	35	45	11.5
	Downstream	14	7	60	8.4	1.2	38	50	11.6
Kralpora (Doodhganga)	Upstream	18	8	326	6.4	2.0	213	145	13.0
	Downstream	18	8	353	6.0	2.4	233	155	13.7
Wathora Bridge (Doodhganga)		15	8	263	7.4	1.8	184	54	8.2
<b>Surface water standards (As per IS:2296)</b>									
Category A		-	8.5	-	6	2	500	-	-
Category B		-	8.5	-	5	3	-	-	-
Category C		-	8.5	-	4	3	1500	-	-
Category D		-	8.5	1000	4	-	-	-	-
Category E		-	8.5	2250	-	-	2100	-	-

DO= dissolved oxygen; BOD= biochemical oxygen demand; TDS= total dissolved solids; TSS= total suspended solids; °C= degree Celsius; µS/cm= micro Siemens per centimetre; mg/l= milligram per litre; NTU= nephalo turbidity units.

54. It is clear that the parameters analyzed above are within permissible limits.

55. As per water quality standards for various water classes based on use (i.e. class A, B, C, D, E), the water of Nallah Doodhganga falls in category A and is suitable for drinking without any conventional treatment but after disinfection.

56. At downstream of Doodhganga Nallah, the water usage is predominantly limited to abstraction of 7.75 MLD by existing water lift station for WTP Kralpora (water supply scheme Doodhganga) besides some unregulated lifting for irrigation purposes by the local farmers. After execution of the proposed (45.4MLD) gravity based transmission line from tapping point at upper reaches of Doodhganga Nallah upto existing water treatment plant located at Kralpora the lift system will be abandoned. The maximum water portion of Doodhganga Nallah enters into Jhelum flood channel. The implementation of the subproject will not impact the downstream users in anyway.

57. The water transmission pipes shall be laid only at two locations on banks of Doodhganga Nallah. The total length of pipe to be laid along the Doodhganga river bank is about 575m (dia 750mm) at upper reaches and about 600m (dia.600mm) along the left side of Doodhganga Nallah (RD17,300m to RD17,900m) located at Handal Bagh Kralpora rest of the pipeline is proposed to be laid along the existing R&B road alignment.

58. **Geohydrology and Groundwater:** The depth of water table at the proposed "Providing and laying of raw water transmission main from near upper reaches of Doodhganga to Kralpora Water treatment Plant in Srinagar city", Srinagar is reported to



be between 2.5m to 7.0m with average depth of 4.71m. Public water supply is the major source of potable water for the settlements around the subproject area. Water table was measured inside the borehole with reference to the Natural soil Level (NSL) on the day of field investigations, and was encountered at a relatively shallow depth at all boring locations. A potential seasonal variation of  $\pm 1.0\text{m}$  to  $2.0\text{m}$  may be expected. In view of above, there is a prospect for seepage water to get intruded at location of working area, during any open excavation, below Natural Soil Level (NSL) at boring locations.

### C. Ecological Resources

59. **Terrestrial ecology and Biodiversity.** Since the subproject stretch is located within heavily built-up area of Srinagar city, no sensitive ecological areas are located along the stretches of subproject.

60. **Forest Areas and Trees.** The subproject is located outskirts of Srinagar and there is no forest within or adjacent to the subproject area. However, a total of 552 trees are required to be removed for the construction of proposed subproject. These trees mainly include *Populus* sp, *Acacia* sp and *Salix*. All possible efforts shall be made to avoid unnecessary cutting of these trees. These trees are owned by State government. Compensatory plantation in the ratio of 1:2 will be carried out after completion of the proposed subproject through any concerned state department (like social forestry/ horticulture/ floriculture).

61. **Wild fauna.** No wild animals are reported around the subproject site as there is no forest close to the subproject site.

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

63. **Protected Area.** There is no protected area within or adjacent to the proposed subproject area

64. **Fisheries.** The common fish species found in River Jhelum and other water bodies of the city include mirror carp, scale carp, Schizothorax, and trout. Commercial fishing is carried out in Dal Lake and in some stretches of River Jhelum. Therefore, no interference with fishery activities is envisaged by execution of the proposed subproject.

### D. Economic Development

65. Jammu and Kashmir's economy is predominantly dependent on agriculture and allied activities. The Kashmir valley is also known for its sericulture and cold-water fisheries. Wood from Kashmir is used to make high-quality cricket bats, popularly known as Kashmir Willow. Kashmiri saffron is also very famous and brings the state a handsome amount of foreign exchange. Agricultural exports from Jammu and Kashmir include apples, barley, cherries, corn, millet, oranges, rice, peaches, pears, saffron, sorghum, vegetables, and wheat, while manufactured exports include handicrafts, rugs, and shawls.

66. Horticulture plays a vital role in the economic development of the state. With an annual turnover of over Rs. 300 crore, apart from foreign exchange of over Rs. 80 crore, this sector is the next biggest source of income in the state's economy. The region of Kashmir is known for its horticulture industry and is the wealthiest region in the state. Horticultural produce from the state includes apples, apricots, cherries, pears, plums, almonds and walnuts.

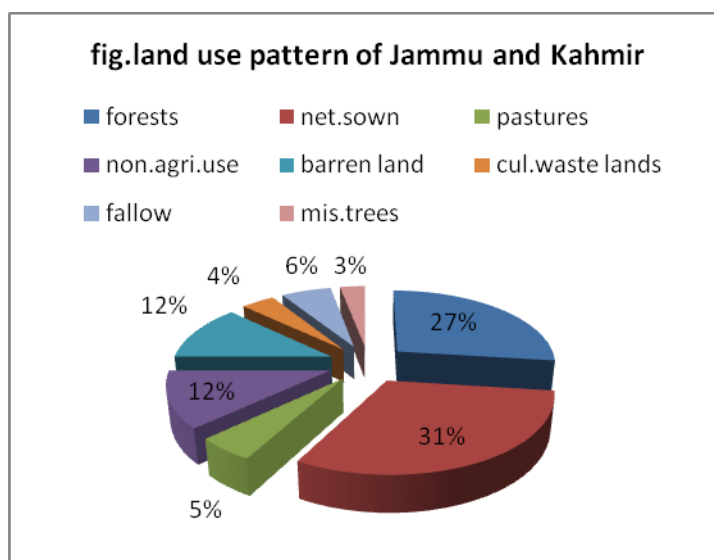
67. **Land use Pattern.** As per Master Plan for Srinagar (2001-2021), 27.70% area of Srinagar city is developed (various types of constructions), 5.4% under defense use, 55.10%

under agriculture, horticulture and rocky land, and 11.66% is covered by water bodies and floating gardens. The proposed subproject will be located within the urban city areas. The broad land uses of Srinagar local area are summarized in **Table-11** below.

**Table 11: Broad land uses of Srinagar Local Area**

Sl.No.	Type of Land use	Percentage
1	Developed area including public, semi public, utilities services, graveyards and cremation grounds etc.	27.70
2	Defence use	5.54
3	Agriculture, plantation, cultivation of trees, orchards, farms and rocky land	55.10
4	Water bodies, river, mullahs and floating gardens	11.66
	<b>Total</b>	<b>100</b>

68. Overall land use pattern of Jammu and Kashmir is shown in Figure 5.



Source: Land use pattern of Jammu and Kashmir as per digest of Statistics(1999-2000),GoI

69. **Commercial Activities:** The land use in the subproject area is mainly commercial. Varied types of commercial activities in the form of wholesale, retail or small scale services are carried out in this area.

70. Laying of DI of pipes will be done on the existing R&B roads or lanes within the available right of way (ROW) and will not involve any land acquisition. The subproject will not have any impact upon any structures.

71. **Industrial Development.** Kashmir region in general is poor in industrialization. However, as per the Master Plan for Srinagar 2001-2021, about 295 hectares land is under the use of industrial purpose of which 155 hectares is by service industries. Major but small scale industrial units in the city include silk factories, woolen mills, Khadi and Village industries, spinning mills, telephone factory, carpet making, food processing units, brick and tile factory, cottage industries, etc. However, such units have not been recorded in the immediate vicinity of the subproject site.

72. **Agriculture.** About 21,488 hectares of land is presently under agricultural use in Srinagar local area. Due to the spread of urbanization, the agricultural activities are decreasing. The net area proposed under agricultural activities by the Master plan 2001-

2021 is 23.27% of the Srinagar local area. There are little agricultural activities carried out in the subproject impact zone near to the tapping point. However the laying of DI pipes will not have any impact to the agricultural related activities.

73. **Infrastructure Facilities.** Since the subproject is situated in Srinagar city. The infrastructure facilities like schools, hospitals, college, drinking water supply system, electricity and communication in the subproject area are satisfactory.

74. **Water supply.** Broadly, the existing water supply system in Srinagar City consists of five sub systems. These sub systems are based on five number of intake works and water treatment plants of the existing water supply system. They are, Water Supply System based on Nishat water treatment plant – 19 MLD, Water Supply System Based on Alusteng water treatment plant - 6.8 MLD, Water Supply System Based on Doodganga water treatment plant -7.75 MLD, Water Supply System Based on Rangil water treatment plant – 20 MLD, Water Supply System Based on Pokhribal Water Treatment Plant – 4 MLD. Total installed capacity is 57.55 MLD but actual operating capacity is 40.28 MLD. The five water treatment plants as a whole serve mostly the entire population of Srinagar City.

75. **Sewerage System.** Srinagar city is proposed to be managed through an elaborate network of sewer lines in the form of trunk sewers, lateral sewers and house connections spread over more than 10 zones that will collect millions of liters of raw domestic sewage on daily basis for treatment through STPs (Sewerage Treatment Plants) augmented by IPS's (Intermediate Pumping Stations) at various locations. Currently part of Srinagar city around Dal lake and old city are catered to by a sewerage system. 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 to house hold to ensure operational efficiency of this vital public system.

76. **Drainage.** As per storm water drainage master plan, Srinagar city is divided into three drainage zones. There are about 50 existing drainage schemes having about 119 km of primary and secondary storm water drains. In addition to such drains, there are substantial lengths of tertiary drains/ deep drains.

77. **Solid Waste.** Estimated quantity of solid waste generation in Srinagar is 450 grams per capita per day. Taking March 2006 populations as 1.035 million, the total quantity of municipal solid waste (MSW) generated in Srinagar in 2006 was 467 MT. During peak tourist season of summer, these figures increase by 3 to 4% due to garbage generated by tourists. It is estimated that less than 50% of waste is collected and disposed at the dumping site at Achan. The total solid waste generated in 2009 in the Srinagar city, including those from the fruit and vegetable market was 680 tons/day i.e. about 0.5 kg/head/day. (In 2020 it shall be about 880 tons/day).

78. **Transportation.** Srinagar city is connected with Jammu and rest of India. National Highway - 1A connects Ambala to Srinagar via Jammu. Srinagar is also well connected by air and laying of railway track is in progress. Transportation system of Srinagar city is characterized by radial form of development with East-West and North-South corridors forming major radials and National Highway Bypass is the only bypass. 43% of the arterial and sub arterial road network within the town has carriage way width less than 7.0 m. 32% of the road length has carriageway width of 7.0 m, while 25% of the road has carriage way width of more than 7.0 m. Srinagar City like any other historical city has very complex road network.

79. Share of goods vehicles and slow moving vehicles is low, while the passenger fast moving vehicles including cars, van / taxis, auto rickshaws, Mini Bus and two wheelers are predominant modes of transport. Passenger fast vehicles constitute for more than 90 % of the traffic on road, cars and taxis constitute more than 50 % of traffic on roads. In goods

vehicle category, there are no heavy vehicles and it is mostly LCV plying in the area. In slow moving vehicles category, cycles are predominant and other categories are almost negligible.

## E. Social and Cultural Resources

80. **Demography** Jammu and Kashmir has a Muslim majority population. It is not the only Muslim majority state or territory in India, but shares this characteristic with the tiny union territory of Lakshadweep (total area being 11 square miles). 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 (inclusive of Megh Bhagats) 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 profile of Jammu and Kashmir state is presented in Table-12 below:

**Table 12: Demographic status of Jammu and Kashmir**

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%
<b>Jammu and Kashmir</b>	<b>10,143,700</b>	<b>66.97%</b>	<b>29.63%</b>	<b>2.03%</b>	<b>1.36%</b>

*Statistics calculated from the 2001 Census India District Profiles.*

81. In Jammu and Kashmir, the principal spoken languages are Kashmiri, Urdu, Dogri, Pahari, Balti, Ladakhi, Gojri, Shina and Pashto. However, Urdu written in the Persian script is the official language of the state.

82. **Health and Educational Facilities.** Since the subproject is situated in Srinagar city. The infrastructure facilities like schools, hospitals, college, drinking water supply system, electricity and communication in the subproject area are satisfactory.

83. Notable higher education or research institutes in Jammu and Kashmir include Sher-e-Kashmir Institute of Medical Sciences Soura Srinagar, National Institute of Technology Srinagar, Government College of Engineering and Technology, Jammu and the Government Medical College of Jammu. University-level education is provided by University of Jammu, University of Kashmir, Sher-e-Kashmir University of Agricultural Sciences and Technology Jammu, Sher-e-Kashmir University of Agricultural Sciences and Technology Kashmir, Shri Mata Vaishno Devi University Jammu, Islamic University of Science and Technology Kashmir, Baba Ghulam Shah Badshah University Jammu, SSM College of Engineering and Technology Kashmir, and various Government Degree Colleges.

84. **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. As a consequence, houseboats became popular among those who were unable to purchase land in the Valley and has now become an integral part of the Kashmiri lifestyle.

85. The Dumhal is a famous dance in the Kashmir valley, performed by men of the Wattal region. The women perform the Rouff, another traditional folk dance. Kashmir has been noted for its fine arts for centuries, including poetry and handicrafts. Shikaras, traditional small wooden boats, and houseboats are a common feature in various lakes and rivers across the Valley. Shikaras are a common feature in lakes and rivers across the Kashmir valley.

86. Kehwa, traditional green tea with spices and almond, is consumed all through the day in the chilled winter climate of Kashmir. Most of the buildings in the Valley and Ladakh are made from softwood and is influenced by Indian, Tibetan, and Islamic architecture.

87. 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, along with Accession Day, an annual holiday which commemorates the accession of Jammu and Kashmir to the Dominion of India. After Dogras, Gujjars form the second-largest ethnic group in Jammu. Known for their semi-nomadic lifestyle, Gujjars are also found in large numbers in the Kashmir valley. Similar to Gujjars, Gaddis are primarily herdsman who hail from the Chamba region in Himachal Pradesh. Gaddis are generally associated with emotive music played on the flute. The Bakkarwalas 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.

88. Some archaeological, historical monuments and religious places like Burzhama archaeological site, historical Jamia Masjid, Pathar Masjid, Hazratbal Shrine, and Chati Padshahi Gurudwara, etc. are located in Srinagar city. However these sites are located far away from the proposed subproject which will have no impact on any of such places and therefore no adverse impact is anticipated.

89. The Kashmir division of J&K State has ideal tourist spots with scenic beauty, adventure tourism, ecotourism, pilgrimage tourism, and other historical places and monuments which attract large number of tourists. Major tourist places in Srinagar city include Dal Lake, Mughal gardens, Hazratbal Shrine, Shankar Achariya Temple, etc. Dal Lake is 9 km, Mughal Gardens 10-14 km, Hazratbal Shrine 12 km, and Shankar Achariya Temple 9 km away from the subproject area; hence no such impact on these sites is anticipated.

90. **Sensitive Environmental Receptors:** The sensitive environmental receptors existing along the road alignment of proposed raw water scheme in subproject area include religious places, educational institutions and community property resources. The details of the existing sensitive environmental receptors are given in **Table 13** below.

**Table 13: Sensitive environmental receptors in subproject area.**

Sensitive Feature	Location	Alignment (RHS/LHS) <sup>5</sup> vis-à-vis the flow in the proposed drain	Distance (m) from the alignment
Hanfiya Public school	Kralpora	LHS	10
Petrol Pump	Kralpora	RHS	7
Mosque	Kralpora	LHS	12
Mosque	Gopalpora	RHS	10
Mothers Dreams School	Gopalpora	LHS	30
Shabir Allam School	Gopalpora Kralpora	RHS	7
Govt. Hr Sec. Institution	Gopalpora Wathura	LHS	15
Mosque	Gopalpora Wathura	LHS	12
Mosque	Shahpora Wathura	RHS	9
Govt. Middle School	Near Wathura Bridge	RHS	30
School	Near Wathura Bridge	LHS	17
School	Batapora Wathura	LHS	30
Petrol Pump	Wathura	LHS	20

<sup>5</sup> LHS-Left Hand Side RHS-Right Hand Side

Petrol Pump	Chadoora	LHS	7
Mosque	Chadoora	LHS	8
Mosque	Alipora Chadoora	RHS	4
School	Sogam	RHS	11
Mosque	Sogam	LHS	5
Mosque	Zohama	RHS	4
Govt. School	Zohama	RHS	20
Govt. Hr Sec School	Zohama	LHS	17
Health Centre	Dadah Ompora	LHS	9
Mosque	Dadah Ompora	RHS	7
School	Dadah Ompora	RHS	7

Source: DSC (K), Survey

91. It is clear from the above table that some of the sensitive receptors are very close to the laying of raw water alignment. During the construction phase necessary mitigation measures should be taken.

## V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

92. The present report assesses the impacts of the proposed activities on various environmental attributes of the subproject site.

93. **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.

94. 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 14:

**Table 14: Summary of Quantifiers and Qualifiers Used for Assessment Purposes**

Duration (time-scale)	Short-term	Impact restricted to construction (0-2 year).
	Medium-term	Impact will continue throughout operation (30 years).
	Long-term	Impacts will exist beyond the life of the Water supply infrastructure (>30 years)
	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 beyond the site boundary but limited to the State of Jammu and Kashmir.
Significance rating pre / post-mitigation (positive / negative)	Low	The impact will have a minimal effect on the environment.
	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%)

95. Categorization of the subproject has been undertaken using REA Checklist for Raw water supply.

## Planning and Design Phase

96. Planning principles and design considerations have been reviewed and incorporated into the site planning process whenever possible. The concepts considered in design of the proposed subproject "Providing and Laying DI pipes in the outskirts of Srinagar City are: (i) minimum land acquisition; (ii) improvement in raw water transmission (iii) Reducing water pollution (iv) most suitable construction methodology; and (v) Site constraints.

97. The Salient design features are presented in **Table 15**.

**Table-15 Silent Design Features of the subproject**

Parameter	Design Consideration
Raw Water Transmission	The proposed subproject includes construction of complete closed raw water system which includes laying of DI pipeline, installation of double kinetic air valve, scour valves, steel racks and other valves.
Raw Water Transmission System	<p>The subproject consists of Construction of 18.5 km long DI pipes K9 of 750mm and 600mm internal diameter raw water transmission system with RCC circular collection sump and construction of RCC divide wall at takeoff source, Providing scour sluice valves at depressed points, Construction of 2 steel pipe rack over Nallah at Zoohama, Wathora and Kralpora. RCC thrust blocks for DI bends and saddle blocks at Kralpora. The air release valves, sluice valve and scour valves should be located appropriately and suitably such that they do not cause any inconvenience to the residents and passers-by and do not impair aesthetics of the surroundings.</p> <p>Installation of air valves as per requirement and installation of pressure control valves at 2 spots along the line. Installation of electromagnetic flow meters at Nowhar, Wathora and Kralpora Treatment plant. The proposed tapping point is near the take off point of existing irrigation canal on Doodganga Nallah situated at a distance of 575m from Nowhar Bridge. For abstraction / tapping of water it has been proposed to construct RCC divide wall for a length of 50m and construction of small weir of width of 2.7m and a height of 0.90m for embedded 750mm dia pipe. The total length of pipe to be laid along the river bank near tapping point is about 575m (dia 750mm) and about 600m (dia.600mm) along the left side of Doodhganga Nallah at RD17,300m to RD17,900m) located at Handal Bagh Kralpora. Construction of steel pipe rack for crossing of 750mm dia.pipe and 600mm dia.pipe over Doodhganga Nallah at Zuhama, Wathore and at Kralpora near water lifting pump station. The pipe rack for crossing of pipe at Zuhama involve: cement concrete block 2 No.'s. of RCC in foundation with superstructure of RCC pipes upto pipe crossing level. Steel I-beam 2 No.'s for span of 13m with ISLC at 1m c/c with side railing and angle iron supports. For steel pipe rack at Wathora/ Kralpora shall of 2 pile foundations with pile cap and RCC column of 1000mm dia. upto the height of 7-8m at mid span and RCC abutment wall at end supports on Nallah banks.</p> <p>2No.'s ISMB 450mm×150mm with cross supports of ISLC 75×40mm at the rate of 1m c/c with side railing of angle iron/ GI pipes. Laying of DI pipes shall be along the edge of the road. The excavation shall be for a depth equal to pipe dia. and a cushion of 1m and for a width equal to dia. of pipe and 400mm. For washing of pipe scour valves shall be fitted at feasible spots i.e., Wathora and at Kralpora. The protection bund of earth filled gunny/ cement bags shall be build along the edges of river in order to avoid sliding and erosion of earthen materials. The diversion bunds (Ring Bund) shall be build at the edge of river for the ease of civil work and also helps to avoid the mixing of excavated material into the river. The workers working near the edge of river shall be provided proper protection equipments viz., live saving jackets, helmets, safety belts, gum boots, etc.</p>
Construction Method for the intake point along the river banks and along the road	<p>It is proposed to construct RCC divide wall at RD-0 of pipe alignment for diversion of water at an angle 45-60° for a distance of 50m down side of Doodhganga Nallah. The 750mm DI pipe to be embedded in RCC block of with 2.75m and pipe is to be laid on Crate Boulders embankment for a length of about 600m.</p> <p>The required quantity of raw water is to be collected on RCC settling chamber having overflow</p>

Parameter	Design Consideration
alignment.	<p>dain off system at distance of 570m from intake point.</p> <p>The raw water transmission DI K-9 shall to be carried along the existing road on the right side of the road with berm cut and also road cut as per site requirements. The total width of road cut shall be based on norms as dia.of pipe and 400mm and depth is dia.of pipe with cushion of 1000mm. The trenches will be filled back partly by excavated material and partly by GSB of 275mm . The balance shall be of G1, G2, dense macadam/ semi dense. Laying of pipe will not remain open for more than 2-3 hours. No road closure is anticipated.</p>
Location.	The subproject Laying of DI pipes for transmission of raw water from higher reaches of Doodhganga Nallah to the WTP Kralpora along the RoW of Existing R&B roads in the outskirts of Srinagar City.
Climatic Conditions	Rainfall intensity and run off may have implications on different productive lands (agriculture, horticulture etc), road surfaces etc Furthermore, climatic conditions play an important role during dispersion of noise and air pollutants. During field investigation, it has been found that number of waterlogged days in each part of the subproject area is between 25 to 30 days in a year. Water logging problem in the subproject area will be mitigated after execution and commissioning of proposed works. There will be benefits of prevention of damage to land, buildings, roads and improvement of public health in the subproject area. Seasonal climatic conditions have been considered for scheduling of construction activities
Air Quality <sup>6</sup>	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 <sub>10</sub> and PM <sub>2.5</sub> ) 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	There is no proper drainage system in the area to carry the discharge from the surrounding area to nearby water bodies.
Ecological diversity	The subproject is situated within an existing built up area where road infrastructure already exists. 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 impacts on biodiversity within the area. However the subproject may affect existing trees present along the proposed subproject. No Permission will be necessary prior to start of civil works as no tree falls in scheduled or protected class. Any landscaping to be undertaken will be done with locally indigenous species and low maintenance requirements.
Land use and livelihoods	Laying of DI of pipes will be done on the existing R&B roads or lanes within the available right of way (ROW) and will not involve any land acquisition. The subproject will not have any impact upon any structures.
Traffic flow and access	<p>Due to the location and nature of the subproject, there will no interference with accesses. There will be no road closure because of the construction.</p> <p>Dumping of materials (to be used in construction) will be carried out during night hours. The inconveniences if any, due to construction site will be provided with proper mitigation methods. 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;</p> <p>i) Pedestrians will be provided with a reasonably safe, convenient and accessible path that replicates the most desirable characteristics of the existing sidewalk(s) or footpath(s).ii) Provide pedestrian information throughout the construction period in the form of Clearly defined advanced warning area.</p> <p>iii) Cross pedestrians to the other side of the street if possible.</p> <p>Iv) It is recommended to adopt adequate safety measures during construction phase e.g., markings, barriers, traffic diversions etc. so as to minimize chances of accidents and</p>

<sup>6</sup> 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 (CO<sub>2</sub>) and secondary pollutants such as hydrocarbons (HC), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO) and sulphur dioxide (SO<sub>2</sub>). 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
	inconvenience to the public at large.
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 will be generated from the various construction activities like construction works, operation of construction equipment and vehicles engaged in transportation of construction materials. However, transportation of construction materials will be confined to the requirement per day, depending upon extent of construction activity. However, these noise levels will be confined to the work sites only and will be temporary in nature occurring mostly during daytime. There will be increased noise levels on sensitive receptors during the construction. This will be limited during the construction phase only. The proposed subproject will not cause any deterioration of surface roads that will led to increased vibration. But vibrations will be produced as part of construction phase that will be mitigated accordingly.
Aesthetics, landscape character and sense of place <sup>7</sup>	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.

98. The following table 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.

<sup>7</sup> Aesthetics refer to the visual quality of an area as imparted by the physical properties of an area, such as scale, color, 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 road development with its immediate surroundings. Impacts are not restricted to the road reserve but the entire view shed (area from where the road development 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 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.

**Table 16: Summary of Anticipated Potential Environmental Impacts during Planning and Design Stage**

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Existing Situation	<ul style="list-style-type: none"> <li>The problem of inadequate raw water infrastructure results in raw water pollution and contamination thereby increasing overall unhygiene of the people.</li> <li>Open raw water channels provides breeding grounds for different water borne diseases like malaria, cholera etc that creates an unsafe environment for residents, pedestrians and commuters. This acts as a barrier to redevelopment and growth of the area.</li> </ul>	<ul style="list-style-type: none"> <li>The subproject will improve raw water facility in a safe and efficient manner.</li> <li>Efficient and closed raw water transmission from the area will result in control of numerous water borne diseases.</li> </ul>	High ( - )	Local/ Regional	Medium-term	Full Mitigation Definite	High ( + )
Planning initiatives	<p>Planning initiatives have been identified as:</p> <ul style="list-style-type: none"> <li>Laying of DI pipes for transmission of raw from upper reaches of Doodh Ganga to WTP kralpora led to improved long-term raw water management along RoW of existing R&amp;B Road in Srinagar City.</li> </ul>	<ul style="list-style-type: none"> <li>The subproject will improve raw water facility in a safe and efficient manner. This will allow for the planning initiatives to be realized.</li> </ul>	High ( - )	Local/ regional	Medium-term	Full mitigation definite	High ( + )
Identification of raw water transmission needs and demands	<p>The ERA vision is to provide safe, reliable, effective and efficient raw water transmission facilities which will best meet the needs of the people in such a way which supports government strategies for economic and social development, whilst being environmentally and economically sustainable.</p>	<ul style="list-style-type: none"> <li>The subproject will improve raw water facility in a safe and efficient manner.</li> <li>Efficient and closed raw water transmission will benefit in control of numerous water borne diseases.</li> </ul>	High ( - )	Local	Medium-term	Full mitigation definite	High ( + )
Alternatives	<p>The following alternatives have been considered:</p> <ul style="list-style-type: none"> <li>Option-1: Do nothing. This will not augment transmission of unhygienic polluted raw water to Kralpora WTP address.</li> <li>Option-2: Do Minimum. This option involves at grade improvements to slightly improve existing scenario but still does not completely augment transmission of unhygienic polluted raw water to Kralpora WTP</li> </ul>	<p>Approval of the IEE and Environmental Management Plan to ensure proposed mitigation measures are complied with.</p>	High ( - )	Site	Short to Medium-Term	Partial Mitigation Definite	Medium ( - )

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
	address. <ul style="list-style-type: none"> <li>Option-3: Current preferred option. This offers the best balanced solution by providing the desired outcomes with least impacts on environment and minimum land acquisition.</li> </ul>						

## Construction Phase

99. Table 17 presents an indication of what activities and facilities are likely to be undertaken during construction of the subproject, including the associated inputs and outputs.

**Table 17: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Construction Phase**

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
<ul style="list-style-type: none"> <li>Construction camp and its associated facilities (including lay-down areas)</li> <li>Storage camps and lay-down areas <ul style="list-style-type: none"> <li>Materials and equipment stockpiles</li> <li>Handling and storage of hazardous materials including chemicals additives, gravel, cement, concrete and lubricants</li> </ul> </li> <li>Source of water</li> <li>Vegetation clearance</li> <li>Bulk earthworks, grading and contouring.</li> <li>Boring</li> <li>Movement of construction staff, equipment and materials</li> <li>Importation of selected materials/base layer construction. <ul style="list-style-type: none"> <li>Laying of DI pipes</li> <li>Construction of pipe racks for river crossing.</li> <li>Construction of a surfaced layout</li> <li>Sub-base and base layers (Excavations, Grading, Importation of fill materials and selected gravel materials for sub-base and base layers, Application of water, Compaction and Disposal of spoil material (excess excavated soil)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Bitumen</li> <li>Cement</li> <li>Chemical additives used in concrete / asphalt (i.e. retarders)</li> <li>Paving blocks/bricks</li> <li>Aggregate (sand and stone)</li> <li>Gravel (fill material for embankments/selected material for sub-base and base layers)</li> <li>Water <ul style="list-style-type: none"> <li>Drinking, cooking and sanitation at construction camps</li> <li>Water for dust suppression</li> <li>Water applied to base and sub-base layers during compaction</li> <li>Water for application to sub-base and base layers prior to compaction</li> </ul> </li> <li>Petrochemicals</li> <li>Other chemicals/lubricants/paints</li> <li>Construction vehicles, machinery and equipment</li> <li>Temporary energy supply to</li> </ul>	<ul style="list-style-type: none"> <li>Old asphalt<sup>8</sup> (removed from existing road during laying of RCC pipes.</li> <li>Waste concrete and other construction rubble</li> <li>Waste bitumen<sup>9</sup></li> <li>Used fuels, lubricants, solvents and other hazardous waste</li> <li>General waste</li> <li>Contaminated soil <ul style="list-style-type: none"> <li>Soil contaminated with bitumen</li> <li>Soil contaminated with petrochemicals (i.e. oils and lubricants) and other chemicals</li> </ul> </li> <li>Sewage and grey water (temporary construction camp sanitation)</li> <li>Spoil material (excess soil removed during excavations)</li> <li>Noise and vibrations (construction vehicles and machinery)</li> </ul>

<sup>8</sup> The restoration of 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 construction is to be carried out, reusing the old asphalt may be more costly than using virgin aggregate

<sup>9</sup> 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
<ul style="list-style-type: none"> <li>- Construction of wearing course (Asphalt layer, Bitumen seal, Concrete and Paving block)</li> <li>• Temporary detours</li> <li>• Noise and vibrations</li> <li>• Dust suppression</li> <li>• Waste production and temporary storage/disposal i.e. used fuels, waste concrete and bitumen, spoil materials and general waste</li> <li>• Stabilization of slopes and erosion prevention</li> <li>• Use of asphalt/bitumen (and associated storage and mixing areas, chemicals)</li> <li>• Concrete batching plan (and associated storage and mixing areas, chemicals)</li> <li>• Interaction between construction workforce and local communities</li> <li>• Management of the passing pedestrians and points of congestion</li> </ul>	<ul style="list-style-type: none"> <li>construction camps</li> <li>• Topsoil used during revegetation and rehabilitation</li> <li>• Plant material for re-vegetation (seeds, sods, plant specimens)</li> <li>• Labour <ul style="list-style-type: none"> <li>- Recruitment of construction workforce</li> <li>- Skills training</li> </ul> </li> <li>• Public movement control <ul style="list-style-type: none"> <li>- need barriers (not just danger tape) to protect people from trenches during construction</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Lighting at construction camps, equipment yards and lay-down areas</li> <li>• Plant material removed from servitude during vegetation clearance</li> <li>• Smoke and fumes <ul style="list-style-type: none"> <li>- Burning of waste</li> <li>- Burning of vegetation cover</li> <li>- Fires used for cooking and space heating (construction camps)</li> <li>- Vehicle exhaust emissions</li> </ul> </li> </ul>

100. The following table 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.

**Table 18: Summary of Anticipated Potential Environmental Impacts During Construction Phase**

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Climate	<ul style="list-style-type: none"> <li>• The nature and intensity of rainfall events in an area, has implications for storm water management.</li> <li>• Smoke from burning activities could be wider spread on windy days especially when dust could be blown off site.</li> </ul>	<ul style="list-style-type: none"> <li>• Seasonal climatic variations will be considered during scheduling of construction activities in the area</li> <li>• Excavations and other clearing activities will only be done during agreed working times and permitted weather conditions.</li> <li>• Storm water control during construction phase as per the method approved by the Engineer.</li> <li>• Seeding of topsoil and subsoil to prevent wind and water erosion of soil surfaces.</li> <li>• No open fires permitted on site</li> </ul>	Low (-)	Site	Short-term	Full Mitigation Probable	Low (-)
Air Quality	<ul style="list-style-type: none"> <li>• Sensitive receptors (e.g. hospitals, schools, religious places ) may be affected temporarily and related impacts during the construction phase</li> <li>• Fugitive dust can also impact air quality in subproject area</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure compliance with the Air Act.</li> <li>• Ensure compliance with emission standards</li> <li>• Guidelines that deal with the control of air pollution on site have been outlined in the Environmental Management Plan (EMP)</li> <li>• Monitoring of air pollution levels in potential problem areas will be undertaken.</li> <li>• Management (including storage, transport, handling and disposal) of hazardous substances used during</li> </ul>	High (-)	Local	Short-term	Partial Mitigation Probable	Medium (-)

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
	<p>during construction. Exhaust fumes from construction machinery, and potential smoke from cooking fires.</p> <ul style="list-style-type: none"> <li>Burning of waste and cleared vegetation</li> <li>Odors from use of toilet facilities' other than provided facilities.</li> </ul>	<p>construction.</p> <ul style="list-style-type: none"> <li>Dust control measures have been included in the EMP.</li> <li>Dust generating construction activities will be avoided during strong winds.</li> <li>Soil loads in transit will be kept covered</li> <li>Stockpiles of soil will be kept covered or have suitable dust palliative applied such as water</li> <li>A suitable dust palliative (water) will be applied if dust levels rise above acceptable levels, Regular servicing vehicles off site in order to limit gaseous emissions.</li> <li>No open fires permitted on site</li> <li>Temporary toilet facilities will be provided on site and will be maintained on a daily basis.</li> </ul>					
Geology	<ul style="list-style-type: none"> <li>Strong water flows into open excavations may occur, causing sidewall collapse.</li> <li>Layers of mixed fill cover natural ground surface in many places.</li> <li>Contamination from spillage of petroleum products, spent engine oil and oil leaks from construction vehicle maintenance taking place on site.</li> <li>Contamination through use of toilet 'facilities' other than provided facilities.</li> </ul>	<ul style="list-style-type: none"> <li>The design of the site drainage system is adequate to control runoff from the subproject site in line with topographical features of the site.</li> <li>Rehabilitate all sites during construction including construction camps, stockpile area, temporary access and hauling routes, as soon as possible after the disturbance has ceased.</li> <li>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.</li> <li>Contaminated water will be contained and disposed off site at an approved disposal site at Achan Landfill in Srinagar.</li> <li>The contractor will dispose of waste from the oil interceptors at Achan Landfill in Srinagar</li> <li>Cement, concrete and chemicals will be mixed on a concrete plinth and provisions will be made to contain spillages or overflows into the soil.</li> <li>No vehicle maintenance to be allowed on site.</li> <li>If oil spills occur the contaminated soil will be disposed of at the Landfill site at Achan in Srinagar.</li> <li>Temporary toilet facility will be provided by contractor on site and maintained on a daily basis.</li> <li>Topsoil and subsoil will be protected from contamination.</li> <li>Subsoil and overburden in all construction and lay down areas to be stockpiled separately and returned for backfilling in the correct</li> </ul>	Medium (-)	Site	Short-term	Full Mitigation Probable	Low (-)

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
		soil horizon order.					
Drainage and hydrology	<ul style="list-style-type: none"> <li>The proposed development is situated along existing R&amp;B roads and lanes. No wetlands or estuaries occur within the subproject location. Due to the nature and locality of the subproject there is unlikely to any significant impacts on water resources within the immediate area.</li> </ul>	<ul style="list-style-type: none"> <li>The site surface will be engineered and shaped in such a way that rapid and efficient evacuation of runoff is achieved.</li> <li>Provide containment areas for potential pollutants at construction camps, refueling, depots and concrete batching plants.</li> <li>Waste management practices will be implemented.</li> <li>The transport, storage, handling and disposal of hazardous substances will be controlled and managed.</li> </ul>	Low (-)	Site	Short-term	Full Mitigation Probable	Low ( + )
Biodiversity Fauna and Flora	<ul style="list-style-type: none"> <li>The proposed development is situated within an existing residential and commercial area. No areas of ecological diversity occur within the subproject location. Due to the nature and locality of the subproject there is unlikely to any significant impacts on biodiversity within the area</li> <li>The proposed construction of water supply may however affect existing trees.</li> </ul>	<ul style="list-style-type: none"> <li>No permission required for tree cutting as all trees are non scheduled.</li> <li>Any landscaping to be undertaken will be done with locally indigenous species and low maintenance requirements.</li> </ul>	Low (-)	Site	Short-term	Full Mitigation Probable	Low ( + )
Land Uses	<ul style="list-style-type: none"> <li>Due to the location and nature of the subproject, there will be interference with access</li> </ul>	<ul style="list-style-type: none"> <li>ERA has consulted with various organizations, departments, etc within the area and will be continued during the construction phase.</li> <li>ERA will made provisions for vehicle and pedestrian access to maintain community linkages.</li> <li>Consult with local departments, organizations, etc regarding location of construction camps other likely disturbances during construction.</li> <li>Provide clear and realistic information regarding detours if any and alternative accesses for local communities and businesses in order to prevent unrealistic expectations.</li> <li>Provide clear and realistic information regarding employment opportunities and other benefits for</li> </ul>	High (-)	Local	Short-term	Partial Mitigation Probable	Medium (-)

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
		<p>local communities in order to prevent unrealistic expectations.</p> <ul style="list-style-type: none"> <li>• Make use of local labor, materials, goods and services as far as possible</li> <li>• Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools.</li> <li>• Consult businesses and institutions regarding operating hours and factoring this in work schedules.</li> <li>• Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</li> </ul>					
Infrastructure and Services	<ul style="list-style-type: none"> <li>• Any community utility such as water supply lines, transformer and power supply cables, telephone cables, public convenience etc, if any, will be relocated if unavoidable. There are a number of existing infrastructure and services (roads, telecommunication lines, power lines and various pipelines within the vicinity of the subproject.</li> </ul>	<ul style="list-style-type: none"> <li>• Utility shifting will be undertaken prior to commencing Laying of DI pipes.</li> <li>• Keep construction related disturbances to a minimum.</li> <li>• Consult with affected service providers regarding impacts on access to infrastructure and services and alternatives.</li> <li>• Consult with affected communities or businesses prior to foreseeable disruptions, for example notifying residents of a temporary severance of water and electric supply.</li> <li>• Provide access points to infrastructure and services.</li> <li>• Monitor complaints by the public.</li> </ul>	Medium (-)	Local	Short-term	Full Mitigation Probable	Low (-)
Traffic	<ul style="list-style-type: none"> <li>• Increased volume of construction vehicles on the roads may lead to increased wear and tear of roads in the vicinity of the subproject site.</li> <li>• Road safety concerns due to slow moving construction vehicles.</li> </ul>	<ul style="list-style-type: none"> <li>• As the laying of DI pipes will be done along the RoW on the existing R&amp;B roads there will be partial or no traffic diversion and jams because of subproject implementation.</li> <li>• Negotiations will be carried with business owners and social service operations regarding the start of work.</li> <li>• Clear roads signs will be erected for the full length of the construction period. Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</li> <li>• A communications strategy is of vital importance in terms of vehicular traffic during closure or detouring of road. The scheduled time for closure/detour will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.</li> <li>• Construction routes clearly defined.</li> <li>• Access of all construction and</li> </ul>	High (-)	Regional	Short-term	Partial Mitigation Probable	Medium (-)

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
		<p>material delivery vehicles will be strictly controlled and allowed during non peak traffic hours.(After evening)</p> <ul style="list-style-type: none"> <li>Enforcement of speed limits.</li> </ul>					
Health and Safety	<ul style="list-style-type: none"> <li>Danger of construction related injuries.</li> <li>Open fires in construction camp can result in accidents</li> <li>Safety of workers and general public must be ensured.</li> <li>Poor waste management practices and unhygienic conditions at temporary ablution facilities can breed diseases.</li> <li>Standing water due to inadequate storm water drainage systems, inadequate waste management practices, pose a health hazard by providing breeding grounds for disease vectors such as mosquitoes, flies and snails.</li> <li>The use of hazardous chemicals in the construction can pose potential environmental, health and safety risks..</li> <li>Road safety may be affected during construction.</li> </ul>	<ul style="list-style-type: none"> <li>Implement good housekeeping practices at the construction camp.</li> <li>Strict health and safety measures to be implemented and audited on a regular basis.</li> <li>Secure enclosed construction site.</li> <li>Use of reputable contractors.</li> <li>Provide warning signs of hazardous working areas.</li> <li>Excavations to be clearly demarcated and barriers (not just danger tape) erected to protect pedestrians from open trenches.</li> <li>Workers will be thoroughly trained in using dangerous equipment.</li> <li>Workers have the right to refuse work in unsafe conditions.</li> <li>Undertake waste management practices.</li> <li>Control speed and movement of construction vehicles</li> <li>Improved signage, speed control, walkways and crossings will reduce health and safety risks due to construction.</li> <li>Exclude public from the site</li> <li>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</li> <li>Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;</li> <li>Provide medical insurance coverage for workers;</li> <li>Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</li> <li>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;</li> <li>Ensure moving equipment is outfitted with audible back-up alarms;</li> <li>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</li> </ul>	High (-)	Site and Local	Short-term	Partial Mitigation Possible	Low (-)



Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Scale	Duration	Mitigation	Significance After Mitigation
		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	<ul style="list-style-type: none"> <li>Sensitive receptors (hospitals, schools, religious places) may be affected temporarily.</li> <li>Use of heavy vehicles and equipment may generate high levels of noise.</li> <li>Vibrations resulting from bulk earthworks and compaction of base layers may create significant disturbances to nearby people and businesses.</li> <li>Disturbance from afterhours work.</li> </ul>	<ul style="list-style-type: none"> <li>Locate concrete batching, asphalt, crushing plants, lay down areas and construction camps away from sensitive receptors.</li> <li>Restrict construction activities to reasonable working hours where near sensitive receptors.</li> <li>Keep adjacent landowners informed of unusually noisy activities planned.</li> <li>Ensure that machinery is in a good state of maintenance.</li> <li>Silencers must be fitted and maintained to all machinery on site.</li> <li>Monitor noise levels in potential problem areas.</li> </ul>	High (-)	Local	Short-term	Partial Mitigation Probable	Medium (-)
Aesthetics, Landscape Character, and Sense of Place	<ul style="list-style-type: none"> <li>The presence of heavy duty vehicles and equipments, temporary structures at construction camps, stockpiles may result in impacts on aesthetics and landscape character</li> </ul>	<ul style="list-style-type: none"> <li>Storage areas will be properly fenced off.</li> <li>All domestic solid waste will be collected from a central point of disposal and fed into the city waste collection system.</li> <li>•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.</li> <li>Identification of suitable waste disposal site with enough capacity to hold additional waste to be produced by the proposed construction activities.</li> <li>Use of recycled material is encouraged especially in filling of excavated areas</li> <li>Guidelines regarding management of waste on site have been outlined in the EMP.</li> <li>Retain mature trees on and around the site where possible.</li> <li>Cluster construction activities on site on a specific area to avoid "sprawl".</li> <li>Unwanted material and litter will be removed on a frequent basis.</li> </ul>	Medium (-)	Local	Short-term	Partial Mitigation Definite	Low (-)
Workers Conduct	<ul style="list-style-type: none"> <li>Construction workers on site disrupting adjacent</li> </ul>	<ul style="list-style-type: none"> <li>Ensure strict control of laborers, minimizing working hours to normal working times, control littering, and</li> </ul>	Low (-)	Local	Short-term	Full Mitigation Definite	Low (-)

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
	land uses by creating noise, generating litter, and possible loitering.	ensure no overnight accommodation is provided.					
Employment Generation	<ul style="list-style-type: none"> <li>The subproject will provide employment opportunities for local people during construction.</li> <li>Expectations regarding new employment will be high especially among the unemployed individuals in the area.</li> <li>Labor gathering at the site for work can be a safety and security issue, and must be avoided.</li> <li>The training of unskilled or previously unemployed persons will add to the skills base of the area.</li> </ul>	<ul style="list-style-type: none"> <li>The use of labor intensive construction measures will be used where appropriate.</li> <li>Employ local (unskilled) labor if possible</li> <li>Training of labor to benefit individuals beyond completion of the subproject.</li> <li>Recruitment of labors will take place offsite.</li> <li>The contractual documentation will ensure that at least 50% of all labor is from surrounding communities</li> </ul>	Medium (+)	Local	Short-term	Partial Mitigation Probable	High ( + )
Archaeological and Cultural Characteristics	<ul style="list-style-type: none"> <li>The proposed development will not require demolition of ASI- or state-protected monuments and buildings</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that construction staff members are aware of the likelihood of heritage resources being unearthed and of the scientific importance of such discoveries.</li> <li>ASI or the State Department of Archaeology will be contacted if any graves be discovered and all activities will be ceased until further notice.</li> <li>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.</li> <li>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.</li> <li>No structures older than 100 years will be allowed to be demolished, altered or destructed without a permit from ASI or the State Department of Archaeology.</li> </ul>					

## Operation and Maintenance Phase

101. Table 19 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.

**Table 19: Summary of Activities and Facilities, Resource Use, and Produced Outputs during Operation and Maintenance Phase**

Activities and Facilities	Inputs/Resource Use	Outputs/Waste Production
<ul style="list-style-type: none"> <li>• Signage</li> <li>• Safety barriers</li> <li>• Lighting</li> <li>• Surface water drainage system</li> <li>• Cut and fill embankments</li> <li>• Vehicle exhaust emissions</li> <li>• Noise and vibrations</li> <li>• Litter collection</li> <li>• Maintenance activities <ul style="list-style-type: none"> <li>– Repainting of road markings</li> <li>– Pothole repair, crack sealing</li> <li>– Resealing/resurfacing</li> <li>– Safety barriers repairs</li> <li>– Upkeep and repair of surface water drainage system</li> </ul> </li> <li>• Eradication and control of invasive vegetation species</li> <li>• Auxiliary activities and Infrastructure <ul style="list-style-type: none"> <li>– Roadside markets and shops</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Labor</li> <li>• Vehicles and equipment used for inspections and maintenance</li> <li>• Bitumen and aggregate used during resurfacing/repair of roads and potholes.</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicle exhaust emissions</li> <li>• Dust</li> <li>• Particulates from tires, brake, and road wear</li> <li>• Petrochemical products leaking from vehicles and entering storm water</li> <li>• Potential for water resource contamination</li> <li>• Illegal dumping, mainly in open spaces near subproject area.</li> <li>• Litter, also entering surface water system and causing blockages</li> <li>• Noise and vibrations</li> <li>• Lighting</li> </ul>

102. The following table 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

**Table 20: Summary of Anticipated Potential Environmental Impacts During Operation and Maintenance Phase**

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Climate	<ul style="list-style-type: none"> <li>• The nature and intensity of rainfall events in an area, has implications for raw water transmission management through open channels.</li> <li>• The corrosive nature of climatic conditions may impact on infrastructure, including signage and safety barriers.</li> </ul>	<ul style="list-style-type: none"> <li>• The designed closed raw water transmission through DI pipes will control raw water pollution.</li> <li>• Provide warning signs and suggested speed limits during dangerous conditions.</li> </ul>	Low ( - )	Site	Medium-term	Partial Mitigation Probable	Low ( + )
Hydrology	<ul style="list-style-type: none"> <li>• The proposed subproject will not affect natural flow of water bodies. It is the safe transmission</li> </ul>	<ul style="list-style-type: none"> <li>• Design of closed raw water transmission system in line with</li> </ul>	Low ( - )	Local	Long-term	Partial Mitigation Definite	Low ( + )

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
	of raw water through DI pipes laying along the existing R&B roads and lanes, hence avoiding natural channels.	topographical features of the site will control raw water pollution					
Health and Safety	<ul style="list-style-type: none"> <li>The reduction in raw water pollution is expected to reduce the number of epidemics like malaria, cholera etc thus improving public safety.</li> </ul>	No Required	High ( + )	Local	Long-term	Partial Mitigation Probable	High ( + )
Aesthetics, Landscape Character, and Sense of Place	<ul style="list-style-type: none"> <li>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 better use of the area.</li> <li>The subproject will reduce raw water pollution.</li> </ul>	<ul style="list-style-type: none"> <li>Provide safe transmission of raw water.</li> </ul>	Low ( + )	Local	Long-term	Partial Mitigation	Medium ( + )

## Cumulative Environmental Impacts

103. Table 21 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.

**Table 21: Summary of Anticipated Potential Cumulative Environmental Impacts**

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
The transmission of raw water from Tapping point to the WTP Kralpora.	<ul style="list-style-type: none"> <li>The Laying of DI pipes along the RoW of existing R&amp;B roads and lanes for the transmission of raw water from tapping point to WTP Kralpora in Srinagar city will address the unhygienic raw water transmission problem of the area.</li> </ul>	<ul style="list-style-type: none"> <li>Refer to tables above</li> </ul>	High ( - )	Site/Local	Long-term	Full Mitigation Definite	High ( + )
The rationalization and reorganization of raw water transmission system from tapping point to WTP Kralpora.	<ul style="list-style-type: none"> <li>In order to promote the national imperative of promoting public drinking water quality, it is essential to provide a safe, efficient, reliable, raw water transmission system</li> </ul>	<ul style="list-style-type: none"> <li>Refer to tables above</li> </ul>	High ( - )	Site/Local	Long-term	Full Mitigation Definite	High ( + )
Reduction of raw water pollution and improvement in incidences of water borne diseases like malaria, cholera etc thus improving public Health.	<ul style="list-style-type: none"> <li>The expected land gains by virtue of effective raw water transmission allows for the area to be redeveloped and revitalized in a coordinated and integrated manner, ensuring connectivity between the various land uses, greater road, pedestrian/open spaces, general urban redesign of the appearance of the area to create a better quality environment for people.</li> <li>Improved drinking water facility to the City</li> </ul>	<ul style="list-style-type: none"> <li>Refer to tables above</li> </ul>	High ( - )	Site/Local	Long-term	Full Mitigation Definite	High ( + )

## Assessment of No-Go Option

104. Table 22 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.

**Table 22: Summary of Anticipated Potential Environmental Impacts of the No Build Options**

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Mitigation	Significance After Mitigation
Climate	<ul style="list-style-type: none"> <li>No obvious impacts</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>					
Air Quality	<ul style="list-style-type: none"> <li>Will remain the same</li> <li>No impacts on sensitive receptors during construction</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	Medium (-)	Local			Medium (-)
Geology	<ul style="list-style-type: none"> <li>No obvious impacts</li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>					
Hydrology	<ul style="list-style-type: none"> <li>Raw Water transmission will remain prevalent in the subproject area that results in wear and tear of roads.</li> </ul>	<ul style="list-style-type: none"> <li>none</li> </ul>	High (-)	Local	Long-term		Medium (-)
Land Use	<ul style="list-style-type: none"> <li>Open type of raw water transmission have maximum chances of getting polluted.</li> <li>Private sector participation and investment will continue to be inhibited, which in turn inhibits the possible redevelopment of the area to be able to realize its full potential, including that of tourism.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	High (-)	Local	Long-term		High (-)
Health and Safety	<ul style="list-style-type: none"> <li>Lack of proper raw water transmission water will continue to create an unsafe environment which may result in cholera, malaria and other epidemics.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	High (-)	Local	Long-term		High (-)
Noise Pollution	<ul style="list-style-type: none"> <li>Noise pollution will remain the same.</li> <li>No impacts on sensitive receptors during construction</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	Medium (-)	Local	Long-term		Medium (-)
Aesthetics, Landscape Character and sense of place	<ul style="list-style-type: none"> <li>Likely to deteriorate as more land uses compete for limited space leading to visual degradation.</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	Medium (-)	Local	Long-term		Medium (-)

## **VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION**

### **Public participation during the preparation of the IEE**

105. 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.

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

- Local communities, Individuals affected, traders and local shopkeepers who are directly affected were given priority while conducting public consultation.
- Walk-through informal group consultations in the subproject vicinity. .
- 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.

107. 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.

### **Notification of Potential Interested and Affected Parties**

108. Since, the project is specific along the RoW of existing R&B roads in Srinagar area; as such means of mass information dissemination about the consultations were necessary. The interested and affected parties were identified during the course of initial environmental examination. Key methods employed included individual interviews, field level observations, community consultations and discussions, interviews through a pre drafted interview schedule. Key respondents included project affected persons, shopkeepers/businessmen from the subproject area, associations of shop owners in addition to daily commuters consulted randomly. In addition to a number of informal consultations conducted regularly in the subproject area. selected on a stratified basis to ensure diversified representation, were formally interviewed with the help of an interview schedule from **14.09.2013** Issues discussed and feedback received along with details of date, time, location and list of participants are given in **Appendix-2** To ensure that people impacted directly due to the subproject are taken on board 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.

### **Future Consultation and Disclosure**

109. The public consultation and disclosure program will remain a continuous process throughout the subproject implementation and shall include the following:

#### **Consultation during detailed design**

110. 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 kept available at the PMU office of ERA.

111. ERA will conduct information dissemination sessions at major intersections and solicit the help of the local community leaders/prominent citizens to encourage the participation of the people to discuss various environmental issues.

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

#### **Consultation during construction:**

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

114. Smaller-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;

#### **Project disclosure**

115. 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, radio broadcasts, road signage, etc. Public information campaigns via newspaper/radio/TV, 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.

116. For the benefit of the community the IEE will be translated in the local language and made available at: (i) ERA office; (ii) District Magistrate Office; and, (iii) PMU/PIU. Hard copies of the IEE will be kept in the town library, 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 PMU/PIU/State Government and the official website of ADB after approval of the IEE by Government and ADB. The PMU/PIU will issue Notification on the locality-wise start date of implementation of the subproject. The notice will be issued by the PMU/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 distributed to any person willing to consult the IEE.

### **VII. GRIEVANCE REDRESSAL MECHANISM**

117. 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 1 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 Central/ Safeguards who will ensure that grievance is redressed within 2 weeks.
- If Director Safeguards cannot resolve the complaint 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.

118. 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 also lodge their complaints online at <http://www.jkgrievance.nic.in>.

119. Apart from the above detailed mechanism for the grievances received at the level of ERA, the provision shall be kept in the EMP of the subprojects 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 subproject sites.

## **VIII. ENVIRONMENTAL MANAGEMENT PLAN**

120. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between the DSC (Engineer), contractors, and PMU/PMC. The EMP identifies the three phases of development as: (i) Site Establishment and Preliminary Activities; (ii) Construction Phase; and (iii) Post Construction/Operational Phase.

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

122. A copy of the EMP must 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. It shall be noted that the Supreme Court of India<sup>10</sup> mandates those responsible for environmental damage must pay

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<sup>10</sup> Writ petition no 657 of 1995. The Supreme Court, in its order dated Feb.4, 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."

the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage. (The polluter pays principle).

123. 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.
  - The Contractor fails to respond adequately to complaints from the public.

### **Institutional Arrangement**

124. 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 (PMC). ERA will be the executing agency.

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

126. 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 execution of the works. The supervision and implementation of EMP shall be the responsibility of DSC with ERA as monitoring agency (with assistance of PMC). 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/local laws and regulations and in accordance with ADB's environmental policy and guidelines.

### **ERA (PMU and PIU)**

- 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 fail to comply with the said environmental specifications.

### **122. Project Management Consultants (PMC)**

- 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.

**123. The Engineer (DSC)**

- 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 the requirements of the 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.

**124. Environmental Expert of Engineer (DSC)**

- Briefs the Contractor about the requirements of the Environmental Specification and/ or EMP, as applicable;
- Advises the Engineer about the interpretation, implementation and enforcement of the Environmental Specification and other related environmental matters;
- Monitors and report 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.

**125. The Contractor**

- 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 timely informed 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 liaisoning, reporting and grievance redressal on day to day basis.
- Receives complaints/grievances from public, immediately implements the remedial measures and reports to the Engineer (DSC) within 48 hours

**126. Capacity Building**

- Training and orientation programmes shall be organized by the Environmental Experts of Engineer (DSC), PMC and ERA for the contractors, labourers, 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.

127. Table 23 outlines the site establishment and preliminary activities.

**Table 23: Site Establishment and Preliminary Activities**

S.N	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, 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	Access to site will be via existing roads. The Contractor will need to ascertain the existing condition of the roads and repair damage shall occur 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 available on site in 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 Contractors must comply with the recommendations from the traffic study. Layout design shall accommodate the impact on existing traffic flow patterns (e.g. access points).	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/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 on all temporary haulage roads in the form of side drains and mitre drains to prevent erosion and point source discharge of run-off.	Engineer	Prior to moving onto site.
3.	Setting up of Construction Camp <sup>11</sup>	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 slopes greater than 1:3.	Engineer and EE	During surveys and preliminary investigations 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:	Engineer	During set-up

<sup>11</sup> Careful planning of the construction camp can ensure that time and costs associated with environmental management and rehabilitation are reduced.

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		<ul style="list-style-type: none"> <li>• site office</li> <li>• ablution facilities</li> <li>• designated first aid area</li> <li>• eating areas</li> <li>• staff lockers/showers (where water /waterborne sewers are available)</li> <li>• storage areas</li> <li>• batching plant (if required)</li> <li>• refueling areas (if required)</li> <li>• maintenance areas (if required)</li> <li>• crushers (if required)</li> </ul>		
		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 bush 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
4.	Establishing Equipment Lay-down and Storage Area <sup>12</sup>	Choice of location for equipment lay-down and storage areas must take into account prevailing winds, distances to adjacent land uses, general on – site 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 are	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 area(s). 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

<sup>12</sup> Storage areas can be hazardous, unsightly and can cause environmental pollution if not designed and managed carefully

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		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 the 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 is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training	EE and Contractor	Ongoing
		Contractors shall submit a method statement and plans for the storage of hazardous materials and emergency procedures.	Engineer and EE	Prior to establishment of storage area
5.	Materials Management – Sourcing <sup>13</sup>	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 <sup>14</sup>	Ensure that all site personnel have a basic level of environmental awareness training	EE	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 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: <ul style="list-style-type: none"> <li>No alcohol / drugs to be present on site;</li> <li>Prevent excessive noise</li> <li>Construction staff are to make use of the facilities provided</li> <li>for them, as opposed to ad-hoc alternatives (e.g. fires for</li> </ul>	EE	During staff induction, followed by ongoing monitoring

<sup>13</sup> Materials must be sourced in a legal and sustainable way to prevent offsite environmental degradation.

<sup>14</sup> These points need to be made clear to all staff on site before the subproject begin.

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		<ul style="list-style-type: none"> <li>cooking, use of surrounding bus as a toilet facility are forbidden)</li> <li>No fires to be permitted on site</li> <li>Trespassing on private / commercial properties adjoining the site is forbidden</li> <li>Other than pre-approved security staff, no workers shall be permitted to live on the construction site</li> <li>No worker may be forced to do work that is potentially dangerous or for what he / she is not trained to do</li> </ul>		
6.	Social Impacts <sup>15</sup>	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).	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	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.	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	
		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	
8.	Dust/Air Pollution <sup>16</sup>	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 times are	Engineer and EE	Throughout the duration of the subproject.

<sup>15</sup> 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.

<sup>16</sup> Establishment of the camp site, and related temporary works can reduce air quality.

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		not excessive.		
		Wind screening and storm water 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 <sup>17</sup>	To prevent storm water damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. A drainage plan must be submitted to the Engineer for approval and must include the location and design criteria of any temporary stream crossings (siting and return period etc).	Engineer	During surveys and preliminary Investigations.
		The subproject is Laying of DI pipes along the existing R&B roads and lanes to provide efficient and safe raw water transmission to the area as the existing open raw water transmission through natural water in the form of Doodhganga Nallah channel gets polluted by way of anthropogenic activities.	Engineer and EE	During site setup.
11.	Water Quality <sup>18</sup> .	Storage areas that contain hazardous substances must be lined with an approved impermeable liner or by slurry walls.	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 runoff to be treated to the Engineer's approval before being discharged into the nearby water body system prior to check the existing water qualities of said water body. (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 <sup>19</sup>	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 Management Procedure	The excavation and use of rubbish pits on site is forbidden	EE	Ongoing
		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	EE	During site set-up And ongoing.

<sup>17</sup> Serious financial and environmental impacts can be caused by unmanaged storm water.

<sup>18</sup> Incorrect disposal of substances and materials and polluted run-off can have serious negative effects on groundwater quality

<sup>19</sup> 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.



S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		notify the Engineer/Contractor shall such an item be uncovered.		
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: <ul style="list-style-type: none"> <li>• stringing of power lines</li> <li>• earthworks / earthmoving machinery on steep slopes above houses / infrastructure</li> <li>• risk to residences along haulage roads / access routes</li> </ul>	Engineer and EE	24 hours prior to activity in question

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

128. Table 24 outlines management of construction activities and work force.

**Table 24: Management of Construction and Workforce Activities**

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Access to Site	Contractors shall ensure that all side and mitre 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 storm water 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 materials. e.g. paved surfaces / cobbled entranceways.	Engineer	Ongoing monitoring.
2.	Maintenance of Construction Camp	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 bush are not being used as a 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	Weekly inspection
		The Contractor shall ensure that all litter is collected from the work and camp areas daily.	Contractor	Ongoing monitoring.
		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	The Contractor must monitor the performance of construction	Contractor	Ongoing monitoring.

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
	Conduct	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.	and Engineer	
		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 <sup>20</sup>	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 must be dampened whenever possible and especially in dry and windy conditions to avoid excessive dust.	Engineer	Ongoing monitoring.
		Where dust is unavoidable in residential or commercial areas, screening will be required utilising 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.
		Excessive dust emissions due to vehicular movements at site should be avoided by way of water sprinkling on the roads prior to the work to be started.	Contractor	As directed by the engineer.
5.	Soil Erosion and Land sliding	Once an area has been cleared of vegetation, the top layer (nominally 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.
		Storm water 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. <sup>21</sup>	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 re-vegetated 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.
		The protection bund of earth filled gunny/ cement bags shall be build along the edges of river in order to avoid land sliding and removal of top soil.	Engineer	As directed by the engineer.
6.	Storm water	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 disturbance is unavoidable, modification of water bodies shall be kept to a minimum in terms of:	Contractor	Ongoing monitoring.

<sup>20</sup> Main causes of air pollution during construction are dust from vehicle movements and stockpiles, vehicle emissions and fires.

<sup>21</sup> Estimated total volume of unused excavated material to be disposed is 26,257 cubic meters.

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		<ul style="list-style-type: none"> <li>Removal of riparian vegetation</li> <li>Opening up of the stream channel</li> </ul>		
		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 storm water 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 closed pipes with velocity not more than 2.5m/sec shall be used in place of high velocity storm water pipelines.	Engineer	As directed by the engineer
		A number of smaller storm water outfall points shall be constructed rather than a few large outfall points.	Engineer	As directed by the engineer
		Storm water outfalls shall be designed to reduce flow velocity and avoid stream bank 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 is 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 <sup>22</sup>	Mixing / decanting of all chemicals, excavated 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 site.	Contractor	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)
		Care must be taken to ensure that run-off from vehicle or plant washing does not enter the ground water. Wash water must be passed through a three-chamber oil-grease trap prior to being discharged as effluent to a regular municipal sewer.	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.	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	Contractor	Ongoing monitoring.

<sup>22</sup> 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.

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		by deweeding must take place. This significantly reduces the amount of time and money that must be spent on alien plant management during rehabilitation.		
		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 further be protected by the construction of berms or low brick walls around their bases	Contractor	As necessary
		Stockpiles shall be kept clear of weeds and alien vegetation growth by regular deweeding	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 waste and making sure that staffs are aware of their uses.	Contractor	Ongoing monitoring.
		All waste must be removed from the site and transported to a disposal site. 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 in a responsible manner at approved site. Waybills for this shall be provided.	Contractor and Engineer	Ongoing monitoring.
		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.

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
11.	Social Impacts <sup>23</sup>	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 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 must be minimized and must have the Engineer's permissions.	Engineer	Ongoing monitoring.
		Provide walkways and metal sheets where required to maintain access across for people and vehicles.	Contractor	Ongoing monitoring
		Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools.	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.
		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: <ul style="list-style-type: none"> <li>noise generated by jackhammers, diesel generator sets, excavators etc</li> <li>drilling</li> <li>dewatering pumps</li> </ul>	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 Redress 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	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 <ul style="list-style-type: none"> <li>submitting these for inclusion in complaints register</li> <li>bringing issues to Engineer's attention immediately</li> <li>taking remedial action as per Engineer's instruction</li> </ul>	Contractor	Ongoing monitoring.

<sup>23</sup> Regular communication between the Contractor and the interested and affected parties is important for the duration of the contract.

S.N	Activity	Management/Mitigation	Responsible for Monitoring	Frequency
		Selected staff are to be made available for formal consultation with the interested and affected parties in order to: <ul style="list-style-type: none"> <li>explain construction process</li> <li>answer question</li> </ul>	Contractor	Ongoing monitoring.
12.	Cultural Environment	Possible items of historical or archaeological value include old stone foundations, tools, clayware, jewellery, remains, fossils etc.	Engineer	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 SES	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 liaisoning, 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)

129. Table 25 outlines the post-construction activities.

**Table 25: Post Construction Activities**

S. N	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
1.	Construction Camp	All structures comprising the construction camp are to be removed from site.	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 cleared of alien vegetation.	Engineer	Subproject completion
		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 asphaltting 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

S. N	Activities	Management/Mitigation	Responsible for Monitoring	Frequency
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 works has caused to neighboring properties.	Contractors	As directed by the Engineer.
	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
		Access or haulage roads that were built across water courses 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.	Engineer and Contractor	On completion of 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)

### Environmental Monitoring Programme

130. **Table 26** 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.

**Table 26: Environmental Monitoring Program**

Aspect	Parameter	Standards	Location	duration / frequency	Implementation	Supervision
<b>1. Site establishment and preliminary activities</b>						
Legislation, Permits and Agreements	Consent for Establishment and Consent to Operate (in relation to hot mixing, wet mixing, batching plant, stone crushers, and diesel generators)	Air Act Water Act Noise Act	-	prior to moving onto site and during construction	Contractor	Engineer/EE/PMU/PMC
	Copy of EMP	EARF and ADB SPS	subproject site, offices, website, library, etc.	at all times	Contractor, Engineer and EE	PMU/PMC
Access to site	Existing conditions	EMP	all access and haul roads	prior to moving onto site	EE and Contractor	PMU/PMC
	traffic rerouting	Traffic Management Plan and EMP	all affected roads	one week in advance of the activity	Engineer and EE	PMU/PMC
	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/PMC
Construction	Approval of	EMP	as identified	prior to	Contractor with	PMU/PMC

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
camp	location and facilities			moving onto site	the Engineer and EE	
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/PMC
Materials management – sourcing	Approval of sources and suppliers	EMP	as identified	prior to procurement of materials	Contractor with the Engineer and SES	PMU/PMC
Education of site staff	Awareness Level Training - Environment - Health and Safety	EMP and records	-	during staff induction, followed by scheduled as determined	Contractor with the Engineer and SES	PMU/PMC
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/PMC	PMU
	GRM Register	EMP	subproject site	prior to moving onto site and ongoing	Contractor with the Engineer, EE/PIU	PMU/PMC
Noise	Baseline Data for noise level in dB(A) $L_{eq}$	National Noise Standards	two locations near construction sites as specified by the engineer	prior to site set-up	Engineer and EE in coordination with the Environmental Monitoring Laboratory of ERA	PMU/PMC
Air quality	Baseline ambient data for particulate matters 10 and 2.5 ( $PM_{10}$ , $PM_{2.5}$ ), sulfur dioxides ( $SO_2$ ), nitrogen dioxide ( $NO_2$ ), and hydrocarbons (HC)	National Ambient Air Quality Standards	two locations near construction sites as specified by the engineer	prior to site set-up	Engineer and EE in coordination with the Environmental Monitoring Laboratory of ERA	PMU/PMC
Soil erosion	Soil erosion management measures	EMP	as identified by the engineer	during site set-up and throughout the duration of the subproject	Contractor with the Engineer and EE	PMU/PMC
Storm water	Storm water management measures	EMP	as identified by the engineer	during site set-up and throughout the duration of the subproject	Contractor with the Engineer and EE	PMU/PMC
Water quality	Baseline qualitative characteristics	EMP	subproject sites <sup>24</sup>	prior to site set-up	Contractor with Engineer and EE	PMU/PMC
Conservation of Natural Environment	Existing conditions	EMP	subproject sites	prior to site set-up	Contractor with Engineer and EE	PMU/PMC
Waste	Disposal sites	EMP	as	prior to site	Contractor with	PMU/PMC

<sup>24</sup> Subproject sites include approved construction site, equipment lay-down and storage area, watercourses along the subproject site, open drainages



Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
management procedure			determined	set-up and ongoing throughout the subproject	Engineer and SES	
Cultural environment	Chance finds	ASI Act and EMP	as determined	prior to site set-up and ongoing throughout the subproject	Contractor with Engineer and SES	PMU/PMC
<b>2. Construction phase</b>						
Access to Site	Qualitative characteristics	Pre-subproject condition and EMP	all access and haul roads	refer to EMP (table on management of construction and workforce activities)	Contractor	Engineer
Construction camp	Qualitative characteristics	Pre-subproject condition and EMP	all access and haul roads	refer to EMP (table on management of construction and workforce activities)	Contractor	Engineer
Staff conduct	Site Records (Accidents, Complaints)	EMP	subproject sites	ongoing	Contractor	Engineer
Air quality	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub> and HC	National Ambient Air Quality Standards	two locations near construction sites as specified by the engineer (DSC).	once in four months (three times in an year)	Contractor in close coordination with the Engineer and Environmental Monitoring Laboratory of ERA	PMU/PMC
Soil erosion	Soil erosion management measures	EMP	subproject sites	ongoing	Contractor	Engineer
Storm water	Soil erosion management measures	EMP	subproject sites	ongoing	Contractor	Engineer
Water quality	Qualitative characteristics	EMP and pre-existing conditions	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, EEPIU	PMU/PMC
	GRM Register	EMP	subproject sites	ongoing	Contractor with the Engineer, EEPIU	PMU/PMC
Cultural environment	Chance finds	ASI Act and EMP	subproject sites	ongoing	Contractor	Engineer

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
Noise quality	Noise Level in dB(A) $L_{eq}$	National Noise standards	two locations near construction sites as specified by the engineer (DSC).	Once in four months (three times in an year)	Environmental Monitoring Laboratory of ERA	PMU/PMC
<b>C. Post-construction activities</b>						
Construction camp	Pre-existing conditions	EMP	construction camp	subproject completion	Contractor	Engineer
Vegetation	Pre-existing conditions	Tree-cutting Permit and EMP	subproject sites	subproject completion	Contractor	Engineer
Land rehabilitation	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	Engineer
Materials and infrastructure	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	Engineer
General	Records	EMP	subproject sites	subproject completion	Contractor with Engineer and EE	PMU/PMC
<b>D. Operation and maintenance (defect liability period)</b>						
Air quality	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub>	National Ambient Air Quality Standards	two locations as specified by the ERA.	Once in 6 months (defect liability period)	Environmental Monitoring Laboratory of ERA	PMU/PMC
Noise quality	Noise Level in dB(A) $L_{eq}$	As per National Noise standards	two locations as specified by the ERA	once in 6 months (defect liability period)	Environmental Monitoring Laboratory of ERA	PMU/PMC
Water Quality	Qualitative characteristics	As per Water Standards	Two Locations as specified by the ERA	once in 6 months (defect liability period)	Environmental Monitoring Laboratory of ERA	PMU/PMC

EE= Environmental Expert of Engineer (DSC)

## Environmental Management and Monitoring Cost

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

132. 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

133. 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 PMC with the assistance of DSC, costs of which are part of project management.

134. Table 27 presents the estimated cost to implement the EMP.

**Table 27: Indicative Cost for EMP Implementation**

Component	Description	Number	Cost per Unit (Rs)	Cost (Rs)	Source of Funds
Legislation, Permits and Agreements	Consent to Establish and Consent to Operate for plants and machinery of the contractor				These consents are to be obtained by contractor on his own cost.
Public consultations and information disclosure	construction phases	Lump sum	50,000	50,000	
Baseline Monitoring	Site preparation and preliminary activities				
Air		Two	7000 per sample	14000	Contractor's cost
Noise		Two	1000 per sample	2000	Contractor's cost
Water		Two	5000 per sample	10000	Contractor's cost
Dust Suppression at subproject sites	construction and defect liability phases	lump sum	500000	500000	Contractor's Cost
Traffic management	Safety Signboards, delineators, traffic regulation equipments, flagman, temporary diversions, etc				Included in engineering cost
Tree compensation	Compensation for tree-cutting	lump sum	300000	300000	
Compensatory plantation <sup>25</sup>	552 x 2 = 1104 (@ 1:2)	lump sum	700000	700000	
Construction Monitoring					
Air	Once in four months at two locations (for three years, total 12 samples)	18	7,000 per sample	126,000	
Noise	Once in four months at two locations (for three years, total 18 samples)	18	1,000 per sample	1,8000	
Water	Once in four months at two locations (for three years, total 18 samples)	18	5000 per sample	90000	
Defects Liability Period (6 months)					
Air	Once at two locations	2	7,000 per sample	14,000	
Noise	Once at two locations	2	1,000 per sample	7,000	
Water	Once at two locations	2	5000 per sample	10000	
				<b>TOTAL (Rs)</b>	<b>18,41,000</b>

The above cost have been arrived on the Lump sum basis and subject to change based on the actuals.

<sup>25</sup> Compensatory plantation involves the cost of plantation and maintenance of the trees in a ratio of 1:2 (i.e. planting double the number of trees actually cut).

## **IX. CONCLUSION AND RECOMMENDATIONS**

135. The process described in this document has assessed the environmental impacts of all elements of proposed raw water Transmission subproject in Srinagar. 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.

136. The public participation processes undertaken during project design ensure 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.

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

138. 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/PMC. 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.

139. 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.

140. 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.

141. 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&amp;K Urban Sector Development Investment Programme

Sector Division:

Urban water supply

Screening questions	Yes	No	Remarks
<b>A. Project siting</b> Is the project area,			
▪ Densely populated?	✓		The sub project area comprises of Dadah Ompora, Sogam, Chadoora, Wathora and Kralpora. On both sides of the Highway newly developed colonies generally belonging to medium and high income groups exist. Therefore the sub project areas are densely populated.
▪ Heavy with development activities?	✓		The sub project areas comprise of predominantly residential structures and few commercial establishments on both sides of road stretches.
▪ Adjacent to or within any environmentally sensitive areas?		✓	The subproject areas are not adjacent to or within any environmentally sensitive areas.
• Cultural heritage site		✓	No heritage site or archaeologically protected monument is located in the subproject areas.
• Protected area		✓	.
• Wetland		✓	
• Mangrove		✓	Not applicable
• Estuarine		✓	Not applicable
• Buffer zone of protected area		✓	None.
• Special area for protecting biodiversity		✓	None. The subproject areas are not adjacent to or within any Special area for protecting biodiversity.
• Bay		✓	Not applicable
<b>A. Potential environmental impacts</b> Will the project cause...			
▪ Impairment of historical/cultural monuments/ areas and loss/damage to these sites?		✓	No impact on historical/cultural monuments/ areas is envisaged.
▪ Interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?		✓	No such significant impacts are anticipated. However, during construction there will be minor impacts due to noise and dust due to construction activities. No problems of smell, influx of insects and rodents are anticipated due to implementation of sub project. However, there will be possible interference with other utilities and blocking the access to neighborhood,

Screening questions	Yes	No	Remarks
			Irrigation channel but this will be temporary, during the construction phase only which will be addressed in EMP.
▪ Dislocation or involuntary resettlement of people		✓	No such significant impacts are anticipated. As the sub-projects are about Providing and Laying of underground pipes along road alignments from inlet to outlet. Hence there requires not any dislocation or resettlement of people.
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		✓	No such impacts are anticipated. Although the sub projects will generate the employment opportunity to such groups.
▪ Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		✓	Not anticipated as the proposed subprojects envisages providing and laying of Raw Water main from inlet (Higher Reaches of Doodhganga Nallah to outlet (Water Treatment Plant Kralpora) along the RoW of existing R&B roads alignment. The sub-projects help in safe management of raw water during all seasons and in all conditions.
▪ Overflows and flooding of neighboring properties with raw sewage?		✓	No such impact is anticipated. The proposed subprojects will help in ensuring safe supply of raw water from source to water treatment plants thus reducing the incidences of existing pollution of raw water source.
▪ Environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		✓	Not applicable
▪ Noise and vibration due to blasting and other civil works?	✓		No blasting activity is required The subproject is laying of raw water supply pipeline. Noise level is expected to increase during construction activities, but it will be temporary, localized and reversible. This shall be mitigated by taking necessary precautionary measures.
▪ Risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation?	✓		During execution stage, workers may face occupational health and safety related issues if personal protection measures are not used properly. Proper implementation of EMP will reduce all such risks. No such impacts are anticipated during the operation stage.
▪ Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		✓	Not applicable as there will be no generation of hazardous material.
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		✓	Not applicable.
▪ Road blocking and temporary flooding due to land excavation during the rainy season?	✓		Temporary road blocking during construction works shall be there in few places for which proper traffic management and diversion arrangements as per EMP & traffic diversion plan shall be followed. Due care shall be taken to carry out the works during

Screening questions	Yes	No	Remarks
			rainy seasons to avoid incidence of temporary flooding in the sub project area.
▪ Increased noise and air pollution resulting from traffic volume during construction activities?	✓		Slight increase in noise levels and air pollution resulting from traffic volume is anticipated during construction activities However it will be temporary, site specific and reversible in nature.
▪ Traffic disturbances due to construction material transport and wastes?		✓	The transportation of construction material and excavated earthen material shall be site specific and restricted to daily requirements which is not expected to result into traffic disturbances. However, traffic diversion plan, if required, will be prepared by contractor in consultation with Engineer to avoid traffic disturbances.
▪ Temporary silt runoff due to construction?	✓		Temporary silt run off may be there coinciding with rainy season. Majority of the works shall be carried out during dry periods to avoid such impacts. To avoid silt flow in drain and in irrigation channel during rainy seasons, silt barrier will be provided at the sides of the drains.
▪ Hazards to public health due to overflow, flooding, and groundwater pollution due to failure of sewerage system?		✓	Not applicable The sub project will improve the health, hygiene and drinking water condition
▪ Deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?		✓	No anticipated The sub project aims at improving the water quality by way of restricting sludge disposal or direct discharge of untreated sewage water into water channel.
▪ Contamination of surface and ground waters due to sludge disposal on land?		✓	No such impacts are expected as there will be no generation of sludge.
▪ Health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?		✓	No such impacts are anticipated as the subproject is about laying of raw water pipe lines.
▪ Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		✓	No such impacts are anticipated.
▪ Social conflicts between construction workers from other areas and community workers?		✓	No such conflicts are anticipated. Mostly the local labourers will be employed and migratory laborer shall be employed only in case of unavoidable circumstances.
▪ 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 construction and operation?		✓	No such impacts are anticipated. There will be no use/or disposal of explosives, fuel and other chemicals during construction and operation phase of the subproject.

Screening questions	Yes	No	Remarks
<ul style="list-style-type: none"> <li>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?</li> </ul>		✓	No such impacts are anticipated in case of the proposed subproject as the sub project is about laying of pipes for raw water system and will be laid underground.

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.	Yes	No	Remarks
<ul style="list-style-type: none"> <li>Is the project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?</li> </ul>		✓	The sub project area is not vulnerable to natural disasters like floods, landslides, cyclone winds, storm surges, tsunami or volcanic eruptions and localized climate changes. However, the subproject area
<ul style="list-style-type: none"> <li>Could changes in precipitation, temperature, salinity, or extreme events over the Project lifespan affect its sustainability or cost?</li> </ul>		✓	Change in the physical factors does not affect the sustainability of the sub project.
<ul style="list-style-type: none"> <li>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)?</li> </ul>		✓	No such issues are anticipated.
<ul style="list-style-type: none"> <li>Could the project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., increasing traffic or housing in areas that will be more prone to flooding, by encouraging settlement in earthquake zones)?</li> </ul>		✓	No such issues are associated with sub project



## **Public Consultation**

**Subproject-:** Providing and Laying of Raw Water Main from Higher Reaches of Doodhganga Nallah to Kralpora Water Treatment Plant in Srinagar city.

### **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 reduction in water logging, unhygienic conditions, impact on drinking water supply shall be avoided ( pipelines passing through existing drains) and breeding of rodents/other disease vectors.
- Information on perceived losses from the proposed subproject during execution stage in terms of increase in traffic congestion, air and noise pollution etc.
- Presence of any historical/cultural site in the vicinity.
- Information on trees to be cut and measures to be taken for compensatory plantation.
- Presence of any protected area/wetland in or adjoining the construction site.
- Information on economic development in terms of storm water drainage, rapid transit of goods and generation of direct employment during the execution of the subproject.

**Date and time of Consultation:** started at 11:00 am, 14.09.2013

**Location:** Kralpora to Nawhar Bridge Dadah Ompora

### **Public Consultation Details**

<b>S.N</b>	<b>Issues Discussed</b>	<b>Reply from Public</b>	<b>Remarks</b>
1	Awareness and extent of knowledge about the subproject	Generally all the people consulted were well aware about the proposed subproject.	Public consultation in different forms like one to one consultation, circulations of questionnaire, group discussions etc need to be a continuous process
2	Information on the benefits of the subproject in terms of economic and environmental enhancement	People are fed up with existing un hygienic raw water transmission and wanted that the subproject may be executed on a fast track so that this problem is eliminated. In addition people belong to labour force wanted that they shall be provided employment during the subproject execution.	It needs to be ensured that the contracting firm for the subproject employees to the maximum possible extent the local work force during the execution of the subproject.
3	Information on perceived benefits from the proposed subproject including reduction in water logging in rainy seasons.	People in general were very enthusiastic about the benefits of the subproject in terms of hygienic raw water transmission and also an improvement in the environmental quality.	-
4	Information on perceived losses from the proposed subproject during execution stage in terms of increase in traffic congestion, air and noise pollution etc.	People wanted that an efficient traffic management plan shall be in place before the construction works are started so that problems like traffic congestion, air and noise pollution shall be contained to the minimum.	Practical and efficient traffic management plan needs to be put in place before the start of construction works
5	Presence of any historical/cultural site in the vicinity	There is no historical/cultural site in the vicinity of the subproject.	-
6	Presence of any protected area/wetland in or adjoining the construction site.	There is no protected area/wetland in the subproject vicinity.	
8	Information on economic development in generation of direct employment during the execution of the subproject	People were well aware about the benefits of the subproject and in addition people at large were aware about the fact that during the execution of the subproject a large number of skilled/semi-skilled people shall get employment and thus were very eager about the start of project work	

### Details of People in Public Consultation

S.N	Name	Address	Occupation
1	Mohd Rafiq Rather	Rather Mohalla Kralpora	Govt. Employee
2	Mohd Shafi Bhat	Kralpora Budgam	shopkeeper
3	Irfan Ahmad	Kralpora	Business
4	Qaisar Ahmad	Near Wathura Bridge	Business
5	Hilal Ahmad Naik	Near Wathura Bridge	Shopkeeper
6	Bashir Ahamd	Gopalpora Wathura	Business
7	Firdous Ahmad	Gopalpora	Shopkeeper
8	Umar Afaq	Budgam	Teacher
9	Mohd Ismail	Dadah Ompora	shopkeeper
10	Rehana Maryam	Dadah Ompora	student

#### Present Issues:

1. The problem of inadequate raw water infrastructure results in raw water pollution and contamination thereby increasing overall unhygienic of the people.
2. Open raw water channels provides breeding grounds for different water borne diseases like malaria, cholera etc that creates an unsafe environment for residents, pedestrians and commuters. This acts as a barrier to redevelopment and growth of the area.

#### Future Prospects:

1. Establishment of an efficient, closed raw water transmission system in area will reduce water pollution.
2. Improvement of local environment to reduce health risks to the citizens

#### Summary of outcomes:

1. The work on the subproject should be started as early as possible so that the problems faced during all seasons are addressed well in time.
2. The quality of the work and material should not be compromised at any cost.
3. The work should be allotted to the contractor who has the resources to compete the work in time.
4. Public desired for implementation of better measures to reduce noise, dust and air pollution during the construction phase.
5. People also wished that local people be given opportunities during the project tenure.
6. People expected that their problems shall be addressed and solutions for them shall be implemented during the subproject execution.
7. People are ready to extend all types of support during execution of the subproject.
8. People suggested that adequate safety measures should be provided.
9. ERA ensured 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.

**PROPOSED RAW WATER TRANSMISSION PHOTOGRAPHS**



**Plate-1. Tapping Point (Source of Raw Water) Near Nowhar Bridge Doodhganga.**



**Plate-2. Proposed Alignment for Laying of DI Pipes at Tapping point (Source) at Doodhganga Nowhar.**





**Plate-3. Proposed alignment for laying of DI pipes along the RoW of existing R&B Road at Daadh Ompora.**



**Plate-4. Proposed alignment for laying of DI pipes along the RoW of existing R&B Road at Chadoora Budgam.**



**Plate-5. Proppeded alignment for laying of DI pipes for transmission of raw water at WTP Kralpora alignment**

## **Traffic Management Plan (TMP)**

### **Traffic Management Plan (TMP)**

During laying of raw water transmission DI pipes, about **1.5m** wide part from the road side. In most of the cases there will be no road blocks as the work will be confined to the peripheral zones of the road. In this regard a traffic management plan has been developed to cope with road traffic disruptions if any likely to be encountered with the commencement of work on **Providing and Laying of Raw Water Main from Higher Reaches of Doodhganga Nallah to Kralpora Water Treatment Plant in Srinagar city**. It calls for coordinated actions from the authorities, different services and public in particular responsible for road/traffic management on a given road or network.

Traffic Management Plan that will be implemented during the construction of the subproject is as follows

- i) **Speedy construction work.** The Laying of raw water transmission pipes will be done on a speedy note with back filling and leveling of the soil on the same day. The Contractor will keep the Roller on the available on site and as soon as the backfilling is done leveling would be done so that the residents would face minimum inconvenience. The affected and interested people will be notified early regarding the inconveniences and the schedule of construction.
- ii) **Usage of alternate route.** Alternate routes will be provided where ever possible to divert the traffic. Those sites where diversion is not possible construction work will be done in such a manner to avoid any road closures.
- iii) **On-site visits and traffic counts.** 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 will be diverted if any as part of the TMS.
- iv) **Adjustments to traffic signal settings.** For the subproject 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.
- v) **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:
  - Pedestrians will be provided with a reasonably safe, convenient and accessible path that replicates the most desirable characteristics of the existing sidewalk(s) or footpath(s).
  - 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.

- vi) **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.
- vii) **Adjustments necessary to public transport operators:**
  - Adjustments in terms of speed at or near constructions sites.
  - Lane driving and avoidances of overtaking.
  - Following of no parking zones.
  - Avoidance of unnecessary halting of vehicles.