Initial Environmental Examination

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India: Uttarakhand Integrated and Resilient Urban Development Project – Development and Improvement of Sewerage System in Nainital (Part A)

Package UIRUDP: WW-NTL-01

Prepared by Urban Development Department, Government of Uttarakhand for Asian Development Bank. This is an updated version of the draft originally posted in October 2021 available on https://www.adb.org/projects/documents/ind-38272-044-iee-5.

CURRENCY EQUIVALENTS

(as of 21 November 2022)

Currency unit – Indian rupee (₹)
₹1.00 = $ 0.012
$1.00 = ₹ 82.83

ABBREVIATIONS

ACM	–	Asbestos containing Material
ADB	–	Asian Development Bank
ASI	–	Archeological Survey of India
BOCW	–	Building and Other Construction Workers
BOD	–	Biological Oxygen Demand
CAMP	–	Comprehensive Asbestos Management Plan
CAPP	–	Community awareness & Public Participation
CGWB	–	Central Ground Water Board
CI	–	Cast Iron
CLC	–	City Level Committee
CPCB	–	Central Pollution Control Board
CPHEEO	–	Central Public Health and Environmental Engineering Organization
CTE	–	Consent to Establish
CTO	–	Consent to Operate
DBO Hybrid	–	Design-Build-Operate
DBO	–	Design-Build-Operate Contractor
DI	–	Ductile Iron
DPR	–	Detailed Project Report
DSC	–	Design and Supervision Consultant
DWC	–	Double Walled Corrugated (Pipe)
EHS	–	Environmental Health and Safety
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
ESMC	–	Environmental & Social Management Cell
FAO	–	Food and Agricultural Organization
FCO	–	Fertilizer Control Ordinance
FSSM	–	Fecal Sludge and Septage Management
GOI	–	Government of India
GOU	–	Government of Uttarakhand
GLSR	–	Ground Level Service Reservoir
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination
IFC	–	International Finance Corporation
IPMC	–	Investment Program Management Consultant
IPMU	–	Investment Program Management Unit
ISPS	–	Intermediate Sewage Pumping Station
JNNURM	–	Jawaharlal Nehru National Urban Renewal Mission
LPCD	–	Liters per Capita per Day
LSGD	–	Local Self Government Department
MCFT	–	Million Cubic Feet
MCM	–	Million Cubic Meter

MLD	–	Million Liters per Day
MOEF&CC	–	Ministry of Environment, Forest and Climate Change
NGO	–	Non-Governmental Organization
NHAI	–	National Highways Authority of India
NOC	–	No Objection Certificate
OHSR	–	Overhead Service Reservoir
O & M	–	Operation and Maintenance
OD	–	Outer Diameter
PHED	–	Public Health Engineering Department
PIU	–	Project Implementation Unit
PMU	–	Project Management Unit
PWD	–	Public Works Department
RCC	–	Reinforced Cement Concrete
REA	–	Rapid Environmental Assessment
ROW	–	Right of Way
SCADA	–	Supervisory Control and Data Acquisition
SBR	–	Sequential Batch Reactor
SEIAA	–	State Environmental Impact Assessment Authority
SPS	–	Safeguard Policy Statement, 2009
STP	–	Sewage Treatment Plant
SWM	–	Solid Waste Management
TOR	–	Terms of Reference
UDD	–	Urban Development Department
UEPPCB	–	Uttarakhand Environmental Protection & Pollution Control Board
UJS	–	Uttarakhand Jal Sansthan
ULB	–	Urban Local Body
UPJN	–	Uttarakhand Pay Jal Nigam
UUSDIP	–	Uttarakhand Urban Section Development Investment Program
WHO	–	World Health Organization

WEIGHTS AND MEASURES

^{o}C	-	degree centigrade
dB	-	Decibels
dia	-	diameter
kg	-	kilo gram
Kl	-	kilolitre
km	-	kilometre
kmph	-	kilometre per hour
ha	-	hectare
HP	-	horsepower
LPCD	-	litres per capita per day
lps	-	litres per second
m	-	meter
m^3	-	cubic meter
mg	-	milligram
mm	-	millimetre
mcm	-	million cubic meter
sq.km	-	square kilometer

NOTE

In this report, "$" refers to United States dollars.

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EXECUTIVE SUMMARY

The proposed Uttarakhand Integrated and Resilient Urban Development Project (UIRUDP) aims to improve universal and equitable access to safe and affordable drinking water, and access to adequate and equitable sanitation and hygiene for all ending open defecation. The outcome of the project is reliability and efficiency of water supply and sanitation services in Dehradun and Nainital enhanced. The Department of Urban Development (UDD), Government of Uttarakhand is the Executing Agency (EA) and Uttarakhand Urban Sector Development Agency (UUSDA) is the Implementing Agency for the UIRUDP. The project has the following four outputs:

(i) **Output 1:** Water supply system and service in Dehradun improved.
(ii) **Output 2:** Integrated sanitation systems and drainage enhanced in Dehradun and Nainital.
(iii) **Output 3:** Computerized maintenance and management systems (CMMS) for water and sanitation developed and implemented in Dehradun and Nainital.
(iv) **Output 4:** Project management, institutional capacity and knowledge strengthened.

Dehradun, the capital of Uttarakhand, is the most populous city in the state and experiencing unprecedented urban sprawl. Nainital, the judicial capital of Uttarakhand, is set in a valley of steep mountains around Nainital Lake. Estimated population of Nainital in 2020 is about 60,000. Compared to the 2011 census data of 41,377, the urban population is increased by 50%. As Nainital is a highly popular hill station, the average number of daily visitors to Nainital is around 72,650 with 90% staying overnight.

Under output 2 of this Project, it is proposed to improve sewerage system in Nainital, and is organized into a single contract package implemented under design-build-operate (DBO) modality. This IEE is prepared for the subproject of “Development and Improvement of Sewerage System in Nainital”.

Existing infrastructure status. Nainital town is fully covered with sewerage system, however, needs improvements. The aging trunk sewer that was built in 1940 has leaks and treatment capacity of existing sewerage treatment capacity is insufficient. Upgrading of the aging trunk sewer and the necessary expansion of sewerage treatment capacity in Nainital are of immediate needs to for the system sustainability. This subproject proposed address these gaps.

Proposed subproject. While ensuring high quality sanitation services to benefit around 154,000 people, and no contamination of ground and surface water from sewer leaks, the project addresses the challenge of a steep hilly town and its limited land space for a large scale STP by introducing prefabricated compact STPs with advanced technology that are also equipped for reuse of treated wastewater. The proposed sewerage system improvements in Nainital include:

(i) Installation of new 17.50 MLD STP (replacing existing 10 MLD STP) with sequential batchreactor (SBR) technology at Russi village, including an underground treated effluent storage tank of 630 Kl capacity within the STP premise. The drawing and design of this storage tank is underway and will be updated in IEE report after finalization. An existing sedimentation tank (5000 m^3) near Russi village will be used as alternative/additional storage for excess treated effluent storage for irrigation purposes.
(ii) Total length of pipe laying under this project is 11.9 Km from which 1.7 Km (0.5

Km proposed new pipe laying from Children Park to Pant statue and 1.2 Km from Pant Statue to Tallital Post Office existing pipeline) along the mall road, 1.8 Km laying of rising main with 250 mm dia Ductile Iron (DI-K9) pipe from Children Park to Tallital Post office along Thandi Sadak, 1.9 Km pipe laying of trunk sewer with 450 mm dia DI-K9 pipe from Tallital post office to Hanuman Garhi, 4.4 Km pipe laying of pressure sewer with 450 mm dia DI- K9 pipe from Hanuman Garhi to Russi bypass and 2.1 Km laying (450 mm dia DI-K9 pipe) of rising main from Russi bypass to Russi STP.

(iii) The existing SPS near Children park will be used for the pumping after rehabilitation.
(iv) installation of five prefabricated small-scale STPs with the treatment capacity of 20 kilolitersper day (KLD) each at five identified locations within the town
(v) 140 circular manholes, mostly in-situ reinforced cement concrete (RCC)
(vi) Around 600 household sewer connections, and
(vii) SCADA and GIS system

Screening and categorization. ADB requires consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in ADB's SPS (2009). The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment (REA) Checklist. The proposed project is not likely to have any significant adverse environmental impacts that are irreversible, diverse, or unprecedented. Potential impacts are mostly site-specific and in most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors. Therefore, the project is classified as Environmental Category "B" per ADB SPS and mandated preparing Initial Environmental Examination (IEE) Report. Per the Government of India regulations, this subproject does not fall under the ambit of Environmental Impact Assessment (EIA) Notification, 2006, and therefore do not require an EIA study or Environmental Clearance (EC) from state-l or central level agencies.

Draft IEE of this subproject was prepared and approved by ADB based on feasibility/preliminary design and included in bid and contract of this DBO package. This draft IEE document has been updated for the components, where detailed engineering design has been completed as on 12th November 2022.

Updated IEE reflecting the final subproject designs including any change in scope, locations etc., and the approval of the same by ADB is required prior to start of construction. Since the designs are being finalized component wise, it is planned to update IEE in stages to proceed with the construction of components for which detailed engineering design and surveys are completed and necessary permissions are obtained from the concerned departments. This updated IEE reflects the updated designs and completed surveys for the Sewerage Treatment Plant (STP) and sewerage networks. It should be noted that, this updated IEE report has included (i) entire sewerage networks of total length of 11.9 km as per final survey (from 11.9 Km, 0.5 Km new proposed sewer line from Children park to Pant Statue and 1.2 Km is the rehabilitation of existing pipeline from Pant Statue to Tallital Post office, 1.8 Km of laying of rising main from Children park to Tallital Post office along thandi sadak, 1.9 Km laying of trunk sewer from Tallital post office to Hanuman Garhi, 4.4 Km laying of pressure sewer from Hanuman Garhi to Russi bypass and 2.1 Km laying of rising main from Russi bypass to Russi STP) including 140 manholes, and 600 household sewer connections, where design is already finalized and approved (100%). However, final survey and detailed design for (i) five prefabricated small-scale STPs are undergoing. This IEE will be updated again based on the outcome of final design and studies and submitted to ADB for review and clearance. This updated IEE will supersede the earlier version of IEE and shall be

contractually binding on the contractor.

Description of the Environment. Nainital is where the High Court of the state is located and the Governor of state resides. Nainital is set in a valley around Nainital Lake that is 1,433meter long and 463 meter wide at an altitude of 1,940 meter (6,350 feet) above the mean sea level (MSL). Total area of the town is 11.73 sq. km, and elevation ranges within the city from, 940–2,100 meter above MSL. Nainital experiences subtropical highland climate influenced by the elevation. Like most places in temperate region, Nainital has relative cool summer. The hottest month is July with temperature ranging from 16.4 °C to 23.5 °C, while the coldest month is January with temperature ranging from 1.7 °C to 10.7 °C. The average annual rainfall is around 3,500 mm, of which 85% is received during the southwest monsoon season between June and September Nainital town, the Lesser Himalayan famous tourist destination of Uttarakhand has been repeatedly devastated by natural hazards and tectonically active fragile mountains together with fast pace of urbanization enhanced vulnerability of the area. There are number of smaller rivulets like Gaula, Bhakra, Dabka, Baur etc. Proposed Subproject components are located in the immediate surroundings of Nainital town, which is converted into urban use for many years ago, and there is no natural habitat left at the proposed sites. There are no forests, eco-sensitive or protected areas within project locations. Screening via Integrated Biodiversity Assessment Tool (IBAT) indicates that there are no protected areas or key biodiversity areas within 10 km of the project area.

It is proposed to construct new STP near Russi village, about 3-4 km (aerial distance), where there is an existing STP of 10 MLD capacity (2x5 MLD). The existing STP will be dismantled, and new STP will also utilize the adjoining 3.79-acre government vacant land for the new STP of 17.5 MLD capacity. Sewage can be transferred from the town to STP site by gravity due to large level difference. Proposed site hilly, vacant and devoid of notable tree cover. The STP will be constructed as per the site topography to avoid the deep excavation and steep and unsuitable areas within the will not be used for any construction. Nearest house is at 250 m from the STP site. Bhatti-Gadhera rivulet flows near the STP site, which meets the Nihal River, 3 km downstream. Excess treated wastewater will be discharged into this rivulet. The Bhatti-Gadhera rivulet remains mostly dry except during rains. Nihal river also carries the untreated wastewater from the adjacent areas. The trunk sewer alignment is proposed along the Nainital Lake, which is busy and main road and market area for local residents and tourists. Five small prefabricated STPs of 20 KLD will be located on small land parcels (requirement is 40 sq. m per each) identified within the premises of following government establishments: High Court Building Complex, PWD guest house, Forest Staff quarters, Polytechnic college, and Raj Bhawan Complex. There are no notable or notified historical, archeological or heritage sites or places in the subproject sites.

Potential Environmental Impacts and Mitigation Measures. This IEE identifies potential environmental impacts in relation to location, design, construction, and operation of the improved infrastructure.The project is unlikely to cause significant adverse impacts that are irreversible, diverse or unprecedented because: (i) proposed components will involve construction works with minimal impacts and it is very much localized. (ii) project area is mostly urban and peri urban nature, and predicted impacts are site-specific and likely to be associated with the construction process. Environmental impacts as being due to the project design or location are not significant. Variousmeasures are included in site planning and detailed design.

STP site is located away from the town, and there are no houses nearby. Necessary green buffer areas will be developed around the plant to account for future development. It is proposed to design the STP to stringent discharge standards suggested by Central Pollution Control Board (CPCB). It is proposed to reuse the treated effluent for various non-domestic purposes. A portion of the treated effluent shall be collected in the treated effluent storage tank within STP facility, and

surplus treated water will be stored in additional/alternative existing storage tank near Russi village and/or discharge into rivulet flowing near the site. Small STP units of 20 KLD will houses within the premises of government establishments where there is adequate space. Actual sites within the premises will be identified during the detailed design in consultationwith the department owning the premises, and location, design and operation will take into consideration issues related to odour, noise, reuse and discharge of surplus treated wastewater.Considering the vulnerability of Nainital to natural hazards, various measures will be included in detailed designs to safeguard the infrastructure.

Construction will have adverse, but temporary, impacts arising mainly from the disturbance to residents, businesses and traffic due to construction work; safety risk to workers and community, dust and noise, public and nearby buildings due to deep trench excavations in the road; access impediment to houses and business, disposal of large quantities of construction waste etc. These are all general impacts of construction in urban areas and there are well developed methods of mitigation that are suggested in the EMP. Proposed trunk main is aligned along the main arterial road along the Nainital Lake, which is the most important road and tourist activity area. To minimize the impacts on local business and residents, tourists and road users, it is proposed adopt trenchless method to lay the trunk main. Once the sewerage system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the operation and maintenance manual and standard operating procedures to be developed for all the activities by the contractor.

Environmental Management Plan (EMP). An Environmental Management Plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels, along with the delegation of responsibility to appropriate agency. Various design related measures are already included in the project detailed design. During construction, the EMP includes mitigation measures such as (i) proper planning of construction works, especially linear works, to minimize the public inconvenience; (ii) barricading, dust suppression and control measures; (iii) traffic management measures for works along the roads and for hauling activities; (iv) provision of walkways and planks over trenches to ensure access will not be impeded; (v) occupation and community healthand safety including COVID-19 health and safety measures and (vi) finding beneficial use of excavated materials to extent possible to reduce the disposal quantity. EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

The draft IEE and EMP was included in the bid and contract documents and the contractor has submitted to PMU/PIU, for review and approval, an updated EMP / site-specific environmental management plan (SEMP) including (i) designated sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) application of Health and Safety Plan for personal protection and protection from COVID 19 infection; (iv) monitoring program as per SEMP and (v) budget for SEMP implementation to PIU, for review and approval. No works can commence prior to approval of SEMP. A copy of the updated EMP/approved SEMP shall always be kept on-site during the construction period.

The EMP shall be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance. To monitor the operation stage performance, there will also be longer-term surveys to monitor raw and treated sewage quality. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the

Environmental Management Plan. The estimated implementation cost of the EMP is INR 1,14,91,000/= (INR one crore fourteen lakhs Ninety-one thousand only). A Climate Risk Vulnerability Assessment study was conducted for the project and its recommendations have been included in the project design.

Consultation, Disclosure and Grievance Redress. The stakeholders were involved in developing the IEE through discussions on-site and a public consultation workshop at city level, after which views expressed were incorporated into the IEE and in the planning and development of the project. Apart from on-site public consultations, a stakeholder meeting was held, and TLC has appreciated and approved the subproject.

The IEE will be made available to the public. The draft IEE has been disclosed and this updated IEE will also be disclosed via the ADB and UUSDA websites. The consultation processes are continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism (GRM) is described within the IEE to ensure any public grievances are addressed properly.

Implementation Arrangements. UUSDA has established a Project Management Unit (PMU) in Dehradun and two Project Implementation Units (PIUs) in Dehradun and Nainital. PMU is headed by Program Director (PD) will implement the project. PD is supported by two Additional Program Directors (APD) for technical and administration. A Deputy Project Director (DPD 1) under APD (Technical) will be the focal person for safeguards and GESI implementation and compliance with ADB SPS and will be assisted by a Social Development and Gender Officer (SDGO), an Environmental Officer (EO) and an Information, Education and Communication (IEC) Officer. PIUs, headed by a Project Managers, will be responsible for day-to-day implementation and supervision. A Junior Engineer in each PIU has been designated Assistant Environmental Officer. PMU and PIUs are supported by Project Management and Design SupervisionConsultant (PMDSC) team in supervision, monitoring and overseeing implementation, policy reforms, and safeguards. Two Environmental Experts in PMDSC will support PMU and PIUs in preparation, implementation and monitoring of all environmental safeguards tasks, and in ensuring compliance with ADB SPS. Contractors has appointed Environment, Health and Safety (EHS) supervisors to ensure EMP implementation and reporting.

Monitoring and Reporting. The PMU, PIU and consultants will be responsible for monitoring and reporting. During construction, results from internal monitoring by the DBO contractor will be reflected in their monthly EMP implementation reports to the PIU. PIU with the assistance of PMDSC, will monitor the compliance of contractor, prepare a quarterly environmental monitoring report (QEMR) and submit to PMU. The PMU will oversee the implementation and compliance and will submit Semi-Annual Environmental Monitoring Reports (SEMR) to ADB for review and approval. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted UUSDA websites.

Conclusions and Recommendations. The subproject is therefore unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated or minimized to acceptable levels through proper engineering design, construction techniques and by implementing recommended mitigation measures and procedures of EMP. Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category “B” is confirmed, and no further study, such as an EIA, is required. To comply with government regulations, subproject will require consent of Uttarakhand Environmental Protection & Pollution Control Board (UEPPCB) for STPs construction, operation

and discharge of treated effluent and sludge disposal. These shall be obtained, At present, component wise designing is being continued for the said package. This IEE has been updated considering sewerage components (sewerage treatment plant (STP), sewerage networks of total length of 11.9 km including 140 manholes, and 600 household sewer connections) where final designs have been completed and approved and SEMP is submitted by the contractor. Update will be done further with completion of design of other components and before start of any construction activities for these components.

The following **recommendations are** applicable to the subproject to ensure no significant impacts:

(i) Recommendations already Implemented with this update:

- Include draft IEE in bid and contract documents - implemented, the ADB approved draft IEE is part of bid documents

- STP designed to meet discharge standards, and ensure proper discharge facilities for surplus wastewater and sludge management facilities Conduct safeguards induction to the contractor upon award of contract - safeguard induction done

- Ensure contractor appoints qualified environment, health and safety (EHS) officers prior to start of works - complied Obtain all other statutory clearances and NOCs at the earliest time possible and include them in the IEE report before award of contract/before start of construction and ensure conditions/provisions are incorporated in the detailed design – process initiated, necessary permissions are yet to be obtained.
- Update/revise draft IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location - IEE is being updated as per current design updates, further it will be updated in final IEE.

- Strictly supervise EMP implementation - being complied Documentation and reporting on a regular basis as indicated in the IEE – will be complied

Continuous meaningful consultations with stakeholders - being complied
Timely disclosure of information and establishment of grievance redressal mechanism (GRM) - being implemented
Involvement of contractors, including subcontractors, in first-level GRM - complied

- Implementation of CRVA recommendations: (i) training/workshop on climatic vulnerability to be conducted during the project work, (ii) involvement of relevant stakeholders and decision makers ; (iii) conservatory approach must be followed during the construction and post construction work and (iv) all the activities of the project will be carried out as per the prescribed standard method and these activities will definitely contribute to minimize the carbon footprint and methane emission in the concerned areas. – being complied and already included in the design
- Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation - PMU, PIUs and consultants are committed for the protection of environment.

(ii) Recommendation to be implemented in next update /final IEE

- Update draft IEE based on finalisation of detailed design for sewer trunk; s pit location for trenchless pipeline laying, and treated wastewater storage tank.
- Ensure that the project sites are cleared of solid waste and other nuisance materials disposed in designated disposal sites as per Solid Waste Management Rules 2016;
- The contractor should comply with the World Health Organization's interim guidance on Water, Sanitation, Hygiene and Waste Management for the COVID19 virus.
- No work will commence until all the preconstruction requirements are met, including:
    - Updated IEE is approved by ADB; COVID19 health and safety plan as part of overall H&S planis prepared by contractor and approved by PMU, (ii) GRM is established and operationalized and (iii) all necessary permissions are obtained
    - Ensure that the geotechnical investigation for slope stability is done, before commencement of the work.
    - Ensure that environmental compliance audit of the existing SPS near children park and the existing sedimentation tank near Russi village is done
    - Ensure the odour modelling of the STP
    - Consent to Establish (CTE) for the STP should be updated based on the final design of STP.

I. INTRODUCTION

A. Project Background

1. The proposed Uttarakhand Integrated and Resilient Urban Development Project (UIRUDP) aims to improve universal and equitable access to safe and affordable drinking water,and access to adequate and equitable sanitation and hygiene for all ending open defecation. Theoutcome of the project is reliability and efficiency of water supply and sanitation services in Dehradun and Nainital enhanced. The project has four major outputs as follows:

2. **Output 1: Water supply system and service in Dehradun improved.** The project will construct around 136 kilometer (km) of water supply networks in newly added wards in South Dehradun, to close the gap of water supply infrastructure. The project will ensure reliable and quality water supply services with a standard norm of 135 liter per capita per day (LPCD); 24 hours a day and 7 days a week (24/7) supply. Around 5,400 household connections will be provided by 2028 with water meters that would allow volumetric billing. Non-revenue water (NRW)in the project area will be reduced from 45–50% to at most 25%, which is higher than the Uttarakhand performance standards. The improved water service will benefit around 40,000 population including about 4,000 urban poor and vulnerable people by 2028.

3. **Output 2: Integrated sanitation systems and drainage enhanced in Dehradun and Nainital.:** The project will construct (i) two sewage treatment plants (STPs) with a total treatmentcapacity of 29 million liters per day (MLD); (ii) around 256 km of sewer networks; (iii) at least 117km of storm water drainage networks factoring potential climate risks; and (iv) around 17,410 household sewer connections in Dehradun. This output will benefit about 138,000 populations, including around 15,000 urban poor and vulnerable people by 2028. The project will collect, transport, and treat fecal sludge and septage at a proposed STP equipped with a septage co- treatment unit. Combining a centralized sewerage system with decentralized septage management solutions, the project will establish a cost-effective integrated sanitation system in Dehradun. In Nainital, which has 100% sewerage system, the project will (i) replace around 4 kmof aging STP1 (17.5 MLD) trunk and outfall sewers with leaks; and (ii) construct a new STP with a treatment capacity of 17.5 MLD and 5 prefabricated compact STPs with advanced moving bed biofilm reactor technology, which will have at least 20 kiloliters per day capacity each.

4. Once household are connected to the new centralized sewer system, existing householdand community level soak pits in the project areas that would be no longer in use. These soak pits after cleaning and connecting with rainwater capturing system can be re-utilized as groundwater recharge pits. This soak pit reutilization idea introduced by UUSDA will be first kindin India, which is an innovative solution to enhance flood-resilience.

5. With an objective to increase access to quality & affordable sanitation and hygiene services enhancing city-wide sanitation service provision to residents and visitors, UUSDA proposed 20 mobile toilet buses for pilot testing under the UIRUDP. Bus mobile toilets are created by refurbishing and converting old transport buses into integrated sanitation treatment facility. During this pilot period, 10 bus mobile toilets are decorated as pink for female-only: and the other10 buses as blue for male-only. Such clear segregation would give more comfort with gender sensitive design and safety to women to exercise their

sanitation activities. Pink Bus Mobile Toilets will be equipped with spaces for feminine sanitation and hygiene practices. Enhanced useof hygienic and safe sanitation services through pink bus mobile toilets will influence behavior ofwomen towards healthy sanitation practices and hence contribute to positive health outcomes. Blue bus mobile toilets will also have similar inclusive design features to accommodate men withspecial and/or other needs.

6. **Output 3: Computerized maintenance and management systems (CMMS) for water and sanitation developed and implemented in Dehradun and Nainital.** To advance the O&Mperformance and asset management of WSS in Dehradun and Nainital, the project will procure, install, and implement city-wide CMMS for WSS schemes. Using the internet of things, this information and communication technology (ICT)-based platform will communicate with supervisory control and data acquisition (SCADA) and geographical information system (GIS) toprovide real-time data and information. It will also provide a range of functions, including but not limited to the following: (i) present and record operation status; (ii) schedule and track inspections; (iii) plan, implement, and report the results of preventive maintenance; (iv) manage fixed assets across multiple sites; (v) manage inventory, work orders and contract managements; and (vi) provide customer services, which include the establishment of consumer data management system with disaggregated data by sex, age, and other social dimension.[1] The detailed program functions for CMMS will be determined through the customized design based on the WSS systemneeds and WSS governance structure in Dehradun and Nainital.

7. **Output 4: Institutional capacity and knowledge strengthened.** This output includes arange of activities such as: (i) enhancing project and contract management of UIRUDP through hands-on implementation support and skills training for project management unit (PMU) and project implementation units (PIUs) at Dehradun and Nainital; (ii) developing robust WSS O&M manuals, which will be aligned with the national WSS manuals [2] and customized to the WSS system, governance structure, and specific conditions and needs in the project cities; (iii)providing training and implementation support on the WSS O&M manuals and CMMS use to UUSDA, UJN, UJS, and project ULBs; (iv) strengthening institutional capacities of UUSDA, project ULBs, and the wards members at project ULBs on WSS tariff re-strutting to enhance the sustainability,[3] green and resilient urban planning for livable and prosperous cities, ecosystem- based adaptation (EBA) measures, integrated water management, intelligent and sustainable WSS operation and management, and gender equality and social inclusion (GESI) issues in urbansystems and services; (v) executing community awareness, participation, and behavior changes

[1] Internet of things describes the network of physical objects— “things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over theinternet.

[2] GOI, Ministry of Housing and Urban Affairs, Central Public Health & Environmental Engineering Organisation (CPHEEO). (i) Manual on Operation and Maintenance of Water Supply System – 2005; (ii) Manual on Sewerage and Sewage Treatment Systems – 2013 Part B O&M and Part C Management; and (iii) Manual on Storm Water Drainage Systems – 2019 Part B O&M and Part C Management. (accessed 18 September 2020).

[3] The World Bank has an ongoing project in Uttarakhand to support institutional strengthening of ULBs’ public financial management and revenue management systems, which would have positive impacts on the financial sustainability of the water supply and sanitation systems and other urban services. To avoid any duplicated efforts, the project team will closely monitor and communicate with the World Bank. If any gaps are identified, the project team will design specific activities to support the project UBLs. (World Bank. 2019. Uttarakhand Public Financial Management (PFM) Strengthening Project.)

programs on water conservation, public health and hygiene practices, waste reduction, and making safe, clean, and healthy community environments; and (iv) implementing the GESI actionplan, which will be further developed during the project preparation

8. This IEE focuses on one of subprojects under output 2, which is the development of sanitation systems in Nainital town. The sub project components are proposed to be beneficial for entire town. Total area is 11.73 km^2 and estimated population of Nainital in 2020 was over 60,000. Compared to the 2011 census data of 41,377, the urban population is increased by 50%.

9. **The objective** of this program is to upgrade the dilapidated sewerage system (mainly trunk sewer) associated with frequent operation troubles such as blockage/chocking of sewer lines, in adequate capacity due to increase in the population, cesspool/ponding of sewage etc. Aholistic approach has been adopted for the development of sewerage system. There is a 10 MLD(2x5 MLD) STP (only primary treatment) at Russi village which is not functioning currently. Therefore, Nainital has inadequate capacity of sewage treatment facility at present. In present scenario the sewage flows through the existing sewer network and connected to existing trunk sewer which is very old and need to be upgraded. Existing treatment facility is inadequate and hence there is an immediate need for providing new treatment facility along with trunk sewer for future sewage generation

10. 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 Safeguards Policy Statement (2009). Accordingly, this Initial Environmental Examination (IEE) has been conducted to assess the environmental impacts and provide mitigation and monitoring measures to ensure that there are no significant impacts because of the subprojects.

B. Purpose of Initial Environmental Examination Report

11. The potential environmental impacts of the subprojects have been assessed using ADB Rapid Environmental Assessment (REA) Checklist for sewerage treatment (Appendix 1). Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subprojectis unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS requirements for environment Category B projects.

12. The Nainital Sewerage System subproject is proposed for implementation under the design-build-operate (DBO) modality, where the design is carried out by the selected bidder based on the feasibility / preliminary project report prepared prior to bidding. Thus, this updated IEE is based on the detailed engineering surveys field reconnaissance surveys, secondary sources of information as well as stakeholder consultations. Baseline environmental monitoring has been conducted to know the baseline status of the concerned area as per the Environment Management Plan (EMP) given in this updated IEE report. . The results are reported in this updated IEE report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE.

13. The draft IEE of this subproject was prepared based on feasibility/preliminary design, and included in bid and contract of this DBO package. This draft IEE document has been

updated for the components, where detailed engineering design has been completed as on 12th November 2022. Updated IEE reflecting the final subproject designs including any change in scope, locations etc., and the approval of the same by ADB is required prior to start of construction. Since the designs are being finalized component wise, it is also planned to update IEE in stages to proceed with the construction of components for which detailed engineering designs are completed. This updated IEE reflects the final designs of the components as per following table. Currently this updated IEE report has included 17.50 MLD sewerage treatment plant and sewerage networks including 140 manholes and 600 household connections, where design is already completed and finalized (100%). The revised/updated and approved IEE will supersede the earlier version of IEE and shall be contractually binding on the contractor.

Subproject Scope, Components, status of detailed design, and changes – up to 12 November 2022

Components / scope of works as per the Draft IEE	Current IEE update	Change in scope and design	Change in location
Sewerage Works			
Sewer Networks – (i) Installation of around 4 km of sewer pipes (3 km of ductile iron (DI-K7) pipe with diameter of 800 mm and 1 km mild steel pipe of 800 mm diameter. (ii) 01 Sewerage treatment plant (STP) of 17.50 MLD capacity (iii) 05 Pre-fabricated STPs of 20 KLD (iv) 500 numbers sewer household connections (v) about 150 numbers of manholes. (vi) underground treated effluent storage tankof 630 Kl capacity for storage of tertiary treated effluent within the STP premises.	(i) 17.50 MLD STP design is finalized (ii) Sewer (trunk main sewer) pipeline is finalized. The total length of rising main, trunk sewer and pressure sewer is 11.9 Km. a. Children Park to Pant Statue to Tallital Post Office 1.7 Km along Mall road. (1.2 Km Rehabilitation of existing Sewer line and 0.5 Km from Children Park to Pant Statue) b. Children Park to Tallital PO 1.8 Km along Thandi Sadak. c. Tallital PO to Hanuman Garhi 1.9 Km d. Hanuman Garhi to Russi bypass 4.4 Km e. Russi bypass to Russi STP 2.1 Km (iii) 600 household sewer connections, and (iv) 140 manholes have been proposed as per the new design (v) 05 pre-fabricated STPs drawing and design underway (vi) The drawing and design of underground treated effluent of 630 kl capacity is underway	(i) The total length of trunk sewer pipeline has increased by 7.9 Km than the length, which was mentioned in DPR. (ii) 17.50 MLD STP slightly moved (20 meter) toward the North West from the location proposed earlier. (iii) 10 manholes have been decreased as per new design. (iv) alternative/additional storage for excess treated effluent storage for irrigation purposes (existing storage tank near Russi village).	None

Components / scope of works as per the Draft IEE	Current IEE update	Change in scope and design	Change in location
	(vii) An existing sedimentation tank (5000 m^3) near Russi village will be used as alternative/additional storage for excess treated effluent storage for irrigation purposes.		
Sewage Pumping Station (SPS) was not proposed in the design	The existing Sewage Pumping Station (SPS) near children park will be used after the approval of concerned Uttarakhand Jal Sansthan (UJS), Nainital.	The existing SPS will be used for the rising main from Children Park to Tallital Post Office along Thandi Sadak.	NA

14. The implementation of the subprojects will be governed by Government of India and Uttarakhand and other applicable environmental acts, rules, regulations, and standards. Environmental safeguards will be followed in accordance with the ADB SPS 2009. During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, asreflected in internationally recognized standards.

C. Report Structure

15. The report has been structured in compliance with ADB SPS, 2009 and contains thefollowing ten (10) sections including the executive summary at the beginning of the report:

16. **Executive Summary**. This section describes concisely the critical facts, significantfindings, and recommended actions.

(i) **Introduction**. Presents a brief overview of the assignment along with its background, objectives, scope of work and methodology etc.

(ii) **Description of the Project.** This section describes the proposed project; its major components; and its geographic, ecological, social, and temporal context, including any associated facility required by and for the project.

(iii) **Analysis of Alternative.** Analyzes the environmental situation “With and Withoutproject”.

(iv) **Policy, Legal, and Administrative Framework**. This section discusses the national and local legal and institutional framework within which the environmentalassessment is carried out. It also identifies project-relevant international environmental agreements to which the country is a party.

(v) **Description of the Environment**. This section describes relevant physical, biological, and socioeconomic conditions within the study area. It also looks at current and proposed development activities within the project's area of influence,including those not directly connected to the project. It indicates the accuracy, reliability, and sources of the data.

(vi) **Anticipated Environmental Impacts and Mitigation Measures**. This

section predicts and assesses the project's likely positive and negative direct and indirectimpacts to physical, biological, socioeconomic (including occupational health and safety, community health and safety, vulnerable groups and gender issues, and impacts on livelihoods through environmental media, and physical cultural resources in the project's area of influence, in quantitative terms to the extent possible; identifies mitigation measures and any residual negative impacts that cannot be mitigated; explores opportunities for enhancement; identifies and estimates the extent and quality of available data, key data gaps, and uncertaintiesassociated with predictions and specifies topics that do not require further attention; and examines global, trans boundary, and cumulative impacts as appropriate.

(vii) **Public Consultation and Information Disclosure**. This section (i) describes theprocess undertaken during project design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders; (ii) summarizes comments and concerns receivedfrom affected people and other stakeholders and how these comments have been addressed in project design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women, the poor, and Indigenous Peoples; and (iii) describes the planned information disclosure measures (including the type of information to be disseminated and the method ofdissemination) and the process for carrying out consultation with affected people and facilitating their participation during project implementation.

(viii) **Grievance Redress Mechanism.** This section describes the grievance redress framework (both informal and formal channels), setting out the time frame and mechanisms for resolving complaints about environmental performance.

(ix) **Environmental Management Plan.** This section deals with the set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts (in that order of priority). It may include multiple management plans and actions (mitigation, monitoring and performance indicators). Outlines the environmental monitoring program and reporting system including the cost of implementing the EMP.

(x) **Conclusion and Recommendations.** Presents the conclusion and recommendations of the IEE study.

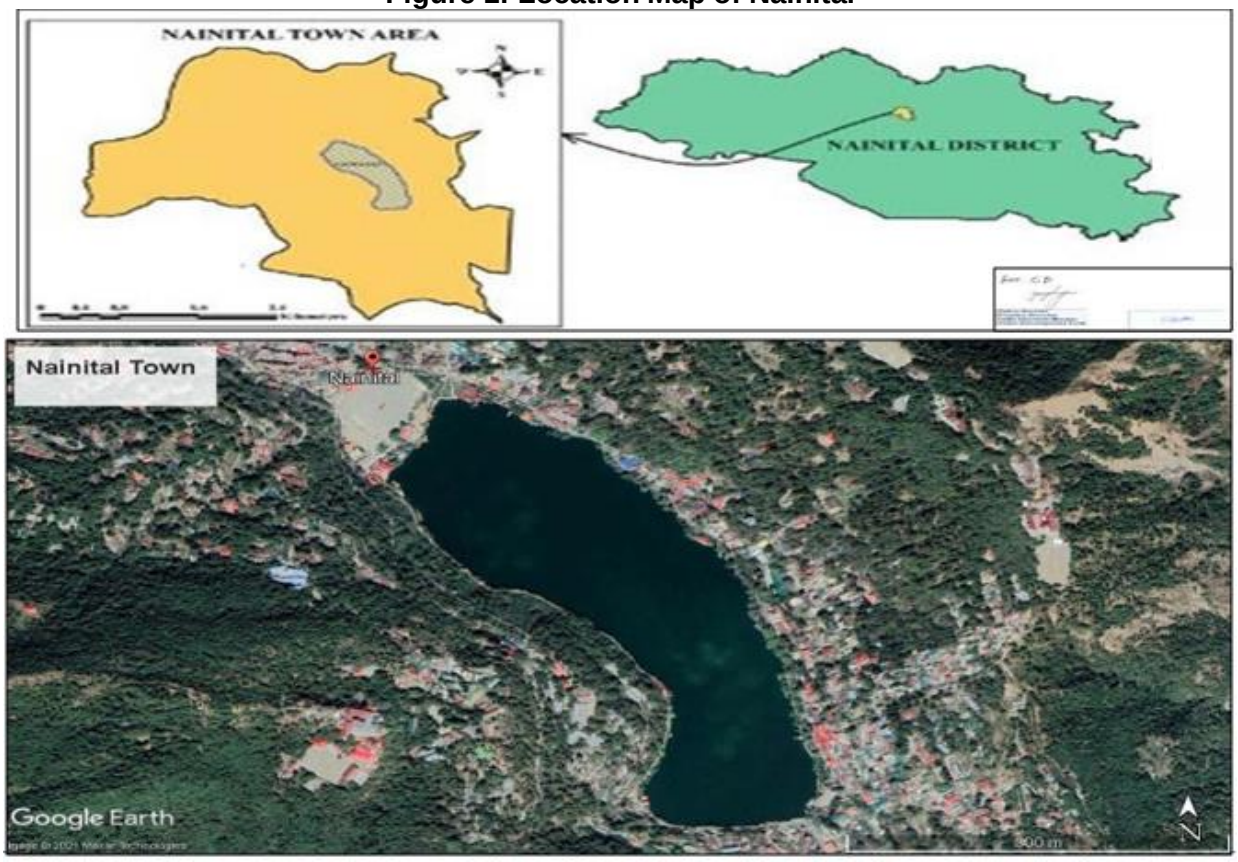
II. DESCRIPTION OF THE PROJECT

A. Nainital City and Subproject Location

17. City of Nainital is the headquarters of Nainital Lake District and Kumaon Mandal. Nainital is the judicial capital of Uttarakhand, where the High Court of the state is located, and the Governor of Uttarakhand resides. With a total area of 11.73 km^2 at an average elevation of 2,084meters (6,837 feet) above sea level, the slopes of the nearby mountains are most populated, withan elevation ranging from 1,940–2,100 meter (6,360–6,890 feet). Nainital is set in a valley around Nainital Lake that is 1,433-meter-long and 463-meter-wide at an altitude of 1,940 meter (6,350 feet) from sea level. Estimated population of Nainital in 2020 was over 60,000. Compared to the 2011 census data of 41,377, the urban population is increased by 50%.

18. As Nainital is the most popular hill station,[4] the average daily visitors to Nainital is around72,650, 90% of which stay overnight.[5] Permanent population increase and 120% floating population overstressed existing water supply infrastructure and service, including the recently added one financed by ADB.[6] The most critical problem is water availability rather than the provision of water supply infrastructure per se. As the water authority in Nainital is observing the rapid groundwater depletion and ground water quality deterioration, the duration of water withdrawal from tube wells has been restricted and available hours of taped water are reduced.

Figure 1: Location Map of Nainital



19. The water pollution issue has been more significant in Nainital lake, as the aging seweragenetworks that has been built between 1980s are not functioning properly, leaving untreated waterleaking into the lake, deteriorating the water quality and resulting in reduced available water for the existing water supply systems.[7] The sewage treatment plant of 10 MLD capacity is not working properly and untreated wastewater finds its way to nearby natural rivulet and ultimately to Nihal river. Thus, replacing of the aging sewerage network and necessary up-gradation of sewage treatment plant in Nainital meeting the effluent discharge norms is an urgent task for the sustainability of both water supply and sewerage

[4] The hill stations are high-altitude towns for recreation and enjoyment and used as a place of refuge to escape the blistering heat in India during summer time, most of the hill stations in India were developed by the British.
[5] UUSDA. 2020. Detailed project report in Nainital sewerage system improvement.
[6] Under Uttarakhand Urban Sector Development Investment Program (two tranches), four tube wells and 154.5 km ofwater supply networks were constructed to serve over 40,000 of residents in Nainital.

systems.

20. It is designed to develop a comprehensive sewerage system to collect, treat, and dispose/reuse the domestic wastewater safely. The main components of subproject of sanitationsystem includes : (i) installation of a new 17.50 MLD STP with sequential batch reactor (SBR) technology at Russi village,(ii)Total length of pipe laying under this project is of 11.9 Km (Rehabilitation of existing 1.2 Km sewer line from Pant Statue to Tallital post office with Cured in place pipe (CIPP) of 1.7 Km from Children park to Tallital post office along the mall road, 1.8 Km laying of rising main with 250 mm dia Ductile Iron (DI-K9) pipe from children park to Tallital Post office along Thandi Sadak, 1.9 Km pipe laying of trunk sewer with 450 mm dia DI-K9 pipe from Tallital post office to Hanuman Garhi, 4.4 Km pipe laying of pressure sewer with 450 mm dia DI- K9 pipe from Hanuman Garhi to Russi bypass and 2.1 Km laying (450 mm dia DI-K9 pipe) of rising main from Russi bypass to Russi STP. ,(iii) installation of five pre-fabricated small-scale STPs with the treatment capacity of 20 kilo-liter per day (KLD) each at five identified locations within the town; (iv) an underground treated effluent storage tank of 630 Kl capacity for storage of tertiary treated effluent within the STP premise, and an existing sedimentation tank (5000 m^3) near Russi village for excess treated effluent storage. (v) a total of 140 manholes, mostly in-situ reinforced cement concrete (RCC) circular manholes, (vi) around 600 household sewer connections.(vii) Use of existing SPS after rehabilitation is also proposed under this sub-project.

21. The design capacities of STP have been determined based on the projected wastewatergeneration. Table 1 shows the projection of population increase in base year of 2021, intermediateyear 2036 and ultimate design year of 2051, which are 135,154 in 2021, 179,678 in 2036 and 239,021 in 2051. Based on the projection of population increase, it has been estimated that the sub-project area will have 14 MLD, 19 MLD & 26 MLD of wastewater during the base, Intermediate& ultimate years respectively. The STP plant will be designed and constructed for the year 2036(under this contract) with space provision for future expansion.

Table 1: Details of Sewage Generation in Nainital

Town	Projected Population (including floating population)			Sewage generation (MLD)		
	Base Year (2021)	Intermediate Year (2036)	Ultimate Year (2051)	Base Year (2021)	Intermediate Year (2036)	Ultimate Year (2051)
Nainital	135154	179678	239021	14.27	18.99	25.24

Source: Subproject Detailed Project Report (2020)

B. Proposed Subproject Components

22. Subprojects are proposed for implementation under Design-Build-Operate (DBO) modality, wherein which the successful bidder has designed the sewerage and components (based on the feasibility / preliminary design / standards/ guidelines provided in the bid document), construct, commission, and operate for 5 years, afterwhich it will be transferred to Nagar Palika Parishad Nainital. Therefore, at this stage, subproject is designed only in outline, and the details of components of the subproject provided in the table 2 below, according to the new information's of detail design phase, this IEE has been updated are as finalized at this stage based on the detailed designs and as included in the bid documents. Table 2 shows the nature and size of the various components of the Water supply, Sewerage and Storm water drainage system.

Table 2: Proposed Nainital Sewerage Subproject Components

Infrastructure	Function	Description	Location
Sewerage			
Sewage collection network including house connections	The Nainital town is completely covered by sewer system, which is fully functional due to the natural gradient of the area; there is no issue with the sewerage flow in laterals. Under the subproject, replacement work of trunk sewer pipeline will be laid through trenchless methods.	**New** **A. Total 11.9 km sewer pipes** Ductile Iron pipes will be used of the following diameter • 1.7 Km (0.5 Km new pipeline and 1.2 Km existing) • 1.8 Km (250 mm, DI-K9 pipe) • 1.9 Km (800 mm, DI-K7 pipe) • 4.4 Km (450 mm, DI-K9) • 2.1 Km (450 mm, DI-K9) **B. 140 numbers Manholes (**in-situ reinforced cement concrete (RCC) circular manholes**)** **House sewer**Connections**:** around 600 household sewer connections along the existing trunk sewer are proposed to be shifted to new trunk sewer by means of un-plasticized polyvinyl chloride (uPVC) pipe stiffness (SN) 4 of 110 mm or 160 mm outside diameter (OD).	Under the subproject, replacement work of trunk sewer pipeline will be laid through trenchless methods. The trunk sewer alignment is proposed along the Naini Lake, which is busy and main walking area for local residents and tourists, hence, a mix of open cut and trenchless method is proposed for laying of trunk sewer pipeline as per the detail projectreport (DPR). The pit width for trenchless pipe laying is proposed as 4 sq. m (2 m x2 m); the pit locations will be selected by the DBO Contractor before execution. Total length of pipe laying under this project is of 11.9 Km (Rehabilitation of existing sewer line) of 1.7 Km from Children Park to Tallital post office along the mall road on PWD road, 1.8 Km laying of rising main with 250 mm dia Ductile Iron (DI-K9) pipe from Children Park to Tallital Post office along Thandi Sadak on irrigation department road, 1.9 Km pipe laying of trunk sewer with 450 mm dia DI-K9 pipe from Tallital post office to Hanuman Garhi on NH 109, 4.4 Km pipe laying of pressure sewer with 450 mm dia DI- K9 pipe from Hanuman Garhi to Russi bypass on NH 109 and 2.1 Km laying (450 mm dia DI-K9 pipe) of rising main from Russi bypass to Russi STP on PWD road. The subproject proposes to construct 140 manholes, mostly in-situ along the trunk sewer network within the ROW of government roads. Household sewer connections along the existing trunk sewer are proposed to be linked with the newtrunk sewer line. Sewer house service connection upto property chambers are proposed for about 600 houses. House connections will be provided through a chamber constructed inside the property lineand another

Infrastructure	Function	Description	Location
			chamber outside the property line. NOC of road cutting for the road under PWD has been obtained and appended as appendix 27 A. in the IEE report and the NOC from NHAI and Irrigation Department are underway and will be submitted in next SEMR.
Sewage TreatmentPlant	Treatment of collected wastewater to meet stipulated discharge standards	**New: 1 STP** 17.5 MLD Capacity **Components:** • SBR (sequential batch reactor) based STP with primary, secondary, tertiary treatment • Disinfection of treated wastewater for reuse • chlorination tank • sludge management (sludge collection, thickening, dewatering and disposal) • Laboratory, and online testing facilities for BOD, COD, TSS etc.,) Instrumentation, automation, SCADAetc.	The proposed STP location is near Russi village (coordinates: 29.364851^0 N, 79.448198^0 E) . Construction of STP (17.5 MLD) with SBR technology will be carried out on the available land of old 10 MLD STP (which is in defunct condition); it is under the possession and ownership of Uttarakhand Pey Jal Nigam, The available land is about 5.30 acres (21,446 sq.m) out of which 3.79 acres (15,350 sq.m) will berequired for the new STP as per thedesign considerations. No objection Certificate received from Uttarakhand Pey Jal Nigam for use of the existing oxidation plant premises in Russi village. The proposed STP is slightly shifted 20 meter toward North West direction as per detailed engineering design due to frequently landslide in the concerned area. The geo-investigation for the slope stability is underway and the results will be incorporated in the final design of STP, the report for the same will be updated in next revised IEE and SEMR.
Treated wastewater storage tank	Store the treated waste water for reuse	It is proposed to reuse the treated effluent for various non-domestic purposes. A portion of the treatedeffluent shall be collected in the 630 Kl capacity treated effluent storage tank by gravity. The treated effluent storage reservoir (dimension: 18mx10mx3.5m) is for storage of 10% of treated effluent of 17.50MLD STP capacity for 8 hours storage. An existing sedimentation tank (5000	A storage tank of 630 Kl capacity for treated wastewater will be installed within the STP premise. The drawing and design for treated wastewater storage tank is underway and will be updated in revised IEE. An environmental compliance audit will be conducted for the existing storage tank near Russi village

Infrastructure	Function	Description	Location
		m^3) near Russi village will be used as alternative/additional storage for excess treated effluent storage for irrigation purposes.	
Outflow sewer	Surplus/excess treated effluent that is not put to reuse will be discharged through outflow sewer	Outflow sewer /treated effluent discharge pipe	The excess treated effluent (after reuse) shall be discharged into the nearby Bhatti-Gadhera rivuletwhich ultimately meets the Nihal river downstream with approval of the Uttarakhand Environmental Protection and Pollution Control Board (UEPPCB). The surplus treated effluent will be discharged into the nearby Bhatti-Gadhera rivulet through the existing channel/system/ The rivulet passes at 88 m from the proposed STP boundary and it travels around 3 km along government owned vacant land, before it meets the Nihal river downstream.
Pre-fabricated Sewage Treatment Plants	To reuse the treated sewage and reduce the fresh water requirements During rainy season, there will not be requirement for recycle water for gardens / parks, and hence arrangement for bypass of sewage from Packaged STP to nearby public sewer shall be made by gravity/pumping system. Treated sewage after chlorination from packaged STP shall be reused within complex for gardening. However, in case of emergency or major maintenance; the treated sewage can be discharged into nearby trunk sewer.	Five STPs, of 20 KLD capacity each, will be installed in following government buildings/ compounds: a) High Court Building Complex (20 KLD) b) PWD guest house (20 KLD) c) Forest Staff quarter (20 KLD) d) Polytechnic college (20 KLD) Raj Bhawan Complex (20 KLD)	Land requirement for the 20 KLD STP is 40 Sq.m. The identified land areas within the premises of government offices are vacant and not in use. UIRUDP has applied for NOC from the respective above mentioned departments. On Obtaining the NOCs, the same will be appended to the next revised IEE report.
Sewage Pumping	An existing Sewage Pumping Station will	The audit of this existing SPS is underway and will	NA

Infrastructure	Function	Description	Location
Station (SPS)	be utilized for the rising main to pump the sewage from Children Park to Tallital Post Office along Thandi Sadak after the prior approval from Uttarakhand Jal Sansthan, Nainital.	be updated in SEMR and next revised IEE report.	

C. Sewage Treatment Plant

23. The proposed STP location (coordinates: 29.364851^0 N, 79.448198^0 E) is near Russi village in implementation stage where the old STPs (2x 5 MLD) exist which are in defunct condition. There is no need for terminal sewage pumping station (TSPS) for STP as due to huge level difference (300 m difference between Russi village and town); the raw sewage through trunk sewer will be received by gravity. The existing STPs were constructed at two levels, and it is planned to demolish the plant units (sedimentation tanks) and construct the new STP of 17.5 MLD capacity on that part and adjoining land (Figure 2).

Figure 2: Location Map for Existing and Proposed STPs

Existing 5 MLD STP at Upper Level at Russi Village (Sedimentation Tank)

Existing 5 MLD STP at Lower Level at Russi Village (Sedimentation Tank)

24. The identified old STP land is under the possession and ownership of Uttarakhand PeyjalNigam since 1974. The available land is about 5.30 acres (21,446 sq.m) out of which 3.79 acres(15,350 sq.m) will be required for the new STP as per the design considerations (**Table 3)**. The Uttarakhand Peyjal Nigam vide letter number 1943/Nainital Sewer/26 dated 5th October 2020 hasprovided 'no objection' to UUSDA for use of the existing oxidation plant premises in Russi villagefor construction of STP. Details of STP land and no objection received from Uttarakhand Pey Jal Nigam along with land records are appended in **Appendix 8.**

Table 3: Details of Land Availability for Sewage Treatment Plants

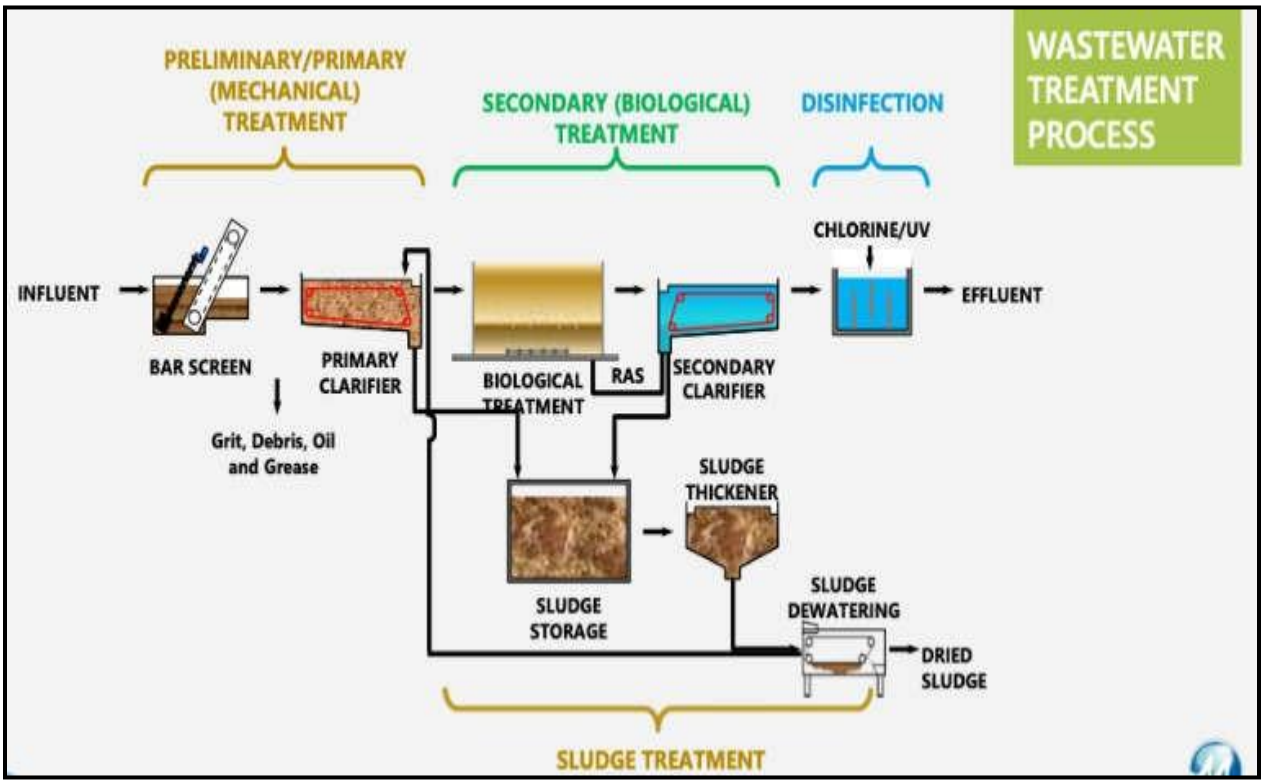
Project Component	Location	Ownership (Area of government land available at the location)	Khasra (Plot) No. [Land-use Classification]	Area required	Status of NOC
Sewage Treatment Plant of 17.5 MLD Capacity	Russi Village	Pey Jal Nigam, Govt. of Uttarakhand [5.30 acres or 2.145 hectare]	636, Plot no. 580 *Land Use: Banzar*[8] (as per land records)	3.79 acre (1.535 hectare)	NOC obtained

Source: Project Management Unit, UIRUDP and Design and Supervision Consultants

25. The STP will be constructed as per the existing topography to avoid the deep excavationand steep area will not use for any other structures and it will be used for landscaping only. A typical sewage treatment process involves (i) primary mechanical treatment to screen out grit, debris, oil and grease from the influent; (ii) secondary biological and/or chemical treatment process; (iii) disinfection; and (iv) sludge dewatering and disposal.

26. As for a biological treatment process at proposed STP, a Sequential Batch Reactor (SBR)is proposed. A SBR is a cyclic activated sludge treatment process and provides highest treatmentefficiency possible in a single step biological process. The incoming sewage will be fed into the cyclic activated sludge process/SBR process basins for biological treatment to remove BOD, CODand Suspended Solids. Thus, neither additional settling unit, nor a secondary clarifier will be required. As for disinfection process, chlorine treatment will be used. As the STP will be designedin a modular approach, it will optimize energy and resource consumption. # Figure 3 is the typical sewage treatment process and layout plan of proposed 17.5 MLD STP is shown in Figure 4. During the detailed engineering design, the treatment process has been finalized now as per the detailed design of DBOC. Nevertheless, the treated effluent must meet the effluent quality standards. It is proposed to design the STPs to stringent discharge standards suggested by CPCB in 2015 and order of National Green Tribunal(NGT) dated 30th April 2019 (Appendix 4). The stringent standards also facilitate maximum utilization of treated wastewater for reuse in various purposes following guidelines of Central Public Health and Environmental Engineering Organization (CPHEEO). (Appendix 10).

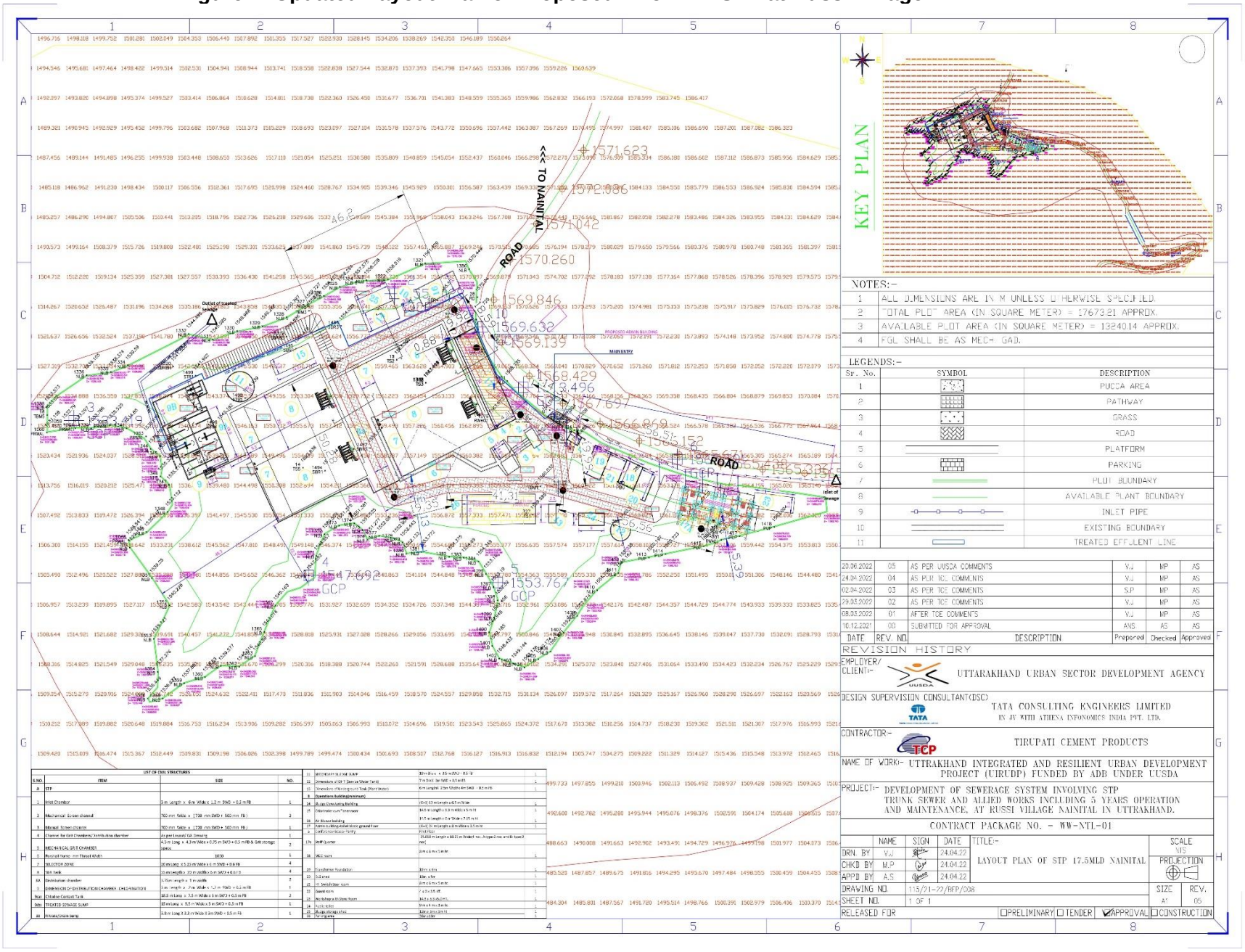
Figure 3: Typical Sewage Treatment Process



Source: Project Management Unit, UIRUDP and Design and Supervision Consultants

[8] Barren land

Figure 4: Updated Layout Plan of Proposed 17.5 MLD STP at Russi Village



27. As for sludge treatment, a sludge sump and pump house shall be provided for collection and transfer of sludge from Aeration tanks to sludge thickener. The thickener shall be provided to thicken sludge (solids concentration to 3-4%). The thickened sludge shall be collected in a sump from where it shall be pumped to centrifuge for dewatering. Dewatered sludge cake will further air dried in a sludge storage shed for 15 days. Sewage sludge generated from the treatment process has undergone sufficient treatment for stabilization and pathogen reduction. Hence, the sludge generated is of high quality that can be applied on land. Considering that the sludge from the treatment process is composed of both inorganic and organic materials, large concentration of some plant nutrients and much smaller concentrations of numerous trace elements and organic chemicals, the sludge can be used for fertilizer in agriculture land. Any remaining can be disposed at identified landfill site near Haldwani[9] which is located about 30 km from proposed STP as per prevailing norms by pollution control board. A sludge reuse plan will be developed and implemented by the Contractor in consultation with the Municipality authorities. UUSDA will obtain approval or NOC/CTO from the Uttarakhand Environmental Protection & Pollution Control Board (UEPPCB) for dried sludge disposal to landfill site.

28. **Reuse and discharge of treated effluent.** A treated effluent storage tank is proposed forthe tertiary treated effluent for reuse purposes and shall meet the tertiary treated quality as specified in the contract. The tertiary treated effluent shall be collected in the treated effluent storage tank by gravity. It is proposed to reuse the treated effluent for various non-domestic purposes the treated sewage shall be used for gardening, cleaning, sewer manholes flushing and other purposes within premises. In order to safeguard the interest of users of treated effluent, it is proposed to apply technology/process to achieve very low biological oxygen demand (BOD) - BOD10, and suspended solids (SS) in the treated effluent. The treated effluent reuse plan shall be developed and implemented by the contractor in consultation with the Nagar Palika Parishad authorities. Treated effluent (partial quantity up to 10%) will be pumped to the existing sedimentation tank located at the higher elevation from Russi village, which will be utilized for irrigation purpose by the vegetable growing community of the village with following the prescribed standard for irrigation purpose. Meaningful consultation was conducted with the local farmers near Russi village regarding the use of excess treated effluent for irrigation purposes. Balance quantity of treated effluent will be used for the green area and other balance quantity will be used for irrigation in the STP premises for the green belt.

29. The excess/surplus treated effluent after reuse (as per the discharge standards) shall be discharged into the nearby Bhatti-Gadhera rivulet from the STP which ultimately meets the Nihal river[10] downstream as per guidelines and approval of the Uttarakhand Environmental Protection and Pollution Control Board (UEPPCB). The rivulet passes at a distance of 88 m from the proposed STP boundary and it travels around 3 km before it meets the river. The Bhatti-Gadherarivulet remains mostly dry except during rains. It has been confirmed by the UUSDA that there are no water intake points in the immediate downstream of Nihal river also carries the untreated wastewater from the adjacent areas. Considering the existing status of river and the degree of treatment, no significant impacts are envisaged. In order to safeguard the interest of users of treated effluent, it is proposed to apply technology/process to achieve very low BOD (BOD10) and suspended solids in the treated effluent. (Figure 5).

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[9]The landfill site for compost plant and sanitary landfill facility is located east of Haldwani City near Indira Nagar railway crossing on Sitarganj bypass near village Gaujajali Uttar
Tehsil, Haldwani at Latitude 29o125.40' N& Longitude 79o320.40' E with land elevation 424 m above mean sea level

[10] a tributary of Bhakra Nadi. and in the entire stretch up to Nihal Nadi, there is no households

Figure 5: Proposed STP and Effluent Discharge System

Source: DBO PMU, Dehradun

Source: Subproject Detailed Project Report (2020)

D. Pre-fabricated Sewage Treatment Plants

30. With an objective to reuse the treated sewage and reduce the fresh water requirements, five (5) packaged STPs have been proposed in the subproject. These STPs, of 20 KLD capacityeach, will be installed in government buildings/ compounds (Figure 6) which are:

(i) High Court Building Complex (20 KLD)
(ii) PWD guest house (20 KLD)
(iii) Forest Staff quarter (20 KLD)
(iv) Polytechnic college (20 KLD)
(v) Raj Bhawan Complex (20 KLD)

31. Land requirement for the 20 KLD STP is 40 Sq.m. The identified land areas within the premises of government offices are vacant and not in use. UIRUDP has applied for NOC from therespective above-mentioned departments. On Obtaining the NOCs, the same will be appended to the this updated IEE report.

32. During rainy season, there will not be requirement for recycle water for gardens / parks, and hence arrangement for bypass of sewage from Packaged STP to nearby public sewer shall be made by gravity/pumping system. Treated sewage after chlorination from packaged STP shallbe reused within complex for gardening. However, in case of emergency or major maintenance; the treated sewage can be discharged into nearby trunk sewer. Details of outfall drains of five packaged STPs are given in Appendix 25.

Figure 6: Google Map Showing Locations of Five Pre-Fabricated STPs

Source: Subproject Detailed Project Report (2020)

E. Sewer Network

33. Out of total length of around 11.9 km, around 1.8 Km of ductile iron class K9 (DI-K9) with 250 mm dia, 1.9 km DI-K7 with 800 mm dia, 6.5 Km of DI-K9 pipe with 450 mm dia will be laid entirely using trenchless/Open cut methods. Further, the trenchless methods are being adopted as the sewer alignment is along the busy road, whereopen excavation is not possible. Small pits shall be excavated at almost every 100 meter and the pipe lying work will be executed through these pits only. This will help in reduced traffic disruptions and inconvenience to local public, shopkeepers as well as tourists.

34. During the work execution total length of pipe laying under this project is 11.9 Km from which 1.7 Km (0.5 Km proposed from Children Park to Pant statue with 250 mm, DI-K9 pipe and 1.2 Km from Pant Statue to Tallital Post Office existing pipeline will be rehabilitated) along the mall road, 1.8 Km laying of rising main with 250 mm dia Ductile Iron (DI-K9) pipe from Children Park to Tallital Post office along Thandi Sadak, 1.9 Km pipe laying of trunk sewer with 450 mm dia DI-K9 pipe from Tallital post office to Hanuman Garhi, 4.4 Km pipe laying of pressure sewer with 450 mm dia DI- K9 pipe from Hanuman Garhi to Russi bypass and 2.1 Km laying (450 mm dia DI-K9 pipe) of rising main from Russi bypass to Russi STP. At the time of connection of new trunk sewerwith the existing one, the manhole at the connection point will be isolated by plugging the upstream and downstream manholes. In the interim period, the sewage will be pumped to the downstream manhole. Once the connection is made, the new sewer will start functioning. The network will be of the conventional gravity collection type,conveying the sewage to discharge into inlet chamber of the new STP. An existing SPS will be utilized to pump the sewage for rising main along thandi sadak from Children Park to Tallital, Post Office. The audit of existing SPS and NOC for the same from Uttarakhand Jal Sansthan (UJS) is underway and will be included in the next updated in IEE report.

35. Under the subproject, the sewer pipelines will be laid within the ROW of government roads,under the ownership of National Highway Authority of India (NH 109); about 6.3 km on NHAI roads, 3.8 Km Public Works Department (PWD) road and 1.8 Km on the road of irrigation department and kms on (Table 3). The PMU has been initiated the process to obtain no objection certificate from NHAI and Public Works Department for laying trunk sewer pipes appendix 27. Photographs of the roads through which the sewer pipelines will be laid are provided in **Appendix 25**.

36. During the execution, the existing trunk will be rehabilitated from Pant Statue to Tallital Post Office. New trunk sewer will be laid in other stretches from Tallital Post Office up to the proposed STP with an alternate arrangement for the function of the existing sewer. At the time of laying of the new trunk sewer, the upstream and downstream manholes will be plugged at that stretch, isolating that particular sewer. The sewage will be bypassed (pumped) to the downstream manhole from Upstream manhole avoiding sewer line under execution. Once the connection is made, the new sewer will start functioning. The network will be of the conventional gravity collection type, conveying the sewage to discharge into inlet chamber of the new STP. The subproject proposes to construct 140 numbers in-situ RCC circular manholes along the trunk sewer network within the ROW of government roads, and Sewer house service connection up to property chambers are proposed for 600 houses.

Table 4: Road Width-wise Diameter of Sewer Pipeline to be Laid

Sl. No.	Name of Major Road	Length (KM)	Category Low/Medium/High Density	Width (M)	Dia of Pipe (mm)	Proposed Trench Width (M)	Road Owning Department	NOC Status
1	Children Park to Tallital Post Office along Mall road	1.7	High	30	Rehabilitation	2 x 2	PWD	Obtained and appended as Appendix 27A.
2.	Children Park to Tallital post office along Thandi Sadak	1.8	High	30	250	2 x 2	Irrigation	Process underway
3.	Talital PO to Hanuman Garhi	1.9	High	30	800	2 x 2	NH 109	Process underway
4.	Hanuman Garhi to Russi Bypass	4.4	High	30	450	2 x 2	NH 109	Process underway
5.	Russi bypass to Russi STP	2.1	Moderate	30	450	2 x 2	PWD	Obtained and appended as Appendix 27A.
	Total	**11.9**						

Source: Project Management Unit, UIRUDP and Design and Supervision Consultants

37. There are no structures (either temporary or permanent) or common property resources (CPRs) on the proposed pipe/drain right of way. During preparation of the resettlement plan transect walks conducted along the proposed alignment have confirmed that no commercial establishments, permanent shops along the route will be impacted. Following the transect walks,survey of affected businesses a total of 19 roadside shops (which includes one vendor and one kiosk), are anticipated to face temporary income loss due to access disruption during the construction period. The resettlement plan assessed these impacts and provided mitigation/compensatory measures for the assessed impact of the project activities

.

38. A total of 140 **manholes**, mostly in-situ reinforced cement concrete (RCC) circular manholes, will be installed along the sewer network. The household sewer connections along the existing trunk sewer are proposed to be shifted to new trunk sewer.

39. **Around 600 household sewer connections** will be installed. House connections will be provided through a chamber constructed inside the property line and another chamber outside the property line. Chambers are to be connected with manholes in the main sewer line below theroads by means of uPVC pipe SN4 of 110 mm or 160 mm OD.

F. SCADA and GIS System

40. The STP will be automatically operated, with PLC based control with SCADA/ HMI whichwill be monitored/ controlled from control station housed in Administrative Building.

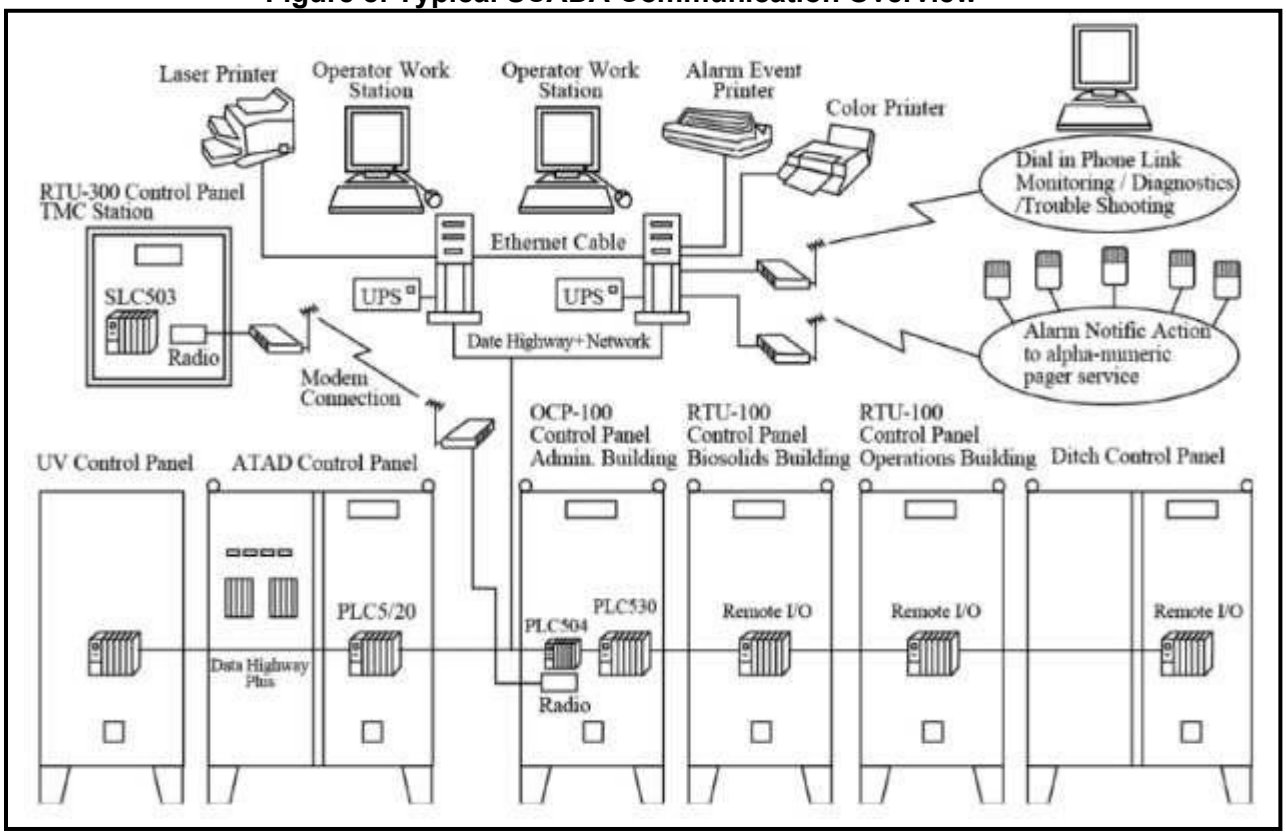
41. The GIS data of trunk sewer and its manholes will be linked to web based interface/ dashboard to Supervisory Control and Data Acquisition (SCADA) for control and monitoring. SCADA presents the data as a viewable and controllable system on the screen

of a computer. The data thus collected is stored and analysed for better real time process control. It assists plant operating personnel by monitoring and announcing abnormal conditions and failure of equipmentand allows the operators to perform calculations based on the sensor inputs. Daily, weekly and monthly reports can be prepared using the stored data. A typical SCADA is shown in Figure 8.

42. Signals generated by various sensors and instruments are transmitted from the sensor toa control panel or computer system, which allows operators to inspect many process variables simultaneously. A Programmable Logic Controller (PLC) is electronic equipment that senses inputs and takes the decision to change outputs according to the set rules stored in the memory.Link systems with PLC are used for transmitting the signal, with which analogue signal is converted to digital signal and transmitted via coaxial cables or optical fibres.

43. The GIS and SCADA will be developed in a compatible environment so that it is aligned to city-wide CMMS. During operation and maintenance, the status of assets, inspection details and inventory etc. will be managed through these linkages to CMMS. The GIS system will be providing real time information for CMMS on ever increasing consumer details.

Figure 8: Typical SCADA Communication Overview[11]



[11] Source: Chapter 6, Part B Operation and Maintenance, Manual on Sewerage and Sewage Treatment Systems, Central Public Health and Environmental Engineering Organization, Ministry of Urban Development, India

G. Subproject Benefits

44. The sewerage system subproject is primarily designed to improve environmental qualityand living conditions of people residing in colony areas within Nainital. The benefits arising from these subprojects include: (i) better public health particularly reduction in waterborne andinfectious diseases due to improved sewerage and drainage systems in project areas; (ii) reduced risk of groundwater/surface water contamination through appropriate sewer collection and treatment; (iii) reduced risk of contamination of treated water supplies; (iv) resolve the problem ofpollution of the Nainital lake and improvement in quality of water bodies due to disposal of treatedeffluent meeting disposal standards.

H. Energy Efficiency Measures included in the subproject

45. The subprojects in the project areas of Nainital are designed with utmost consideration toenergy efficiency. Gravity flow systems have been adopted.

46. To make the project energy efficient, as part of this project, energy efficiency measures are required to be included in the design of the projects. Accordingly, energy efficiency measuresare being considered and incorporated into the subproject designs where appropriate. Energy efficient, high-performance motors and transformers shall be provided for optimum utilization of energy during construction and operation of the project.

47. Component of luminaries shall be ‘energy efficient low loss’ type. Low power consuming CFL (Compact Fluorescent Lamp) /LED (Light-emitting Diode) type of luminaries shall be used for office/ all indoor areas except pump house area. HPSV or HPMV luminaries shall be used forpump house area and other outdoor areas. Street/ area lighting shall be of LED type and controlled by time switch/ photocell for automatic switching of luminaries. Solar type streetlights shall be installed where feasible in the project. Specification of solar lighting shall be as per Ministry of New and Renewable Energy. Fixtures shall be energy efficient and ballast shall be electronic low loss type.

48. Supervisory Control and Data Acquisition (SCADA) has been proposed for entire systemof sewerage works. SCADA shall support and include a multi-level real-time auditing and advisingof energy optimization process and Real-time process performance software. The key benefits ofa performance auditing system would be a more energy efficient plant, improved reliability and safety, and increased profitability.

I. Implementation Schedule

49. After the completion feasibility study /preliminary designs, bids were invited in the month of January 2021 for the subprojects to be implemented under the DBO (design-build-operate) modality. After technical and financial evaluation of bids, works were awarded to the successful bidder and contract agreement was signed on 01 September 2021. Design and build completion period is 36 months after the award of work. After completion of constructionand commissioning, scheme will be operated by DBO contractor for 5 years, and after which theoperation and maintenance will be carried out by Nagar Palika Parishad Nainital.

III. ANALYSIS OF ALTERNATIVES

50. The ADB SPS requires an analysis of project alternatives to determine the best method of achieving project objectives (disposing the human waste generated, in Nainital in this case) while minimizing environmental impacts. Alternative analysis provides opportunity to integrate environmental considerations into early stages of project (i.e., pre-feasibility or feasibility study), so that adverse environmental impacts can be avoided or minimized by various alternatives. It also provides opportunity to study various options vis a vis costs, provides a logical base, via transparent process, assist in decision making, gaining public support and ultimately in project approvals and timely implementation.

51. The proposed sewerage subproject components include sewage collection network, transmission, treatment and treated wastewater reuse and disposal. Descriptions of various alternatives considered for critical components such as water source, sewage treatment, treatedwastewater disposal etc., are presented in the table 5 below.

Table 5: Analysis of Alternatives

1.	**Project Need – No Project Alternative**
Type of alternative	**'No project' / 'with project' alternative**
Description of alternatives	**<u>No project alternative</u>** Sewerage subprojects of Nainital city is proposed to improve the service levels of basic infrastructure – which will ultimately improve. The objective of this subproject is to upgrade the dilapidated sewerage system (mainly Trunk sewer) associated with frequent operation troubles such as blockage/chocking of sewer lines. A holistic approach has been adopted for the development of sewerage system. There is a 10 MLD (2x5 MLD) STP (only primary treatment) at Russi village which is not functioning currently. In present scenario the sewage flows through the existing sewer network and connected to existing trunk sewer which is very old and needto be upgraded. Existing treatment facility is inadequate and hence there is an immediateneed for providing new treatment facility along with trunk sewer for future sewage generation. At present the sewage of the town, except Harinagar, Krishnapur and Narayan Nagar areas, is being disposed off near Russi village in where the old STPs (2x 5 MLD) exist (only primary treatment). The existing STPs were constructed at two levels and it is planned to demolish the plant units (sedimentation tanks), which is situated near STP site and construct the new 17.5 MLD capacity STP on that part and adjoining land. Besides the old Russi STPs, 2 more STPs have also been constructed under JNNURM. In Harinagar – I area near Dhobighatand Krishnapur areas, of capacities 0.45 MLD (MBBR) and 0.80 MLD (SBR) respectively. Another STP of 0.45 MLD is under construction in Narayan Nagar under AMRUT. With an objective to reuse the treated sewage and reduce the fresh water requirements,five (5) packaged STPs have been proposed in the subproject. These STPs, of 20 KLDcapacity each, will be installed in government buildings/ compounds. The project intends to provide following benefits to the town population, and the "no project" alternative will deprive people of these benefits: • better public health particularly reduction in waterborne and infectious diseases; reduced risk of groundwater contamination through appropriate sewer collection and treatment; • to resolve the problem of pollution of the lake

	• reduced risk of contamination of treated water supplies; • improvement in quality of surface water bodies due to disposal of treated effluent meeting disposal standards **<u>With project alternative</u>** The proposed subproject will support the ongoing efforts of the Government of Uttarakhand (the government) towards improving sewerage systems. The project will construct the sewerage networks, new wastewater treatment plants, pre-fabricated seweage treatment plants (packaged STPs) in some identified areas and decentralized waste water management systems along with improved drainage system in the project areas. The project is expected to increase operational efficiency, improve service delivery, and result in a positive impact on health and quality of life for the residents of project towns in the state. The sewerage system will remove the human waste from their homes safely and quicklyas a result, good hygiene and sanitation practices will be promoted and there will be reduced health and safety risks. Overall, the '**with project alternative'** will bring about improved public health and livingenvironment that will contribute to improved quality of life in the city. Improved sanitationwill create an enabling environment for local economic development and improved social services that communities within the sphere of influence of the municipality area will benefit from; thus, contributing to the overall economic development of the region. • .

Selected Alternative	Without subprojects would yield the town to be continuously under-serviced that puts thehealth of the general public at an increasing risk and could potentially worsen the living environment. This 'no project' scenario would impede further social and economic development of the district/area and the defer commitments to improve the proportion ofthe population with sustainable access to clean environment and basic sanitation. Given the large-scale benefits to the population and environment, 'with project' alternative is considered appropriate
2	**Sewage treatment process**
Type of alternative	**Sewage treatment technology**

Description of alternatives

Various secondary treatment technologies have been considered in the sewage treatment process after the primary treatment consisting of screening and grit removal. Secondary treatment is the critical process that removes the organic putrescible organicmatters and brings down the BOD of the effluent to meet the discharge standards. Following process technologies are considered: *Extended Aeration (EA), Moving Bed Bio-Reactor (MBBR), Sequencing Batch Reactor (SBR) and Membrane Bio Reactor (MBR).*

A comparison of various treatment technologies is presented below in terms of meritsof the process over key parameters like quality characteristics and land requirement:

Comparison of Treatment Technologies for STP

Parameters	Impact	EA	SBR	MBBR	MBR
Capital cost	Initial Investment	Medium	High	Medium	Very high
Power cost	Proportion al to impact on lifecycle cost	High	Medium	Medium	Very high
Chemical cost	Proportion al to impact on lifecycle cost	Least	Least	Least	High - Membra ne cleaning chemica ls
Operation and Maintenance Cost	Proportion al to impact on lifecycle cost	Least	High - Automation maintenance	Medium	Very High - More automation maintenanc eand Membra ne cleaning
Space Requirements	Land Requirement	Medium	Less. 60% of that required for EA.	Less. 50%of that required for EA.	Less. 40% of that required for EA.
Periodic equipment replacement cost	Proportion al to impact on lifecycle cost	Less	Medium	Less	High - Membran e replacem ent once in (5-7 years)
Skilled personnel Cost	Proportion al to impact on lifecycle cost	Simplest to operate	Cycle time control needs higher skill	Simple to operate	MBR need higher skill

Complexity	Simpler is better	Relatively simple process	Cycle time control adds some operational complexity	Relatively simple Process	MBR TMP/ permeability monitoring, scour, back pulse, and maintenance cleaning adds some complexity
Reuse Potential	Relates to reuse applications and additional capital costs	need additional units for reuse applications	need additional units for reuse applications	need additional units for reuse applications	Highly reliable effluent quality – not need additional units

Comparison of Various Treatment Technologies for STP

Assessment Parameter/ Technology		EA*	SBR	MBBR	MBR
1.0 Performance after Secondary Treatment					
1.1	Effluent BOD, mg/L	<20	<10	<30	<5
1.2	Effluent SS, mg/L	<30	<10	<30	<5
1.3	Fecal coliform removal, log unit	upto 3<4	upto 3<4	upto 2<3	upto 5<6
1.4	T-N Removal Efficiency, %	50-60	70-80	10-20	70-80
2.0 Performance After Tertiary Treatment					
2.1	Effluent BOD, mg/L	<10	<10	<10	<10
2.2	Effluent SS, mg/L	<5	<5	<5	<5
2.3	Effluent NH3N, mg/L	<1	<1	<1	<1
2.4	Effluent TP, mg/L	<0.5	<0.5	<0.5	<0.5
2.5	Effluent Total Coliforms, MPN/100 mL	10	10	10	10
3.0 Area Requirements					
3.1	Average Area, m^2 per MLD Secondary Treatment + Secondary Sludge Handling	675	450	450	450

	3.2	Average Area, m^2 per MLD Tertiary Treatment + Tertiary Sludge Handling	100	100	100	0
	3.3	Total Area, m^2 per MLD Secondary + Tertiary Treatment	775	550	550	450

Source : DPR 2020

Selected Alternative

Selected process: Sequential batch reactor (SBR)

The genesis of selecting a suitable treatment process is primarily correlated with degree of treatment aimed to be achieved. In India, the latest court Order of April 2019 (NGT Order dated 30-04-2019) mandates all the civic authorities to adopt the treated sewage characteristics applicable are as shown below:

Parameter	Parameters Limit
pH	5.5 – 9.0
BOD	Not more than 10 mg/l
TSS	Not more than 20 mg/l
COD	Not more than 50 mg/l
Nitrogen-Total	Not more than 10 mg/l
Phosphorus- Total ,for discharge into ponds/lakes	Not more than 1.0 mg/l
Fecal Coliform (MPN/ 100 ml)	Desirable -Less than100 PN/100ml Permissible – 230 MPN/100ml

SBR provides highest treatment efficiency possible in a single step biological process. The system is operated in a batch reactor mode this eliminates all the inefficiencies of the continuous processes. A batch reactor is a perfect reactor, which ensures 100% treatment. Separate modules are provided to ensure continuous treatment. The complete process takes place in a single reactor, within which all biological treatment steps take place sequence. The complete biological operation is divided into cycles. Each cycle is of 3 – 5-hour duration, during which all treatment steps take place.

3	**Treated wastewater disposal**
Type of alternative	Treated wastewater disposal – reuse applications

Description of alternatives	(i) Discharge of treated wastewater into water bodies / on land (ii) Reuse the treated wastewater in non-potable uses (iii) It is proposed to reuse the treated effluent for various non-domesticpurposes The treated sewage shall be used for gardening, washing,sewer manhole flushing and other purposes within premises (iv)The excess/surplus treated effluent after reuse (as per the discharge standards) shall bedischarged into the nearby Bhatti-Gadhera rivulet from the STP which ultimately meets the Nihal river (a tributary of Bhakra Nadi) downstream. as per guidelines and approval of the Uttarakhand Environmental Protection and Pollution Control Board (UEPPCB). The entire stretch passes through vacant Govt. land). (v) In order to safeguard the interest of users of treated effluent, it is proposed to apply technology/process to achieve very low biologicaloxygen demand (BOD) - BOD10, and suspended solids (SS) in the treated effluent. The treated effluent reuse plan shall be developed and implemented by the contractor in consultation with the Nagar Palika Parishad authorities and affected stakeholders.
Selected Alternative	Reuse in non-potable applications and discharge excess/surplus treated effluent in nearby Bhatti-Gadhera rivulet from the STP which ultimately meets at Nihal river downstream.
4	**Project Locations**
Description Selected of alternatives	**Location of Sewage Treatment Plant (STP):** The site selection for STP is mainly guided by technical feasibility, availability of suitable and adequate Government land. The location of STP within a service area is based primarily on topographic considerations and the need to provide for future development. STP site is selected with proper consideration given to the availability of land and required utilities such as electric power, potable water, fire protection and telephone service. **The 17.5 MLD capacity STP location** (coordinates: 29.364851^0 N, 79.448198^0 E) is proposed near Russi village where the old STP (2x 5 MLD) exist (sedimentation tank only. The land is under the possession and ownership of Uttarakhand Pey Jal Nigam, Nainital. The available land is about 5.30 acres (21,446 sq.m) out of which 3.79 acres (15,350 sq.m) will be required for the new STP as per the design considerations. No objection received from Uttarakhand Pey Jal Nigam..The STP will be constructed as per the existing topography to avoid the deep excavation and steep area will not used for any other structures and it will be used for landscaping only. The STP site is vacant land and nearest sensitive receptor (house) is at 250m distance . Although a 500m distance away from habitation is desirable as far as possible, due tolack of suitable lands and also considering the selected superior and compact sewage treatment technology the proposed STP site is selected. Proposed STP site is covered with, shrubs and bushes, and no notable wildlife is reported at this site. There is no protected areas, wetlands, mangroves, or estuaries in or near the project locations. As per IBAT screening report there is no formally designated Protected areas within 10 km radius area of the proposed STP site. **Laying of Trunk Sewer and Sewer Network Pipelines:** During the work execution total length of pipe laying under this project is 11.9 Km from which 1.7 Km (0.5 Km proposed from Children Park to Pant statue with 250 mm, DI-K9 pipe and 1.2 Km from Pant Statue to Tallital Post Office existing pipeline will be rehabilitated) along the mall road, 1.8 Km laying of rising main with 250 mm dia Ductile Iron (DI-K9) pipe from Children Park to Tallital Post office along Thandi Sadak, 1.9 Km pipe laying of trunk sewer with 450 mm dia DI-K9 pipe from Tallital post office to Hanuman Garhi, 4.4 Km pipe laying of pressure sewer with 450 mm dia DI- K9 pipe from Hanuman Garhi to Russi bypass and 2.1 Km laying (450 mm dia DI-K9 pipe) of

	rising main from Russi bypass to Russi STP. No involuntary land acquisition of private land is anticipated for this project. The project sites are located in existing road right of way (RoW) and government-owned lands. Further, the trenchless methods are being adopted as the sewer alignment is along Naini Lake and the busy road, where open excavation is not possible. This will help in reduced traffic disruptions and inconvenience to local public, shopkeepers as well as tourists. During pipe laying works tree cutting is not envisaged as per detailed design, however If any tree is required to be cut, compensatory tree plantation will be carried out in 1:3 ratio asper UUSDA policy.

IV. POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Safeguard Policy Statement, 2009

52. ADB SPS requires that during the design, construction and operation of the project necessary compliance to all applicable laws and international conventions / treaties along with pollution prevention and control technologies and practices consistent with international good practice, are ensured.

53. **Screening and Categorization with that of ADB SPS 2009.** ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, includingdirect, indirect, cumulative, and induced impacts in the project's area of influence. Each proposedproject is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

a. **Category A**. A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilitiessubject to physical works. An environmental impact assessment (EIA) is required.
b. **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. Theseimpacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for Category A projects. An initial environmental examination (IEE) is required.
c. **Category C**. A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
d. **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

54. The environmental impacts of Nainital sewerage subproject have been identified and assessed as part of the planning and design process. An environmental assessment using ADB's Rapid Environmental Assessment Checklist for Sewerage (Appendix 1) was conducted, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this IEE has been prepared in accordance with ADB SPS's requirements for environment Category B projects.

55. **Environmental Management Plan.** An EMP which addresses the potential impacts andrisks identified by the environmental assessment has been 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. The EMP has proposed mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.

56. **Environmental Audit of Existing Facilities.** ADB SPS requires that relevant external experts perform an environmental audit, if a subproject involves facilities and/or business activitiesthat already exist or are under construction, it determine the existence of any areas where such project may cause or is causing environmental risks or impacts and

identify and plan appropriatemeasures to address outstanding environmental issues. If the project does not foresee any new major expansion, the audit constitutes the environmental assessment for the project. and plan appropriate measures to address outstanding compliance issues.

57. **Public Disclosure.** The IEE is available in an accessible place (e.g., local government offices, libraries, community centers, etc.), and a summary translated into local language for the project affected people and other stakeholders. The following safeguard documents are availablein ADB's website so that the affected people, other stakeholders, and the public can provide meaningful inputs into the project design and implementation:

a. For environmental category A projects, a draft EIA report at least 120 days before Board consideration;
b. Final or updated EIA and/or IEE upon receipt; and
c. Environmental monitoring reports submitted by the Project Management Unit(PMU) during project implementation upon receipt.

58. **Consultation and Participation.** ADB SPS require borrower to conduct meaningful consultation[12] with affected people and other concerned stakeholders, including civil society, andfacilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report on regular basis

59. **Grievance Redress Mechanism.** ADB SPS require borrowers to establish a mechanismto receive and facilitate resolution of affected people's concerns, complaints, and grievances about the subproject's performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject.

60. **Monitoring and Reporting.** Borrower shall monitor, measure and document the implementation progress of the EMP. If necessary, the borrower shall identify the necessary corrective actions, and reflect them in a corrective action plan. Borrower shall prepare and submitto ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. For subprojects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis until ADB issues a project completion report.

61. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, ADB SPS requires the borrower to update the environmental assessment and EMP or prepare a new environmental assessment and EMPto assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

62. **Occupational Health and Safety**. ADB SPS requires the borrower[13] to ensure that workers[14] are provided with a safe and healthy working environment, taking into account risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. Borrower shall take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work, including: (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and

enforcing its use; (iv) training workersand providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

[12] Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stageand is carried out on an ongoing basis throughout the project cycle;1 (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues

[13] In case where responsibility is delegated to subproject contractors during construction phase, borrower shall ensurethat the responsibilities on occupational health and safety are included in the contract documents

[14] Including non-employee workers engaged by the borrower/client through contractors or other intermediaries to workon project sites or perform work directly related to the project's core functions.

63. **Community Health and Safety.** ADB SPS requires the borrower to identify and assess risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and shall establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts. The borrower shall ensure to apply preventive and protective measures for both occupational and community health and safety consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental,Health and Safety Guidelines. PMU shall also adhere to necessary protocols in response to emerging infectious diseases such as the corona virus disease (COVID-19) consistent with the guidelines of relevant government healthcare agencies and the World Health Organization.

64. **Physical Cultural Resources.** Borrower is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. ADB SPS requires that such resources likely to be affected by the subproject are identified, and qualified and experienced experts assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the proposed location of a subproject component is in areas where physical cultural resources are expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

65. **ADB SPS International Best Practice Requirements.** ADB SPS requires that, during the design, construction, and operation of the project, the executing agency shall apply pollutionprevention and control technologies and practices that are consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. (IFC's General EHS Guidelines[15] and Sector Specific (Water and Sanitation) Guidelines[16].. These standards contain performance levels and measuresthat are normally acceptable and applicable to projects. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Governmentof India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specificproject circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

66. **Bidding and Contract Documents**. This IEE report, which contains the EMP, has been included in bidding and contract documents and verified by PMU. The PMU has ensured thatbidding and contract documents include specific provisions requiring contractors to (i) comply withall other conditions required by ADB, and (ii) to submit to PMU, for review and approval, a site- specific environmental management plan (SEMP), including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solidand hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program as per EMP; and (iv) budget for SEMP implementation, among others as maybe required. No works can commence prior to approval of SEMP. A copy of the EMP and/or approved SEMP will be kept on site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP and/or SEMP constitutes a failure in compliance and shall require corrective actions.

67. **Conditions for Award of Contract and Commencement of Work**. PMU shall not award the works contract under the subproject until (i) relevant provisions from the EMP are incorporated into the works contract; (ii) this IEE report is updated to reflect subproject's final detailed design and PMU has obtained ADB's clearance of such updated IEE report; and (iii) othernecessary permits from relevant government agencies have been obtained. For "design, build, and operate" type contracts, PMU shall be ensured that no works for a subproject which involvesenvironmental impacts shall commence until (i) relevant provisions from the EMP are incorporatedinto the works contract; and (ii) this IEE report is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance for such updated IEE.

[15] World Bank Group, 2007. Environmental, Health and Safety General Guidelines, Washington, DC.
[16] World Bank Group, 2007, Environmental, Health and Safety Guidelines for Water and Sanitation, Washington, DC.

B. National and State Laws

68. The implementation of the subprojects will be governed by Government of India and State of Uttarakhand and other applicable environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize or 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 applicable international, national, state or municipal or local. Key standards include those related to drinking water quality, air quality, effluent discharge, and protected areas. Compliance is required in all stages of the subprojects including design, construction, and operation and maintenance.

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

70. Applicable environmental regulations. Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in Table 6

71. None of the components of this sewerage system subproject falls under the ambit of the EIA Notification 2006, and therefore EIA Study or environmental clearance (EC) is not required for the subproject.

Table 6: Applicable Environmental Regulations

Law	Description	Requirement	Relevance to Project Phase
EIA Notification	Projects indicated in the schedule of this notification requires EIA study and environmental clearance.	None of the components of this subproject falls under the ambit of the notification; no EIA study or environmental clearance required	-
National Environment Policy (NEP), 2006	NEP is a comprehensive guiding document in India for all environmental conservation programs and legislations by Central, State and Local Government. The dominant theme of this policy is to promote betterment of livelihoods without compromising or degrading the environmental resources. The policy also advocates collaboration method of different stakeholders to harness potential resources and strengthen environmental management.	UIRUDP should adhere to NEP conservation of environmental resources and abatement of pollution	All phases of project
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments (1987)	Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, by Central and State Pollution Control Boards and for conferring on and assigning to CPCB/SPCBs powers and functions relating to water pollution control. Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quantity and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the subproject having the potential to generate sewage or trade effluent will come under its purview. Such projects have to obtain Consent to establish (CTE) under Section 25 of the Act from Uttrakhand Pollution Control Board (UEPPCB) before starting implementation and Consent to Operate (CTO) before commissioning.	UUSDA has obtained the Consent to Establish (CTE) to establish the Sewerage Treatment Plant and appended as appendix 30 in this IEE report and CTO (prior to start of operation) will be obtained from Uttrakhand Pollution Control Board(UEPPCB). The CTE is based on preliminary design and PMU will consult the UEPPCB regarding the updating of the CTE based on detailed design, prior to construction. All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the UEPPCB website. (http://ueppcb.uk.gov.in)	Construction and Operation
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	This Act was enacted to achieve prevention, control and abatement of air pollution activities by assigning regulatory powers to Central and State boards for all such functions. The Act also establishes ambient air quality standards. The projects having potential to emit air pollutants into the atmosphere have to obtain CFE and CFO under Section 21 of the Act from UEPPCB. The occupier of the project/facility has the	The following will require CFE and CFO from UEPPCB: (i) Diesel generators); (ii) Batching Plant hot mix plants; and (iii) stone crushers, if installed for construction.	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	responsibility to adopt necessary air pollution control measures for abating air pollution.	All relevant forms, prescribed fees and procedures to obtain the CFE and CFO can be found in the UEPPCB website (http://ueppcb.uk.gov.in) If ready mix concrete and hot mix bitumen is procured from third party, contractor to ensure that the plants, from where material is being purchased is having CTE/CTO and copy should be collected from third party and submitted in PIU	
Biodiversity Act of 2002	This Act primarily addresses access to genetic resources and associated knowledge by foreign individuals, institutions or companies, to ensure equitable sharing of benefits arising out of the use of these resources and knowledge to the country and the people.	Not Applicable	-
Wildlife Protection Act, 1972 and amendment 1991	This overarching Act provides protection to wild animals, birds, plants and matters connected with habitat protection, processes to declare protected areas, regulation of wildlife trade, constitution of state and national board for wildlife, zoo authority, tiger conservation authority, penalty clauses and other important regulations.	Not applicable – none of the project components are located in or near protected areas. .	Construction
Forest (Conservation) Act, 1980	The Forest (Conservation) Act prohibits the use of forest land for non-forest purposes without the approval of Ministry of Environment Forests and Climate Change (MoEF&CC), Government of India	Not applicable; none of the components of the subproject are located in forest.	Construction
Environmental (Protection) Act, 1986 amended in 1991 and the following rules/notifications:	This is an “umbrella” legislation that empowers the Central Government to take all necessary measures to protect and improve the quality of the environment and prevent, control and abate environmental pollution. Empowers central government to enact various rules to regulate environmental pollution, including standards for quality of air, water, noise, soil; discharge standards or allowable concentration limits for environmental pollutants, handling of hazardous substances, locating/prohibiting industries, etc.,	There are rules / notifications that have been brought out under this Act, which are relevant to UUSDA, and are listed below	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
Environmental Standards (ambient and discharge).	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	Appendix 2 provides applicable standards for ambient air quality, emission limits and emission stack height requirements for diesel generators	Construction and operation
Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	Appendix 3 provides applicable noise standards, and noise limits for diesel generators	Construction and operation
Solid Waste Management Rules 2016	Responsibility of Solid Waste Generator: (i) segregate and store the waste generated in three separate streams namely bio-degradable, non- biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time; (ii) store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; (iii) No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.	Contractor to follow all the rules during construction works	Construction and operation
Construction and Demolition Waste Management Rules 2016	Every waste generator shall segregate construction and demolition waste and deposit at collection center or handover it to the authorized processing facilities Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work, Large generators shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse	Construction waste shall be collected at stockpile area for8-10 days and will be sent to disposal site.. The process to identify the site for waste disposal is underway and will be updated in next revised IEE. Contractor to follow all the rules during construction works. Sludge or any material if classified as hazardous waste / material is to be handled and	Construction

Law	Description	Requirement	Relevance to Project Phase
	of C and D Waste. Large generators shall segregate the waste into four streamssuch as concrete, soil, steel, wood and plastics, bricks and mortar, Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;	disposed according to this Rules Excerpts from C and D Rules are provided in Appendix 5.	
Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016,	Responsibilities of the occupier for management of hazardous and other wastes.- (1) For the management of hazardous and other wastes, an occupier shall follow the following steps, namely:- (a) prevention; (b) minimization; (c) reuse, (d) recycling; (e) recovery, utilization including co-processing; (f) safe disposal. (2) The occupier shall be responsible for safe and environmentally sound management of hazardous and other wastes. (3) The hazardous and other wastes generated in the establishment of an occupier shall be sent or sold to an authorized actual user or shall be disposed of in an authorized disposal facility. (4) The hazardous and other wastes shall be transported from an occupier's establishment to an authorized actual user or to an authorized disposal facility in accordance with the provisions of these rules. (5) The occupier who intends to get its hazardous and other wastes treated and disposed of by the operator of a treatment, storage and disposal facility shallgive to the operator of that facility, such specific information as may be needed for safe storage and disposal. (6) The occupier shall take all the steps while managing hazardous and other wastes to- 6 (a) contain contaminants and prevent accidents and limit their consequences on human beings and the environment; and (b) provide persons working in the site with appropriate training, equipment and the information necessaryto ensure their safety.	Contractor to comply all the requirements of this Act, if there are any hazardous wastes are generated, handled or managed during construction and operation works. However, it is unlikely that it will involve any hazardous waste.	Construction and operation
Wetlands (Conservation and Management) Rules, 2017	The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization, construction, dumping of untreated waste and effluents, and reclamation. The Central Government may permit any of the prohibited activities on the recommendation of Central Wetlands Regulatory Authority.	Not applicable as subprojects components are not located in or near to designated wetland area.	
Ancient Monuments and Archaeological	The Act designates areas within 100 meters (m) of the "protected monument/area" as "prohibited area" and beyond	Not applicable - there are no protected monuments / places	Construction

Law	Description	Requirement	Relevance to Project Phase
Sites and Remains Act, 1958 and Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010.	that up to 200 m as "regulated area" respectively. No "construction" is permitted in the "prohibited area" and any construction activity in the "regulated area" requires prior permission of the Archaeological Survey of India (ASI).	of archeological / historical places in or near the project areas In case of chance finds, the contractor/ PIU will be required to follow a protocol as defined in the Environmental Management Plan (EMP)	
The Building and Other Construction Workers (BOCW) Act 1996 and the Uttaranchal Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Rules, 2005.	Labour Department, Government. of Uttarakhand adopted proactive approach and initiated necessary steps to implement the provisions of the BOCW Act through the Uttaranchal Building And Other Construction Workers (Regulation Of Employment And Conditions Of Service) Rules, 2005. Further, Uttarakhand Government constituted the Building and Other Construction Workers Welfare Board (Board) in October 2005 to carry out welfare schemes for construction workers. As per the provision of the BOCW Act, Cess Act and Uttarakhand Rules, establishments which had employed on any day of the preceding twelve months, 10 or more building workers in any building or other construction work are required to pay cess at the rate of 1% of the total cost of construction incurred by an employer. The cess so collected is required to be spent for the welfare of building and other construction workers.	Contractors are required to follow all the provisions of BOCW Act. Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 (BOCW Act) and Building And Other Construction Workers' Welfare Cess Act, 1996 (Cess Act) was passed to address the concerns regarding safety, health & welfare of larger number of labour force employed in the building and other constructions sector.	Construction
Contract Labor (Regulation and Abolition) Act, 1970; The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	Provides for welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor. The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.,	Applicable to all construction works in the project Principle employer (UUSDA) to obtain Certificate of Registration from Department of Labour, as principle employer Contractor to obtain license from designated labor officer Contractor shall register with Labor Department, if Inter-state migrant workmen are engaged Adequate and appropriate	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
		amenities and facilities shall be provided to workers including housing, medical aid, traveling expenses from home and back, etc., Appendix 6 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.	
The Child Labour (Prohibition and Regulation) Act, 1986	Prohibits employment of children below 14 years of age incertain occupations and processes Employment of child labor is prohibited in building andconstruction Industry.	No child labour shall be employed	Construction and operation
Minimum Wages Act, 1948	Minimum wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of buildings, roads and runways are scheduled employment.	Applicable to all construction works in the project All construction workers shouldbe paid not less than the prescribed minimum wage	Construction and operation
Workmen Compensation Act, 1923	Provides for compensation in case of injury by accident arising out of and during the course of employment.	Compensation for workers in case of injury by accident	Construction and operation
Equal Remuneration Act, 1979	Provides for payment of equal wages for work of equal nature to male and female workers and not for making discrimination against female employees in the matters of transfers, training and promotions etc.	Equal wages for work of equal nature to male and female workers	Construction and operation
The Indian Forest Amendment) Act ,2002	This Act makes the basis for declaration of Reserved Forests, constitution of village forest committees, management of reserved forests and penalties and procedures.	Not applicable; none of the components / pipeline alignment are in forest areas.	Construction
IS 11768: 1986/2005: Recommendations for disposal of asbestos waste material	The standard emphasis that every employer who undertakes work which is liable to generates asbestos containing waste, shall undertake adequate steps to prevent and /or reduce the generation of airborne dust during handling, storing,	The crux is waste avoidance: the practice inculcated should focus the on minimal waste generation.	Construction

Law	Description	Requirement	Relevance to Project Phase
		Waste Collection: In the project circumstance, the waste is referred to the damaged powered asbestos which will be collected in the Permissible plastic bags to be disposed to the nearest TSDF facilities.	
International Conventions and Treaties			
Ramsar Convention, 1971	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. India is one of the signatories to the treaty. The Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans.	There are no Ramsar sites inor near project area. Not applicable to this project	-
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	India is a signatory of this convention which aims to control international commercial trade in endangered species	Not applicable in this project as no endangered species of wild fauna and flora is found in project town.	-
Montreal Protocol 1992	India is a signatory of this convention which aims to reduction in the consumption and production of ozone-depleting substances (ODS), while recognizing differences in a nation's responsibilities. Ozone depleting substances are divided in two groups Chlorofluorocarbons (CFCs) and Hydro chlorofluorocarbon carbons (HCFCs)	Not applicable in this project as no ODS are involved in construction works	-
Basel Convention on Trans-boundary Movement of Hazardous Wastes, 1989	India is a signatory of this convention which aims to reduce trans-boundary movement and creation of hazardous wastes	Contractor to follow the provisions of Hazardous Waste Rules 2016 for storage, handling, transport and disposal of any hazardous waste emerged during construction works Under this Convention, asbestos or asbestos waste in	-

Law	Description	Requirement	Relevance to Project Phase
		the form of dust and fibers is classified as hazardous waste.	
Convention on Migratory Species of Wild Animals (CMS), 1979 (Bonn convention)	CMS, also known as Bonn convention, was adopted in 1979 and entered into force on 1 November 1983, which recognizesthat states must be the protectors of migratory species that livewithin or pass through their national jurisdictions, and aims to conserve terrestrial, marine and avian migratory species throughout their ranges. Migratory species threatened with extinction are listed on **Appendix 7** of the Convention. CMS Parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Migratory species that need or would significantly benefit from international cooperation are listed in **Appendix 7** and CMS encourages the Range States toconclude global or regional agreements.	Not applicable to this project as no migratory species of wild animals are reported in the project areas.	-

72. Clearances / permissions to be obtained prior to start of construction. Table7 below shows the list of clearances/permissions required for project construction. This list is indicative, and the contractor should ascertain the requirements prior to start of the construction and obtain all necessary clearances/permission prior to start of construction.

Table 7: Clearances and Permissions required for Construction Activities

S. No	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision	Compliance Status
1	Construction and Operation of new STP including discharge of treated effluents and disposal of sludge	Consent to establish (CTE) and consent to operate (CTO) under Water Act, 1974 from Uttarakhand Pollution Control Board (UEPPCB)	PIU and DBO-Contractor	PIU	CTE has obtained from UKPCB (Appendix-30) The CTE is based on preliminary design and PMU will consult the UEPPCB regarding the updating of the CTE based on detailed design, prior to construction.
2	Tree Cutting	State forest department	PIU	PIU and PMU	Not required as per the completed design as on 12th Nov 2022
3	Hot mix plants, Crushers ,Batching plants and emergency Diesel Generators	Consent to establish and consent to operate under AirAct, 1981 from UEPPCB	DBO Contractor	PIU	Permission will be taken if required.
4	Storage, handling and transport of hazardous materials	Hazardous Wastes (Management and Handling) Rules. 2016; Manufacturing, Storage and Import of Hazardous Chemicals Rules,1989 from UEPPCB	DBO Contractor	PIU	Will be complied
5	Material Sourcing-Approval for sourcing stones and sand from quarries and sand mining and borrow areas	Permission from District Collector/ State Department ofMining	DBO Contractor	PIU	Material shall be procured from already approved Govt. queries
6	New quarries and borrow areas	Environmental clearance underEIA Notification 2006	DBO Contractor	PIU	Material shall be procured from already approved Govt.
7	Temporary traffic diversion measures	District traffic police	DBO Contractor	PIU	Will be complied during construction period
8	Road cutting for Sewerlaying works	Nagar Palika	DBO Contractor	PIU	Road cutting permission has been obtained from PWD and from NHAI and Nagar Palika Parishad Nainital are underway.

9	Construction Waste and Demolition Debris Management	Approval from Nagar Palika for disposal site is required per Construction and Demolition Waste Management Rules2016	DBO Contractor	PIU	All the C & D waste will be transferred Govt. approved land fill site. The process to identify the site for waste disposal is underway and will be updated in next revised IEE.
10	Labour License	Labour Commissioner, Government of Uttarakhand	DBO Contractor	PIU	Attached in SEMP
11	Use of Vehicles and Equipment-Pollution Under Control (PUC) Certificate	Motor Vehicle Rules, 1989	DBO Contractor	PIU	Attached in SEMP

73. PMU will be overall responsible for supervision in getting all clearances and provide details to ADB through semi-annual report. PMU will ensure all necessary regulatory clearances and approvals are obtained prior to commencement of works. Respective PIUs, with support of project consultants and contractors, are responsible for obtaining the clearances/permits and ensuring conditions/specifications/provisions are incorporated in the subproject design, costs, and

implementation. The PIUs shall report to PMU the status of compliance to clearances/permits aspart of the regular progress reporting.

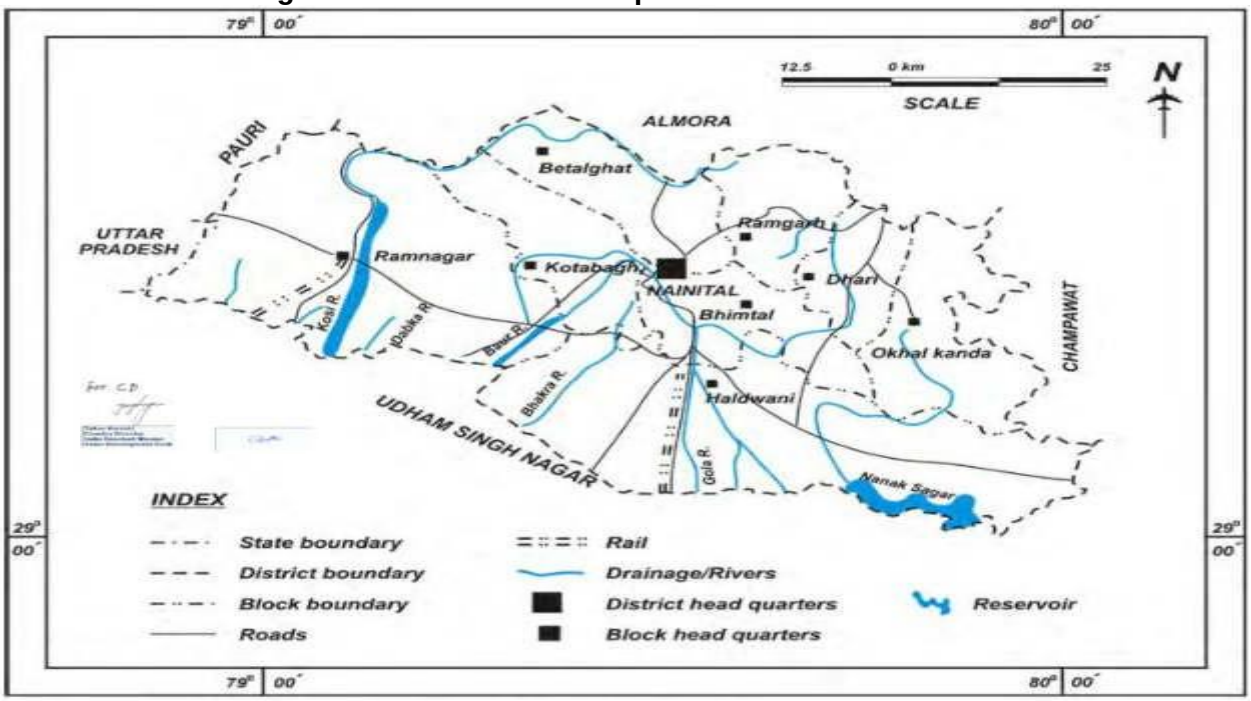
V. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location, Area and Connectivity

74. **State Uttarakhand**. Situated in the foothills of Himalayan Mountain ranges, Uttarakhand is one of the hilly states in India. It is in the northern part of India and spans at about 301 kilometersin the east to west direction, and 255 kilometers from north to south. It covers an area of 53,483 square kilometers and is at the elevation range of 210 to 7817 meters above sea level (masl). Uttarakhand is constituted of 13 districts falling in two major administrative units, i.e., Garhwal inthe northwest portion, and Kumaon in the southeast portion. Dehradun is in Garhwal division, while Nainital, is in Kumaon division.

Figure 9: Administrative Map of Nainital District



Source: CGWB

75. Nainital is the headquarters of Nainital District in the Kumaon foothills of the outer Himalaya in the State of Uttarakhand. It is geographically located in the southern part of the state.Nainital is located approximately in between 80º14' and 78º80' east longitude and 29º00' and 29º05' north latitude. Nainital is known as the Lake District of Uttarakhand due to predominance of lakes in the area. The presence of more than a hundred lakes has been recorded. The district boasts of some of the most scenic lakes in India. Nainital town is spread over an area of 11.73 square Kilometer of which Naini Lake covers 0.54 Sq. Km.

76. Situated at an altitude of 1,938 m above sea-level, Nainital is set in a valley containing a pear-shaped lake, approximately 3.5 km in circumference, and surrounded by mountains, of which the highest are Naina (2,615 m) on the north, Deopatha (2,438 m) on the west, and Ayarpatha (2,278 m) on the south

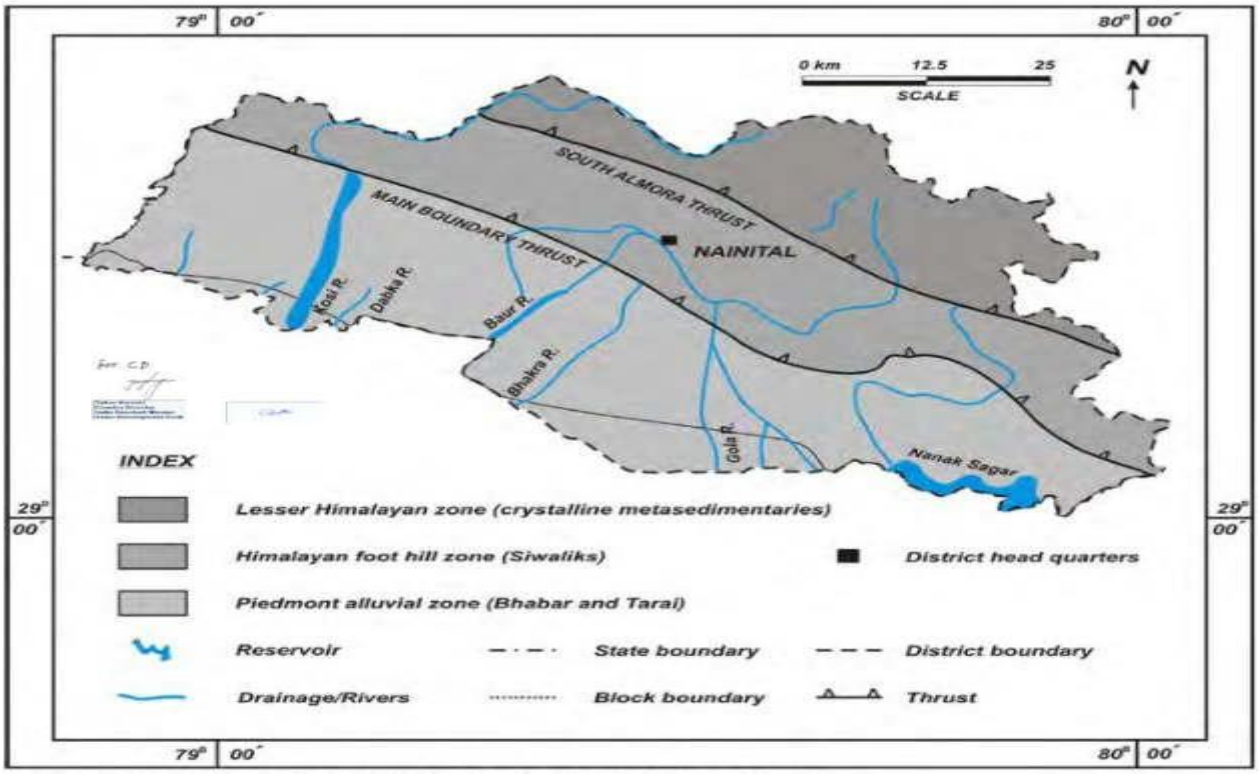
77. Almora district lies to the north of Nainital and to its south lies the Udham Singh Nagar district. Champawat district flanks it in the east and district of Pauri Gahwal lies in the west. The nearby places of importance include Bhowali (11 km), Bhimtal (22 km), Naukuchiatal (26 km), Sattal (24 km) and Khurpatal (10 km). According to the data available, Nainital had become a popular hill resort by 1847. The Nainital Municipal Board was formally constituted in 1845.

78. Nainital, owing to its location, is colder than the rest of the hilly tract of Kumaon region. During monsoon, it gets heavy rainfall. The neighbouring areas of Almora and Ranikhet are warmer than Nainital. The monthly maximum and minimum temperatures in the town range between 28 degree C and 7-degree C.

2. Physiography, Drainage, Soils, Geology and Geohydrology

79. **Physiography:** Nainital district comprises of three broad physiographic divisions, from north to south viz., the Lesser Himalayan Zone, the Himalayan Foot Hill Zone and the Piedmont Alluvial Tract corresponding to the major geo-tectonic sub-divisions of the Himalayas. The proposed project coverage area and Nainital city falls under the ***Himalayan Foothill Zone, whichruns*** in NW-SE direction with a maximum elevation of 1677 m above Mean Sea Level. The lowerSiwaliks are truncated towards south by major/minor structural discontinuities. The slopes are relatively moderate, with flat-topped hills. The physiographic map of Nainital district is shown in Figure 10.

Figure 10: Physiographic Map of Nainital district



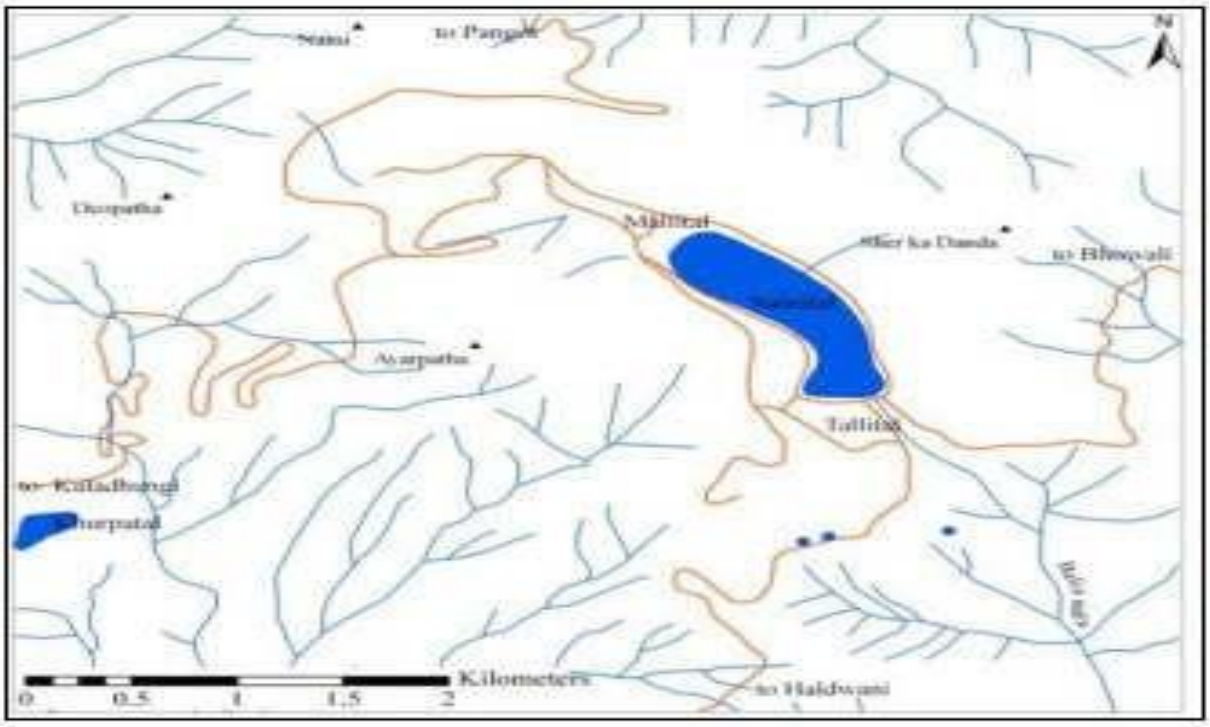
Source: CGWB

80. **Drainage.** Uttarakhand is an origin place of several Indian rivers including glacial fed rivers, non-glacial fed rivers and rainfed rivers. Ganga, Yamuna, Ramganga, Kali, Koshi rivers and their tributaries constitute surface water bodies. Uttarakhand possess three main river basinsas Bhagirathi (Alaknanda basin and Ganga basin), Yamuna (Tons basin) and Kali system. In Nainital district Kosi is the main river arising out of Koshimool near Kausani flows on the westernside of the district. There are number of smaller rivulets like Gaula, Bhakra, Dabka, Baur etc.

81. The Nainital city is set in a valley around the Nainital Lake - an eye-shaped lake, which islocated at an altitude of 1,940 m (6,350 ft) from sea level. The bed of the lake is at a depth of 85 m (93 yd) near Pashandevi, the deepest point of the lake. The lake is deduced to have been formed tectonically. Fed by the discharge of the Naini lake, Balia nala is the major drainage system of the area. 26 major drains feed the lake including the 3 perennial drains. Another lake named as Khurpatal to the southwest of the Naini

lake has elevation of 1570 meters above msl. The drainage of the area consists of several small rivulets in a dendritic, trellis, and parallel pattern(Figure 11). Some natural springs also exist due to occurrence of karst network, lithological contacts, and secondary discontinuities (faults and joints) observed in the area.

Figure 11: Drainage networks in and around Nainital Lake



Source: Journal of Rock Mechanics and Geotechnical Engineering 10 (2018),pp. 280 - 289

Soil.

82. **The Soils in and around Nainital city** are alluvial, riverine, non-calcareous to moderate calcareous soils and have been carved out by the fast-flowing rivers draining the Himalayas. Forest soils, which occur under coniferous and deciduous forest are found rich in organic matter. Mountain/hill soils are the collective terminology used for various types of soils occurring at very high elevations, under a wide range of forest types trees.

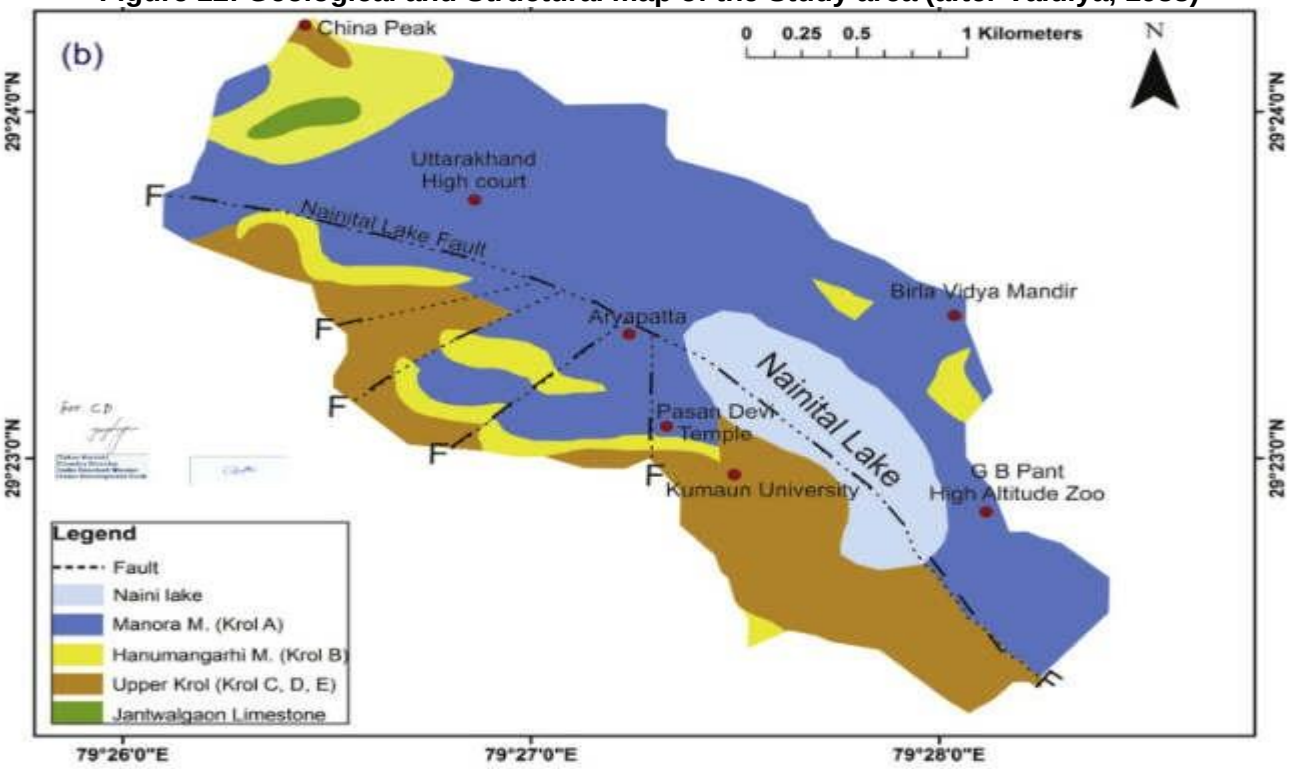
83. **Geology:** Nainital district can be classified into three broad geotectonic divisions namely,the Lesser Himalayas, the sub-Himalayas and the Piedmont alluvial plains. Each of these divisions is characterised by distinct rock types of varied geological age, structural trends, tectonicsetting and geomorphic features.

84. **Geology in and around Nainital city** has been well studied by many investigators viz. Middlemiss (1890), Auden (1942) and Valdiya (1988). Valdiya has given a detailed geological map of Nainital and its environs (Figure 12). The lake basin is made completely of folded and faulted rocks of Krol and Tal formations which are ascribed to Cambrian age. Krol Formation canbe further divided into two parts, namely Lower Krol (Korl-A or locally known as Manora slate composed of purple slate and Krol-B or locally known as Hanumangarhi slate composed of grayish to greenish slates) and Upper Krol (Krol-C composed of dolomitic limestone and silty sandstone, Krol-D composed of thickly bedded

dolomitic limestone and Krol-E composed of rhythmite and dolomitic limestone).

85. The lake catchment is diagonally cut by the Naini fault or the Lake faults called by some geologists. The chief rock types are calcareous slates, ferruginous shales, argillaceous limestone, dolomite and dolomitic sandstones. The rotational movements along Naini fault has been the cascading factor for the origin of Lake Nainital (Valdiya 1988). The synclinal structure at Sher-ka-danda is traversed by a number of fractures trending NE-SW. The Nainital fault and these associated fractures have caused shearing and shattering of the rocks responsible for hill slope instability. Almost half the aerial extent of the lake basin is covered with debris generated by mass
–movements in past.

Figure 12: Geological and Structural map of the Study area (after Valdiya, 1988)

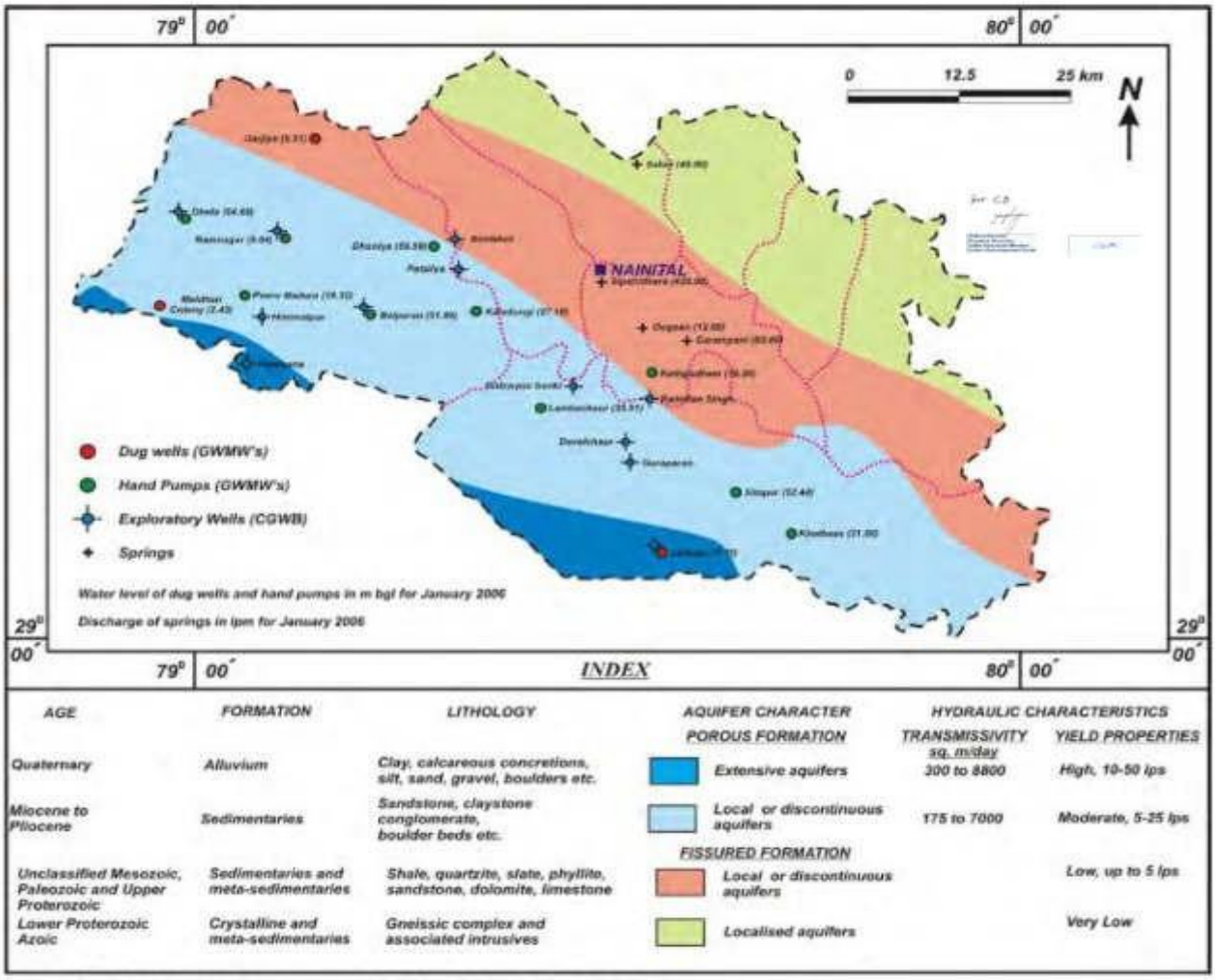


Source: Journal of Rock Mechanics and Geotechnical Engineering 10 (2018),pp. 280 – 289

86. **Hydrogeology.** The geotectonic setup and physiography vary enormously within a limitedgeographical area controlling the occurrence, movement and behavior of ground water. On the basis of general morphology and geologic setting, the entire district can be broadly classified intotwo distinct parts viz. Hard Rock Terrain and. Piedmount Alluvial Tract with reference to occurrence and yield of groundwater. More than 55% of the geographical area of Nainital districtis underlain by the Outer Himalayan foot hill zone and Lesser Himalayan formations comprising mainly of sand stone, mudstone, shale, clay lenses, quartizites, slates, phyllites and gneisses. These rock masses have poor primary porosity. On the other hand the sediments belonging to the Quaternary age mainly consist of loose, poorly sorted, unconsolidated boulders, cobbles, pebbles, gravels, coarse to medium sand and clay. Composition of these sediments is heterogeneous in nature and cover around 40 – 45% of the geographical area of the Nainital district.

87. **Ground Water Resources** Groundwater resources, in Nainital district have been estimated for only two blocks (Ramnagar and Haldwani), which fall in the plain area. The Net Annual Ground Water available for Ramnagar and Haldwani blocks are 3481.2 and 5338.71 ham, respectively and percentage of Ground Water Development in Ramnagar and Haldwani blocksare 29.17% and 23.53% respectively.

Figure 13: Hydrogeological map of Nainital district



Source: CGWB

88. **Natural Hazards:** Due to the fragile eco-system and geo-dynamic terrain, Uttarakhand State is highly vulnerable to natural disasters like earthquakes, landslides, forest fires, and cloudburst etc. According to hazard zoning in the Vulnerability Atlas of India, Nainital city and adjoiningregion in western Himalayas is a is a very active seismic region of Himalayan belt, stretching fromPamir - Hindukush to Arkans. According to seismic zoning map of India, Nainital city lies in ZoneIV and falls under “very high” to “high” category earthquake zone.

89. **Slope instability and landslide in the area around Nainital.** The problem of landslide**,** subsidence and erosion of soil is common in Nainital particularly in the periphery of the Naini Lake. This is due to a combination of several factors like geological movements,

structure, lithology, water seepage, soil cover, vegetation cover, weather and climate change. Landslide and soil erosion from the adjoining hills causes heavy silt deposition in the lake.

90. Nainital, the Lesser Himalayan famous tourist destination of Uttarakhand has been repeatedly devastated by natural hazards since 1866 while habitation in the same started only after 1841. The area is seismically active and is falls in Zone IV of Earthquake Zoning Map of India. Tectonically active fragile mountains together with fast pace of urbanization enhanced vulnerability of the area. The rainfall is largely responsible for initiation of slope instability and landslides in the region.

91. In the Lesser Himalayan township of Nainital, mass movement is often triggered by heavyprecipitation during monsoon, destabilization of the toe of the slope materials by developmental initiatives and hill slopes undercutting by streams. Furthermore, fast pace of urbanisation is deduced to be the causative factor for the slope instability. This is reflected overloading of unstable slopes by heavy structures, construction on old landslide mass, change the course of natural streams, ill maintenance of artificial drainages, inadequate waste water management, indiscriminate hill cutting and change in land use aggravated the problem.

92. The geological terrain around the Nainital lake has soft sedimentary rocks, which makes it fragile and prone to cave-ins and landslides. The lake is bound by the high and steep Naina peak on the north-west side, by the Tiffin Top to the south-west and snow view peaks on the north. Geologist CC Pant of Kumaon University said “The steep slopes around the Nainital lake,which form its catchment, have highly folded and faulted rocks due to a geological fault line running from Sukhatal through the lake via Baliyanala up to Kathgodam. This fault line results instress, shearing and pulverising of the rock formations beneath Nainital. So there will be always danger of some major danger from the geological disturbances here,” said Pant.

93. .Over two years ago, experts from IIT Roorkee had also undertaken a study of the geological terrain around the Nainital lake. The report had pointed out that around 200 metres high and 165 metres long patch on the slope above the Mall Road was highly fragile and vulnerable up to 22 metres depth and as such needs immediate reinforcement through perforatedpipes.

94. .The township of Nainital, is one of the popular hill station and famous tourist destination where people routinely gather in large numbers. In the past, the same area has witnessed massmovements in 1866, 1867, 1880, 1893, 1898, 1924, 1989 and 1998 while recently in 2008, 2014,2015 and 2018 (Balia Nala landslides). These inflicted heavy loss of life, infrastructure, property and geo-environment.

95. Geologically, the area is occupied by rocks of Lesser Himalaya. It mainly consists of limestone/dolomitic limestone, slate and quartzite. The rocks in this area are found highly deformed, degraded and dissected by structural discontinuities. Apart from the region exhibits traces of a number of lineaments along Balia nala, Hanumangarhi, Golf Course, Lands End, IDHColony and all these areas fall in the zone of maximum landslide hazards risk. Geomorphologicalstudy of the area indicates that the surface slopes consist mostly of old landslide materials which are mostly unconsolidated and loose in nature. Due to morphological setting of the area, the streams have high sinuosity and hence, higher erosive

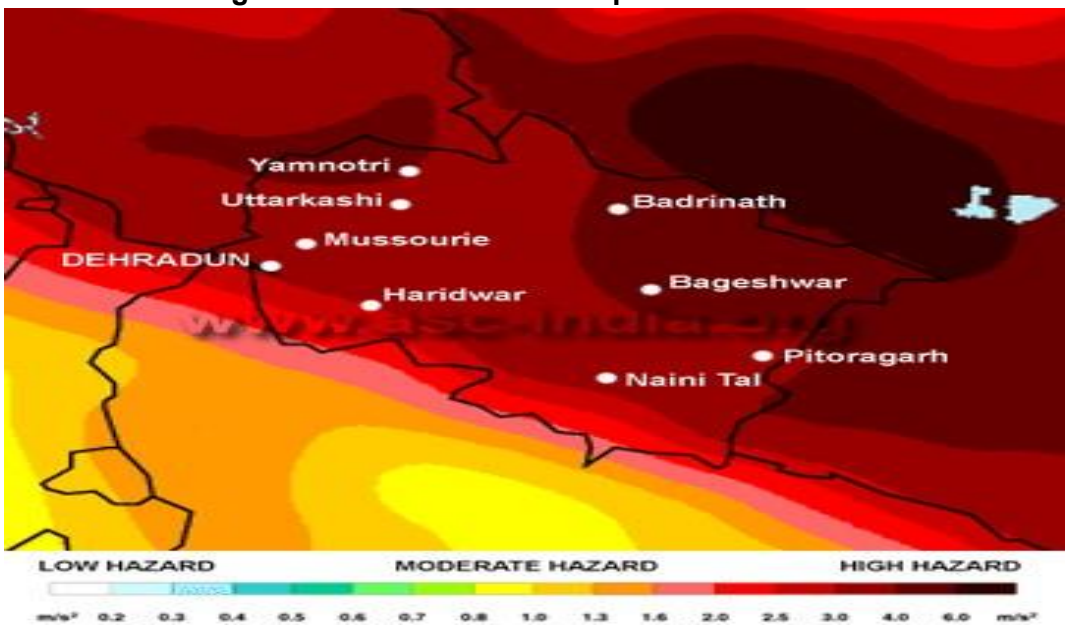
capacity, especially when these are loadedwith sediments. High relief of the area promoted high surface runoff and enhanced pore water pressure together with reduced frictional forces promoted mass wastage in the area. The geo- hydrological condition of the hill slopes is an important parameter influencing the stability of the slopes as water reduces the shearing strength of the slope forming materials causing instability. It is therefore recommended that both surface and subsurface drainage measures shouldtherefore be planned and executed in the same region (Khanduri, 2017).

Figure 14: Slope instability and landslide in the area around Nainital

(a) slope failure with uprooted trees at Cement house (b) huge amount of debris accumulated between Everest and India hotels (c) collapsed portion of Lower Mall road between Grand Hotel and HDFC Bank and (d) Rais Hotel colony and Harinagar areas pose treat by Balia nala landslide.

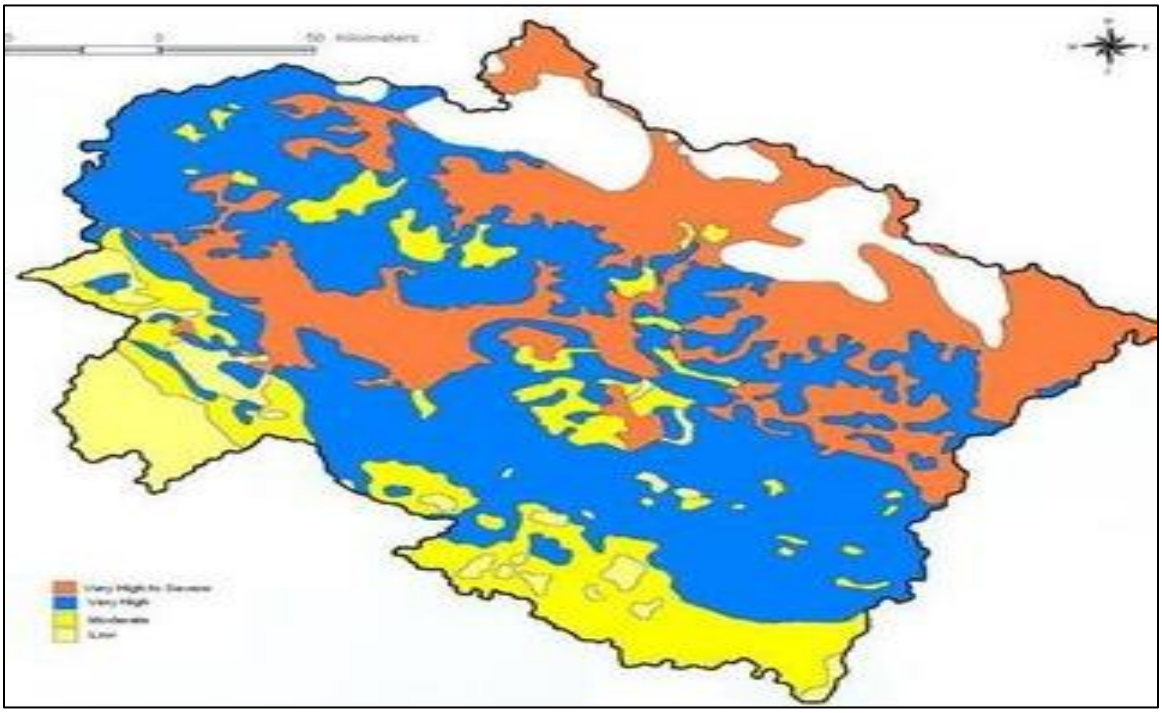
96. **Seismicity**: The Himalayan foothills are witness of many seismic activities, that's why whole Uttarakhand comes under either zone IV or zone V of Indian seismic zonation map. The seismic hazard map of India was updated in 2000 by the Bureau of Indian Standards (BIS). Thereare no major changes from the BIS 1984 map for the state of Uttarakhand. The districts in Uttarakhand lie in Zones V and IV where MSK intensities in excess of IX and up to VIII, respectively, may be expected. According to GSHAP data, the state of Uttarakhand falls in a region of high to very high seismic hazard. As per the 2002 Bureau of Indian Standards (BIS), Nainital district also falls in Zones IV.

Figure 15: GSHAP Hazard Map for Uttarakhand



Source: http://asc-india.org/maps/hazard/haz-uttaranchal.htm

Figure 16: Map Showing Uttarakhand Earthquake Zone

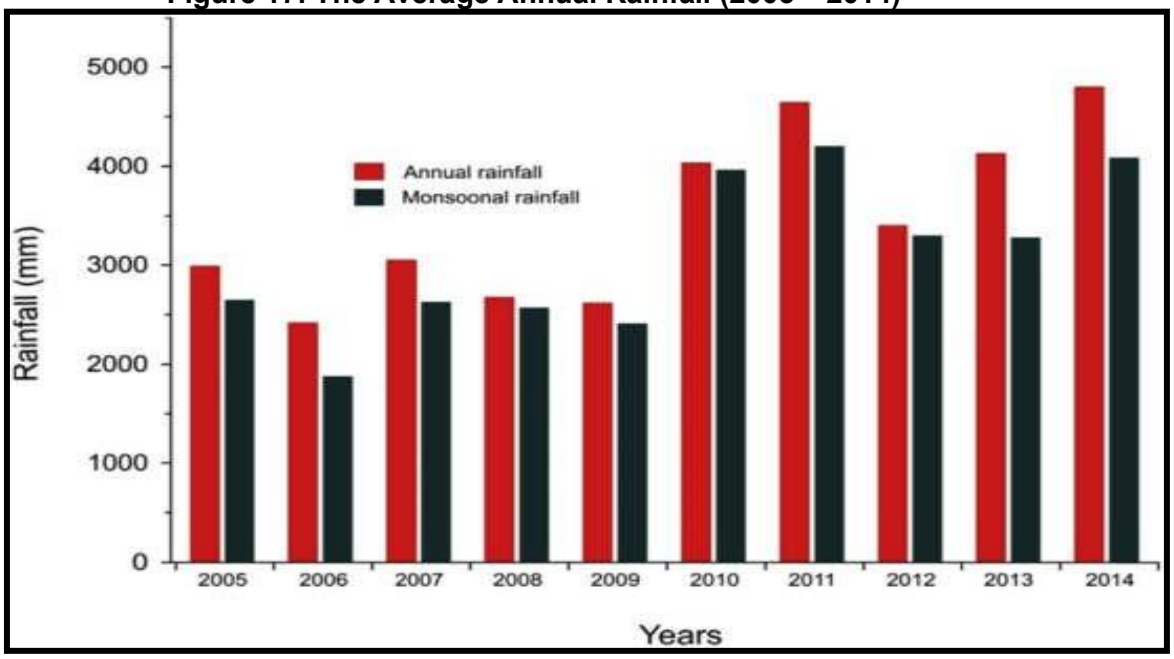


1. Climate

97. Nainital experiences subtropical highland climate as the city's climate is influenced by theelevation. The city is a bit dry during winter and very wet during summer due to South Asian monsoon system. Like most places in temperate region, Nainital has relative cool summer. The hottest month is July with temperature ranging from 16.4 °C to 23.5 °C, while the coldest month is January with temperature ranging from 1.7 °C to 10.7 °C.

98. The regional climate is influenced by the two major atmospheric phenomena, namely thesouthwest Indian monsoon during summer and mid-latitude westerly's in winter. The average annual rainfall is around 3500 mm, of which 85% is received during the southwest monsoon season between June and September (see Figure 15). Local convection also causes some rainfallduring pre-monsoon season. The heavy rainfall during the monsoon months triggers the debris flow and slope failure, endangering the lives of people and safety of infrastructures.

Figure 17: The Average Annual Rainfall (2005 – 2014)



Source: IMD

2. Air Quality

99. Ambient air quality in Uttarakhand is monitored by Uttarakhand Pollution Control Board. However, at present there is no monitoring station in Nainital and therefore no data on ambient air quality available. Air quality is mainly influenced by the heavy traffic in the city during the touristseason. Since no major industries are situated within the City limits, it is unlikely that serious impact on air quality is caused by tourism activities. Air quality monitoring has been conducted in the pre-construction phase (SIP period) by the contractor and has updated in IEE. A summaryof air quality monitoring results conducted by the UUSDIP on October 2017 is presented in Table 8AThe analytical results reveals that at all locations all the parameters are well within the permissible limit of National Ambient Air Quality Standard (NAAQS). Air quality monitoring was conducted during the pre-construction phase as per the standard method, as Improved West and Geake Method for SO_2, Jacob & Hochheiser modified method for NO_2, Gravimetric method for PM2.5 and PM10, and Non dispersive infrared (NDIR) spectroscopy for Carbon monoxide. The results summarized in Table 8 B. All the parameters are within the standard limit of NAAQS (2009). However, Particulate matters (PM 10 and PM 2.5) are above WHO standards in all the samples.

Table 8 A: Air Quality Monitoring Results of Nainital Town

PARAMETERS	UNIT	LOCATIONS				Permissible Limits (NAAQS)
		Phansi Gadhera Pump House	Children Park Pump House	Old Waterworks UJS Campus	Sukhaa Tal Pump House	
$PM_{2.5}$	µg/m³	42.18	52.53	49.7	37.05	60
PM_{10}	µg/m³	77.4	86.42	93.11	74.97	100
SO_2	µg/m³	21.16	27.78	19.52	18.22	80
NO_2	µg/m³	36.39	48.54	35.66	32.57	80
CO	mg/m³	<0.2	0.5	<0.2	<0.2	2 (8hr)

Benzene (as C_6H_6)	µg/m^3	<1.0	<1.0	<1.0	<1.0	5
Hydrocarbon (as HC)	mg/m^3	<0.1	<0.1	<0.1	<0.1	-

Source: UUSDIP- IEE Revised Report, 2017

Table 8 B : Air Quality Monitoring at selected location of Nainital

Parameters	**Nainital club ward mallital (Mall road) 29^{0}23.3660' N 79^{0}27.5560' E**	**Tallital Dant. 29^{0}22.8070' N 79^{0}27.8110' E**	**STP Russi Plot no. 580 29^{0}21.9030' N 79^{0}26.9160' E**	**Near Gabbar Bridge 29^{0}21.8870' N 79^{0}26.9180' E**	**Dharmshala Tallital Haldwani road 29^{0}22.5370' N 79^{0}27.8630' E**	**NAAQS 2009 µg/m^3**	**WHO µg/m^3 (24 Hrs Mean)**
Particulate Matter PM2.5 (µg/m^3)	31.2	30.9	31.8	33.8	35.2	60	15
Sulfur dioxide (µg/m^3)	29.9	30.2	30.2	31.8	31.2	80	40
Nitrogen dioxide (µg/m^3)	41.2	41.1	43.2	43.8	44.2	80	25
Carbon monoxide (mg/m^3)	1.03	1.12	1.01	1.11	1.1	2 mg/ m^3	-
Particulate Matter PM10 (µg/m^3)	65.9	66.1	67.2	66.2	68.2	100	45

3. Noise

100. The noise in the City is high during the tourist season during daytime. The noise due to the various tourists' activities and vehicular movement is of concern in some areas like bus stand,mall road and taxi stand. At present there is no monitoring station in Nainital, and therefore no data on ambient noise level is available with by Uttarakhand Pollution Control Board. Noise qualitymonitoring has been conducted in the pre-construction phase by the contractor and has been updated in IEE. A summary of the Noise level analysis conducted by the UUSDIP on October 2017 is presented in Table 9. The analytical results reveal that in all locations all the parameters are well within the permissible limit for commercial area as mentioned in the NationalNoise Level Standards. (Appendix 3). Baseline ambient noise level monitoring was carried out during the pre-construction period and included in updated IEE (Table 9 B). Noise levels were measured during day and night time for residential and commercial areas. It was observed that all the values are within the standard limits as prescribed by CPCB and WHO (Table 9 B).

Table 9 A: Noise Level Monitoring Status of Nainital

Parameters	Unit	Location				Permissible Limits (Commercial Area)
		Phansi Gadhera Pump House	Children Park Pump House	Old Waterworks UJS Campus	Sukhaa Tal Pump House	
Leq- Day	dB (A)	52.5	64.1	58.9	53.6	65 (Commercial Area)
Leq- Night	dB (A)	46.3	51.6	48.3	44.5	55 (Commercial Area)

Source: UUSDIP- IEE Revised Report, 2017

Table 9 B. Noise quality monitoring results at Nainital

Parameters	Unit	STP plant Russi village 580 (Residential) $29^0$21.9030'N $79^0$26.8880'E	Nainital Tallital Dant area (commercial) $29^0$22.8070'N $79^0$27.8110'E	Mall road HDFC bank Nainital (commercial) $29^0$23.3660'N $79^0$27.5560'E	Dhrmashala Tallital (Commercial) $29^0$22.5370'N $79^0$27.8630'E	Russi bypass road (residential) $29^0$21.8870'N $79^0$26.9160'E
Leq- Day	dB (A)	53.1	60.8	62.3	62.2	51.8
Leq-Night	dB (A)	42.2	52.8	52.1	52.2	42.1

Source: Baseline Environmental Monitoring during the SIP phase

Receptor/ Source	India National Noise Level Standards (dBA)[a]		WHO Guidelines Value for Noise Levels Measured Out of Doors[b] (One Hour LA_q in dBA)	
	Day	Night	07:00 – 22:00	22:00 – 07:00
Industrial area	75	70	70	70
Commercial area	65	55	70	70
Residential Area	55	45	55	45
Silent Zone	50	40	55	45

4. Surface Water

101. Uttarakhand is an origin place of several Indian rivers including glacial fed rivers, non- glacial fed rivers and rain fed rivers. Ganga, Yamuna, Ramganga, Kali, Koshi rivers and their tributaries constitute surface water bodies. Uttarakhand possess three main river basins as Bhagirathi (Alaknanda basin and Ganga basin), Yamuna (Tons basin) and Kali system. In addition of these rivers, glaciers, lakes, numerous streams, springs etc. also contribute as a majorpart of surface water resources. A total 968 Himalayan glaciers are also important which have 213.74 km^3 total ice volume and cover 31449.3 km^2 basin area and 2883.37 km^2 (i.e. 9.17%).glaciered area including Chorbani, Gangotri, Khatling, Nandadevi glaciers etc. The tals such asBhimtal, Sat tal, etc. of Nainital district of Kumaun region are important sources for drinking and irrigation purposes. Besides this, Hemkund, Rupkund and Vasukital are some of the glacial lakeswhereas Nachiketatal, Nainital, Dodital, Bhimtal and Naukuchiatal are the renowned lakes of middle Himalaya. The lakes and tals in upper parts and middle Himalaya form an important part of total drainage system. Surface water quality monitoring have been done for selected parameters to know the baseline status of surface water during the pre-construction phase. Sample was collected from Nihal river, Naini lake and irrigation channels within the sub-project area. Almost parameter was found within the standard limit. The results are shown in Table 9 C and compared with Class C standard of surface water (CPCB).

102.**Naini Lake** is the most important water body in Nainital both in terms of environment andtourist attraction. It receives storm water from large catchment areas. The Uttarakhand Environment Protection and Pollution Control Board (UEPPCB) monitor the lake water quality. The GOU, with financial assistance from GOI is implementing “the Nainital Lake Conservation Action Plan” to control water pollution in Nainital and five other lakes in the region. The monitoringresults of the lake water suggest very low level of dissolved oxygen.

103.The lake meets the local drinking and domestic water needs and is for the most part fed by rainfall during monsoon and by inflow from perennial springs and subsurface inflow during the non-monsoon season. The lack of knowledge of input and output parameters such as subsurface inflow, use of lake water for domestic and industrial purposes, evaporation loss and leakage from lake including the outflow through sluice gates had created uncertainty in determining the availability of water in the lake. The water Balance study conducted by the “National Institute of Hydrology, Roorkee in 1998-99 indicates that pumping pattern from the lake has a direct bearing on the water availability in the lake. This fact is clearly reflected in the relation between surface outflow and annual rainfall in the lake basin which shows a reduction in the annual surface outflow for a given amount of annual rainfall in the last 25 years. This reduction is mainly due to increase pumping. Further it has also observed that the discharge of downstream spring located in the Balia ravine have decline drastically which may be due to chocking of subterranean pathway from sedimentation.

104.Pollution of Naini Lake: Naini Lake is the most important water body in Nainital both in terms of environment and tourist attraction. It is also recipient of storm water for large catchments. This lake is polluted due to urbanization and tourism activities. Discharge of untreated waste water, disposal of solid waste and silt deposition are the major factors that cause pollution of the lake. Nainital Lake Region Special Area Development Authority (NLRSADA) is implementing centrally sponsored Nainital Lake Conservation and Management Project (NLCP) under the National Lake Conservation and Management

Project. UEPPCB monitors the lake water quality. The quality monitoring result for the lake water suggests very low level of dissolved oxygen. The quality of the lake water is expected to be improved after implementation of the NLCP.

105.A summary of the lake water quality conducted by the Uttarakhand Environment Protection and Pollution Control Board (UEPPCB) in 2019 and 2020 is presented in Table 10 The results shows pollution load in lake water. Therefore, the action plan for prevention and control of pollution Naini lake in order to meet water quality criteria of Class-B should be adopted (Table 2 of Appendix 2).

Table 9 C: Baseline Surface water monitoring during the pre-construction (SIP) phase

Surface Water						
Parameters	**Mallital Naini lake 29^{0}23.4280' N 79^{0}27.4670' E**	**Tallital Naini lake 29^{0}23.0820' N 79^{0}27.7770' E**	**Natural drain near gabber bridge 29^{0}23.4820' N 79^{0}27.3740' E**	**Nihal River 29^{0}23.4820' N 79^{0}27.3740' E**	**Russi STP site (Natural drain) 29^{0}21.9020' N 79^{0}26.8950' E**	**Class B standard**
pH	7.62	7.24	7.09	7.28	6.99	8.5
Turbidity(NTU)	<1.0	<1.0	<1.0	<1.0	<1.0	
Total Hardness (as CaCO3) (mg/l)	362	304	326	393	371	
Dissolved Oxygen (mg/l)	6.4	6.26	6.2	6.5	6.5	4 mg/l or more
Biochemical Oxygen Demand (mg/l)	BLQ (2.0)	BLQ (2.0)	BLQ (2.0)	2	BLQ (2.0)	3 mg/l or less
Chemical Oxygen Demand (mg/l)	BLQ (4.0)	BLQ (4.0)	BLQ (4.0)	4	BLQ (4.0)	-
Chloride as cl (mg/l)	74	162	64.2	148	128	-
Mercury as Hg (mg/l)	BLQ (0.001)	BLQ (0.001)	BLQ (0.001)	0.001	BLQ (0.001)	-
Iron as Fe	BLQ (0.1)	BLQ (0.1)	BLQ (0.1)	0.1	BLQ (0.1)	-
Total Dissolved Solids	448	496	462	518	508	-
Total suspended Solids (mg/l)	<4.0	<4.0	<4.0	<4.0	<4.0	-
Calcium as ca (mg/l)	89.6	73	80.7	132	94.8	-
Zinc as Zn	BLQ (0.5)	BLQ (0.5)	BLQ (0.5)	0.5	BLQ (0.5)	-
Hexavalent chromium (mg/l)	BLQ (0.01)	BLQ (0.01)	BLQ (0.01)	0.01	BLQ (0.01)	0.05
Magnesium as mg (mg/l)	33.5	29.5	30.2	32.8	28.4	-
Copper as cu (mg/l)	BLQ (0.2)	BLQ (0.2)	BLQ (0.2)	0.2	BLQ (0.2)	-

Manganese as mn (mg/l)	BLQ (0.2)	BLQ (0.2)	BLQ (0.2)	0.2	BLQ (0.2)	-
Sulphate as SO4 (mg/l)	18.26	14.21	18.9	15.62	16.92	-
Cyanide (mg/l)	BLQ (0.001)	BLQ (0.001)	BLQ (0.001)	0.001	BLQ (0.001)	0.05
Nitrate Nitrogen (mg/l)	1.9	2.42	3.2	2.2	2.6	-
Sodium as Na (mg/l)	21.6	16.48	21.6	21.4	19.2	-
Potassium as K (mg/l)	3.1	3.4	2.62	3.1	2.3	-
Fluoride (mg/l)	BLQ (0.2)	BLQ (0.2)	BLQ (0.2)	0.2	BLQ (0.2)	1.5
Cadmium as cd (mg/l)	BLQ (0.2)	BLQ (0.2)	BLQ (0.2)	0.2	BLQ (0.2)	
Total Arsenis as As (mg/l)	BLQ (0.01)	BLQ (0.01)	BLQ (0.01)	0.01	BLQ (0.01)	0.2
Lead as Pb (mg/l)	BLQ (0.01)	BLQ (0.01)	BLQ (0.01)	0.01	BLQ (0.01)	-
Boron as B (mg/l)	BLQ (0.2)	BLQ (0.2)	BLQ (0.2)	0.2	BLQ (0.2)	-
Selenium as Se (mg/l)	BLQ (0.01)	BLQ (0.01)	BLQ (0.01)	0.01	BLQ (0.01)	-
Aluminium as al (mg/l)	BLQ (0.01)	BLQ (0.01)	BLQ (0.01)	0.01	BLQ (0.01)	
Total Residual chlorine (mg/l)	BLQ (0.2)	BLQ (0.2)	BLQ (0.2)	0.2	BLQ (0.2)	
Total Coliform	500	300	290	$50*10^3$	490	500
E. coli	275	200	570	$4*10^3$	560	

Source: Baseline Environmental Monitoring during the SIP phase

Table 10: Water Quality of Naini Lake at Nainital (Water Intake Point), Nainital (Year 2019 - 2020)

Month	pH	BOD (mg/L)	COD (mg/L)	Conductivity (umhos/cm)	Temp (°C)	DO (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Calcium as Ca(mg/L)	Magnesium as Mg (mg/L)	Hardness as CaCO3 (mg/L	Total Dissolved Solids (mg/L)
Jan-19	7.53	1.6	6	430	8	7.4	220	23	128	92	220	318
Feb-19	7.68	1.4	5	380	6	7.6	196	25	134	96	230	264
Mar-19	7.75	2	6	390	15	7.4	260	19	156	130	286	302
Apr-19	7.64	1.8	5	300	18	7.2	240	21	178	142	320	268
May-19	7.76	2	6	380	19	7.4	260	25	182	144	326	284
June-19	7.58	1.4	5	460	17	7	240	17	144	116	260	310
July-19	7.49	1.6	6	420	15	7.4	216	19	168	104	272	284
Aug-19	7.5	1.2	5.0	360	16	7.6	220	15	156	102	258	242
Sept-19	7.63	1.6	5.0	410	15	6.0	244	17	186	110	296	272
Oct-19	7.86	1.8	6.4	390	14	6.2	226	15	180	132	312	268
Nov-19	7.94	1.4	6.8	420	12	6.0	268	19	192	124	316	282
Dec-19	7.72	1.6	6.0	430	07	6.2	260	25	174	138	312	298

Source: UEPPCB

Year 2020

Month	pH	BOD (mg/L)	COD (mg/L)	Conductivity (umhos/cm)	Temp (°C)	DO (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Calcium as Ca(mg/L)	Magnesium as Mg (mg/L)	Hardness as CaCO3 (mg/L	Total Dissolved Solids (mg/L)
Jan-20	7.72	1.6	6.0	430	7.0	6.2	260	25	174	138	312	298
Feb-20	7.76	1.6	7.0	460	12	8.0	180	24	172	136	308	277
Mar-20	7.47	2	6	390	15	6.8	226	23	186	158	344	274
Apr-20	7.32	1	4	340	19	8.6	144	16	152	130	282	212
May-20	7.59	1.6	6.0	410	24	8.0	248	19	156	132	288	274
June-20	7.63	2.0	7.0	430	22	8.2	266	19	176	152	328	285
July-20	7.0	2.2	8.0	410	21	8.4	284	21	168	144	312	279
Aug-20	7.47	2.2	6.0	430	22	8.0	262	19	154	138	292	289

Source: UEPPCB

5. Groundwater Quality

106. **Ground Water Quality** Water quality monitoring is an important exercise for establishing its suitability for various uses. It is helpful in evaluating the nature and extent of pollution, if any. A perusal of the chemical analysis results of groundwater/spring water samples indicates that the groundwater in the entire district is fresh and all the constituents lie within the permissible limits (Table 1 of Appendix 2). The variations of different chemical parameters pertaining to hand pumps and springs are given in Table 11A. The water in the area is suitable for domestic and irrigation requirements. During the pre-construction phase the selected physico-chemical parameters of selected parameters were analyzed for ground water samples all the values were found within Drinking water standard limit of BIS 10500-2012 (Table 11 B)

Table 11 A: Variations of Different Chemical Parameter, District Nainital

Parameters	Hand pumps	Springs	National Standards[17] for Drinking Water
			Max. Concentration Limits[18]
Electrical Conductivity	275-500 µmohos/cm	175-467 µmohos/cm	
pH	8.10-8.20	8.10-8.20	6.5 – 8.5
Calcium	8-64 mg/l	16-32 mg/l	75 (200)
Magnesium	15-43 mg/l	12-44mg/l	30 (100)
Sodium	6.4-34 mg/l	3.5-21 mg/	-
Potassium	1.1-4.5mg/l	0.9-3.8 mg/l	-
Bicarbonate	146-268 mg/l	98-195 mg/l	=
Chloride	7.1-21 mg/l	7.1-21 mg/l	250 (1000)
Nitrate	Nil-17 mg/l	Nil-8.8 mg/l	45 (No relaxation)
Fluoride	Nd-0.17mg/l	Nd-0.30 mg/l	1.0 (1.5)
Total hardness as CaCO	150-260 mg/l	100-240 mg/l	200(600)

Source: CGWB

Table11 B: Baseline Ground water monitoring during the pre-construction

Parameters	Near Subhash toilet mall road $29^0$23.0820	Post office Tallital $29^0$22.0870 ' N $79^0$27.8110	Water source Jal Sansthan $29^0$23.0700 ' N $79^0$27.7830	Near Dharmshala Haldwani road $29^0$22.5370	Russi Village $29^0$21.8950 ' N $79^0$26.8770 ' E	BIS Standard 10500:2012	
						Acceptable limit	Permissible limit
pH value	7.62	7.28	7.62	7.68	7.69	6.5 to 8.5	No relaxation
Total dissolved solid mg/l	684	892	962	748	1048	500	2000
Chloride(as Cl) mg/l	159.2	210	241	284	314.6	250	1000
Total Hardness (as $CaCO_3$) mg/l	289	302	396	454	521	200	600
Total Alkalinity (as $CaCO_3$) mg/l	162	216	281	208	248	200	600
Fluoride (as F) mg/l	Less than 1	Less than 1	Less than 1	Less than 1	Less than 1	1	1.5
Nitrate (NO_3) mg/l	BLQ (0.5)	BLQ (0.5)	BLQ (0.5)	BLQ (0.5)	BLQ (0.5)	45	No relaxation
Sulphate (SO_4) mg/l	20.16	24.9	18.92	36.8	28.9	200	400
Iron(as Fe) mg/l	BLQ(0.1)	BLQ(0.1)	BLQ (0.1)	BLQ(0.1)	BLQ(0.1)	0.3	No relaxation
Lead(as Pb) mg/l	BLQ(0.005)	BLQ(0.005)	BLQ (0.005)	BLQ(0.005)	BLQ(0.005)	0.01	No relaxation
Arsenic(as As) mg/l	BLQ(0.005)	BLQ(0.005)	BLQ (0.005)	BLQ(0.005)	BLQ(0.005)	0.01	0.05
Cadmium (as Cd) mg/l	BLQ(0.001)	BLQ(0.001)	BLQ (0.001)	BLQ(0.001)	BLQ (0.001)	0.003	No relaxation

Manganese (as Mn) mg/l	BLQ(0.05)	BLQ(0.05)	BLQ (0.05)	BLQ(0.05)	BLQ(0.05)	0.01	0.3
Zinc (as Zn) mg/l	BLQ(1.0)	BLQ(1.0)	BLQ(1.0)	BLQ(1.0)	BLQ(1.0)	5	15
Copper (as Cu) mg/l	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	0.005	1.5
Mercury (as Hg) mg/l	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	0.001	No relaxation
Phosphate (as Po_4) mg/l	BLQ(0.1)	BLQ(0.1)	BLQ(0.1)	BLQ(0.1)	BLQ(0.1)	-	-
Chromium (as Cr^{+6}) mg/l	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	BLQ(0.01)	0.05	No relaxation
Phenolic compound mg/l	BLQ(0.001)	BLQ(0.001)	BLQ(0.001)	BLQ(0.001)	BLQ(0.001)	0.001	0.002

6. Soil Quality monitoring

During the pre-construction phase the selected physico-chemical parameters were analyzed for soil quality analysis and the analytical results are shown in Table 11 C.

Table 11 C: Physico-chemical parameters of Soil in the project area

Parameters	**Tallital Dant** (Road side)	**Mall road Alka Hotel** (Road side)	**STP plant Russi Village** (Land covered with grass Cat. Barren)	**Near Dharmshala** (Barren land)	**Near Gabbar Bridge** (Barren land)
pH	7.21	7.28	6.89	7.28	7.34
Electrical conductivity, (at25^{0}C),µs/cm	262	196	192	218	208
Moisture (at105^{0}C),%	13.92	12.96	12.62	14.2	15.26
Calcium (as Ca),mg/kg	62	728.2	962	518	493
Magnesium (as Mg) ,mg/kg	372	462	620	292	283
Permeability, Cm/sec	392	418	462	408	384
Nitrogen (as N),%	1.02	0.88	0.96	1.08	0.8
Sodium (as Na) mg/kg	492	721	218	428	429
Phosphate (as PO4), mg/kg	726.8	528	386	528	362
Potassium (as k), mg/kg	862	936	362	692	692
Organic Matter, (%)	1.28	1.34	1.42	1.32	1.42

Oil &Grease, mg/kg	4.92	7.2	4.92	7.4	13.92
Texture					
1. Silt, %	26.2	22.62	28	23.92	18.6
2. Clay %	21.8	18.6	21	20.42	21.5
3. Sand, %	52	58.8	51	55.7	55.9

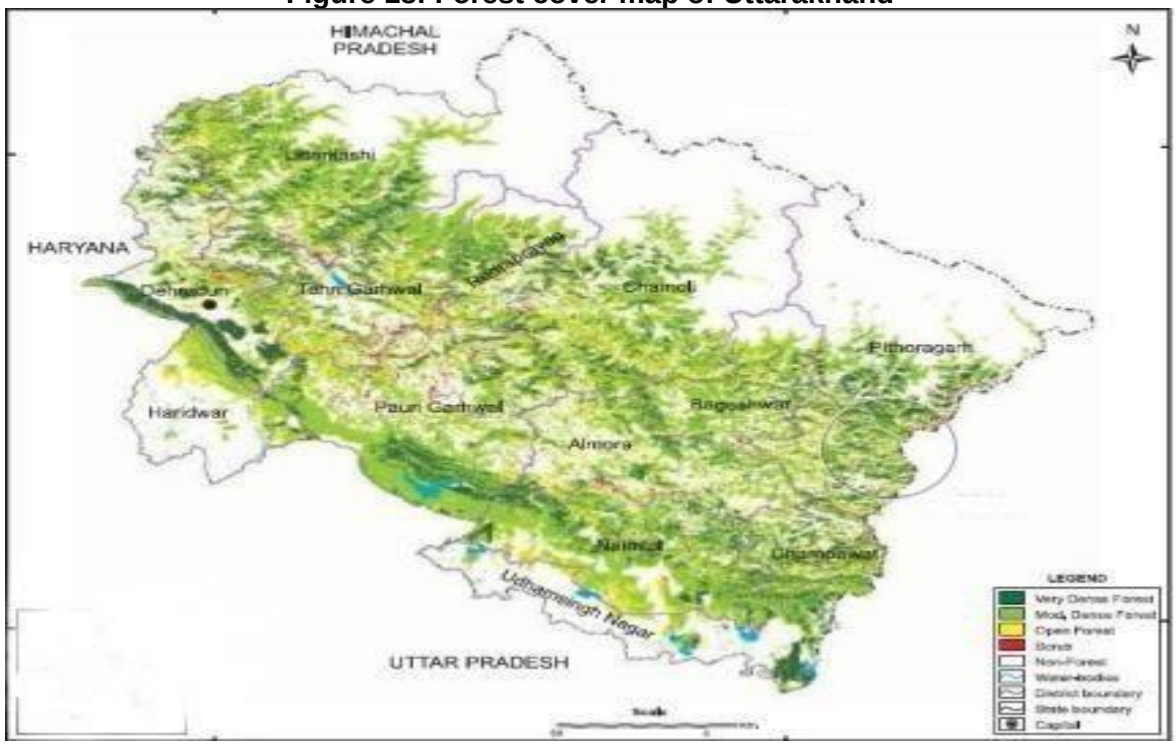
B. Ecological Resources

107.Uttarakhand is a beautiful state set at the foothills of the snow-clad Himalayas with lush green vegetation. There is a diverse range of flora and fauna in Uttarakhand, India. The vegetationof the state majorly comprises alpine trees and tropical rainforests. Wildlife in Uttarakhand thrivesin these dense forests. With the varied flora and fauna in Uttarakhand, a number of National Parkshave been set up in different parts of the country, which not only serve as a natural habitat for Uttarakhand flora and fauna, but also as a huge source of information for tourists who visit theseparks.

108. Uttarakhand comprises of 13 districts spreading over an area of 51,082 sq km, floristically,it falls under the west Himalayan Biogeography zone and it is well-known for floral diversity similarto any other Himalayan region in the country with an estimated 4,000 species of flowering plantshaving great economic medicinal, aromatic and artistic value. The endemic plant wealth of Uttarakhand is worth mentioning as it ultimately forms part of the National heritage. UttarakhandHimalayas have about 116 species as indigenous group. Are naria ferruginea; Chimonobambusajaunsarensis, Gentian tetrasepala, G. saginoides, Meeboldia solenoids, Microschoenus duthiei, Trachycarpus takil, Poa rhadina, etc. are some such species.

109. The area under forest in Uttarakhand is 3.4 million hectares, which constitutes 61.45% ofits total land available for utilization. By legal status, reserve forests constitute 71.08%, protectedforests 28.51% and unclassified forests 0.41% of the total forest area. The major forest types occurring in the state are Tropical Moist Deciduous, Tropical Dry Deciduous, Sub-tropical Pine, Himalayan Moist Temperate, Sub-Alpine and Alpine Forests. Forests are largely distributed throughout the state, with conifers and Sal being the major forest formation. As per forest Surveyof India. Forest cover map of Uttrakhand is shown in the Figure18.

Figure 18: Forest cover map of Uttarakhand



Source: Forest Survey of India

110. Of the total geographical area of 6,794 sq. km, the forest cover in the **Nainital District is** 3574 sq. km. Vast expanse of forests exist within the city limit. The Corbett National Park, located 30 km from the town, is a prime forest reserve situated in Nainital District, but no project component site is near this protected area.

111. The hilly region of Nainital is covered with Sal, Pine, Oak, Buruns, Kaphal, and other treesgrowing up to 1,830 m above sea-level, along with Deodar, Surai etc. at higher altitudes. There are small tracts of cultivated lands and fruit orchards etc. in between the forests in this region. The following important trees and bushes grow in Nainital.

[17] Bureau of India Standard 10200: 2012.
[18] Figures in parenthesis are maximum limits allowed in the absence of alternate source.

Table 12 A: Floral diversity of Nainital

S.NO.	COMMON NAME	BOTANICAL NAME
1	Pipal	*Ficus Religiosa*
2	Neem	*Azadiracta Indica*
3	Asok	*Saraca Indica*
4	Aam	*Magnifera Indica*
5	Sal	*Shorea Robusta*
6	Teak	*Tectona Grandis*
7	Jamun	*Sygygium Cumini*
8	Bel	*Aegle Marmelos*
9	Amrood	*Psidium guajava*
10	Shisham	*Delbergia sisso*
11	Eucalyptus	*Eucalyptus globulus*
12	Kachnar	*Bauhinia Variegata*
13	Munj	*Sacchrum Munja*
14	Dhatura	*Dhatura Stromonium(*
15	Tulsi	*Oscimum Sanctum*
16	Bathua	*Chenopodium Album*
17	Curry Patta	*Murraya koenigii*
18	Akra	*Solanum erianthum*
19	Madar	*Calatropis gigantia*

112. **Medicinal Flora:** Many Medicinal plants grow in the deep valleys of hills. In the middle Himalayan range we find Daruharidra(Berberis aristata), Timoor (Zanthoxylum armatum), Manjishtha (Rubia cordifolia), Sugandh abala (Pavonia odorata), Samayava, Manduparna, Dhooplakkar, Talish (Trifolium tumens) Deodar (Cedrus deodara), Padam (Nelumbo nucifera), Vidhangabhed, Kakoli (Roscoeaprocera), Ksheerkakoli (Roscoea sp.), Lahsuniya and so many other plants. The Himalayan range as the potential to grow plants like Saffron, Vindhanga, and Ghritkumari and so on. Many of these plants have a great commercial importance. These are widely used in indigenous system of medicines like Ayurveda, Yunani and Aamchi for skin disease, Stomach disorder, nervous disability, liver disease.

113. **Fauna**. The faunal composition of Nainital comprises of species of animals andbirds which are listed as follows:

Table 12 B: Faunal diversity of Nainital

S.NO.	COMMON NAME	ZOOLOGICAL NAME
1	Langur	*Seminopithecus entellus*
2	Red Monkey	*Rheus Macaque*
3	Squirrel	*Funambulus Pennanti*
4	Garden Lizard	*Calotes Versicolor*
5	Rat	*Rattus Rattus*
6	Dog	*Canis Lupus*
7	Goat	*Copra aegagrus hircus*
8	Domestic Cat	*Felis catus*
9	Cow	*Bos taurus*
10	Buffalo	*Bubalous bubalis*
11	Mongoose (Newla)	*Herpestis edwardsii*

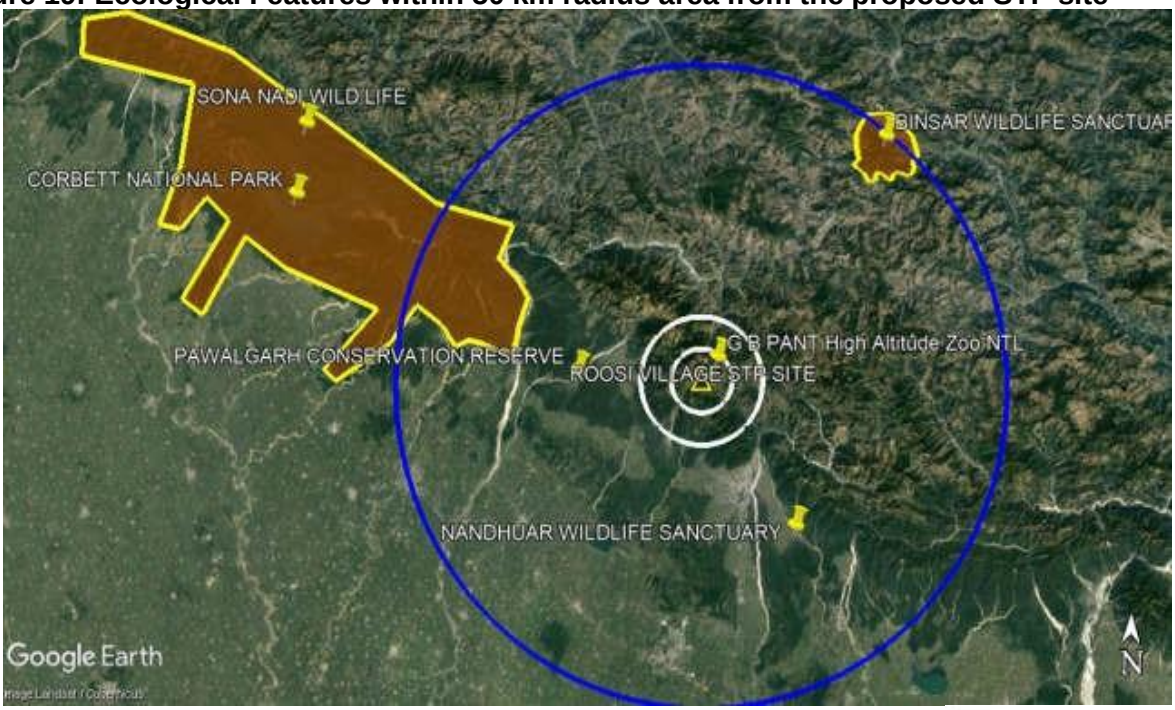
Common Avian Species

S.NO.	COMMON NAME	ZOOLOGICAL NAME
1	House Crow	*Curvus Splendus*
2	Sparrow	*Passer Domesticus*
3	Myna	*Acridotheres Tristis*
4	Bulbul	*Pycnonotus sp.*
5	Kingfisher	*Halcyon Compensis*
6	Eagle	*Aquila Chrysaetous*
7	Robin	*Sexicoloides Fulicatus*
8	Woodpecker	*Dendrocopos Sp.*
9	Parrot	*Psittacula Krameri*
10	Canary	*Serenus canaria*
11	Pigeon	*Columba libia*
12	Koyal	*Eudynamys scolopacius*

114. **Nainital City**, the district head quarter, is an urban area surrounded by hilly forested areas. There is no remaining natural habitat within the developed area of the city. Proposed project area mostly comprises semi urban and habitation areas, and agricultural, vacant and barren lands.

115. None of the project components are falling within protected or forest areas and no wildlife has been reported within the proposed service area. There are no eco-sensitive or protected areas within proposed project activity areas of Nainital sewerage project. Based on the screening conducted using the Integrated Biodiversity Assessment Tool (IBAT), it has been found that there is no protected area within 10 km buffer from the proposed STP location at Russi Village. However, between 10km and 50km radius of the proposed STP location six protected areas (Figure 19). are recorded viz. Binsar wildlife Sanctuary, Jim Corbett National Park, Nandhore - Ladhiya Valley., Naina Devi Himalayan Bird Conservation Reserve, Nandhooure Wildlife Sanctuary and Pawalgarh Conservation Reserve. Therefore, there is no direct risks or impacts on biodiversity and natural resources.

Figure 19: Ecological Features within 50 km radius area from the proposed STP site



C. Economic

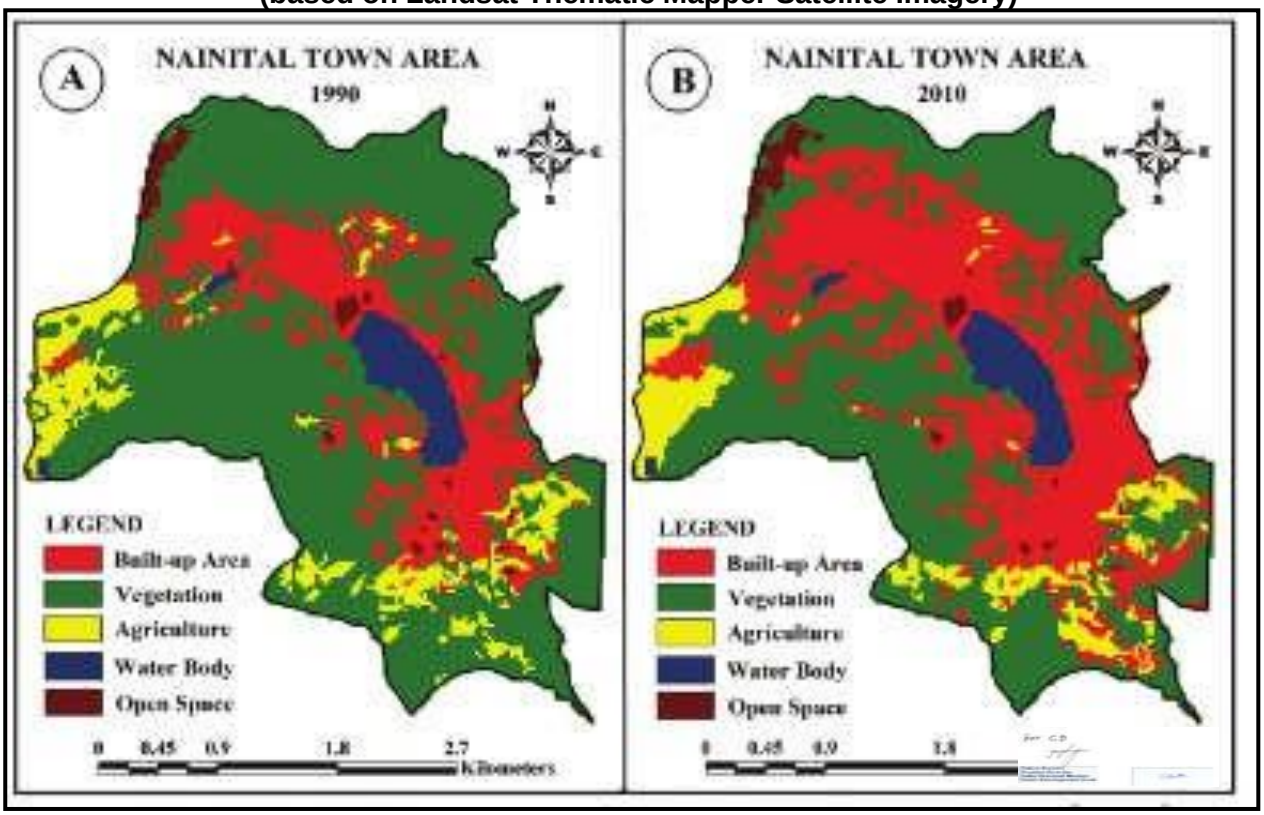
Land Use

116. **Land use** is an important indicator in understanding the interactions between human activities and the environment. A study was conducted by the Centre of Excellence for Natural Resource and Data Management System (NRDMS) in Uttarakhand, Kumaun University in Nainital town by using multi-temporal satellite data to detect the changes in land use quickly and accurately.

117. As per the Master Plan of Nainital town (MPNT), area developed by Kumaun **Urban** Planning, it encompasses an area of 12.19 km^2. Out of the present total town area only about

11.03 km^2 area falls under the Nainital Municipal area. The average height of the town stands at 2040m above the mean sea level which varies between 1416 m to 2546 m. Nainital is a popular hill station in the Uttarakhand state of India and is head quarter of Nainital district in the lesser Himalayan zone. Nainital is set in a valley containing a pear-shaped lake with a mean depth of 18.55 m. The results obtained through the analysis of multi-temporal satellite imageries are diagrammatically illustrated in Figure 20 (A & B) and land use distribution in the Nainital Town area are represented in Table 9 and Table 10 .

Figure 20: Land use/cover status of the Nainital Town area : (A) - in 1990, (B) - in 2010 (based on Landsat Thematic Mapper Satellite Imagery)



118. Figure 20 (A) depicts spatial distributional pattern of land use/cover of the Nainital town area for the year 1990 while Figure 20 (B) for the year 2010. These data reveal that in 1990, about 19.97% (2.43 km^2) area of Nainital town was under built-up land, 65.07% (7.92 km^2) under vegetation, 9.37% (1.14 km^2) under agricultural land, 3.94% (0.48 km^2) under water body and 1.65% (0.20 km^2) area was covered by open space. During 2010, the area under these land categories was found 35.93% (4.38 km2) under built-up land, 49.71% (6.06km^2) under vegetation, 8.62% (1.05 km^2) under agricultural land, 3.94% (0.48 km^2) under water body and 1.80% (0.22 km^2) under open space. The land use distribution in the Nainital Town area is shown in Table 16

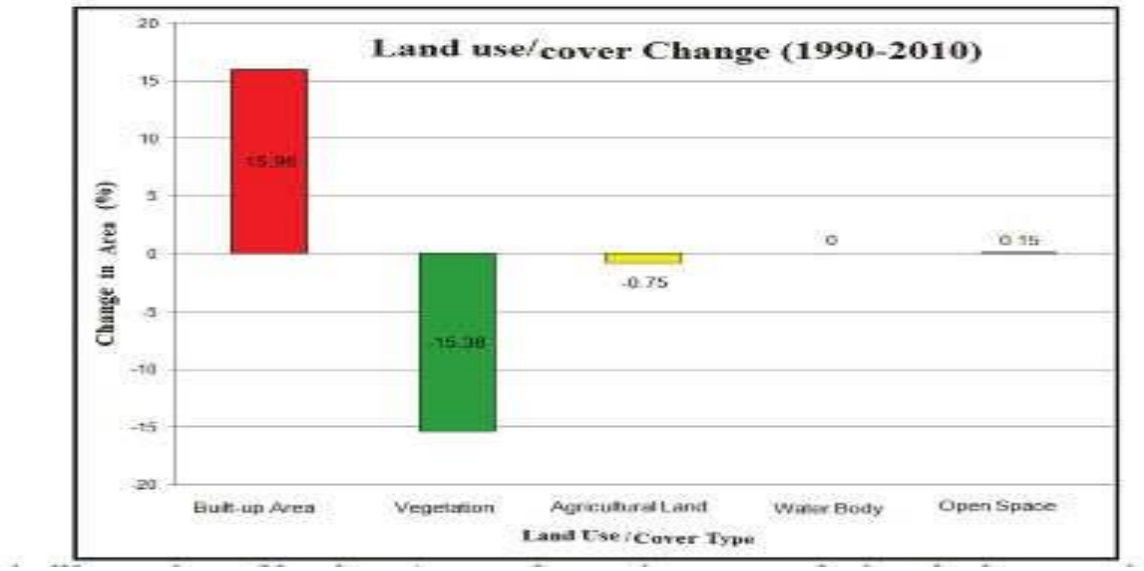
Table 13 : Area and Amount of Change in different Land use/Cover Categories in Nainital Town area during 1990 to 2010

Land use/cover categories	1990		2010		Change 1990-2010	
	km^2	%	km^2	%	km^2	%
Built-up area	2.43	19.97	4.38	35.93	1.95	15.96
Vegetation	7.92	65.07	6.06	49.71	-1.86	-15.36
Agricultural land	1.14	9.37	1.05	8.62	-0.09	-0.75
Water body	0.48	3.94	0.48	3.94	not traceable	not traceable
Open Space	0.20	1.65	0.22	1.80	0.02	0.15
Total	12.19	100.00	12.19	100.00	--	--

Source: "*Quantifying Land Use/Cover Dynamics of Nainital Town (India) Using Remote Sensing and GIS Techniques*" by Jiwan Rawat, Vivekananda Biswas and Manish Kumar; 2013, AARS.

119. **Land Use/Cover Change.** The data registered in Table 13 and Figure 21 depicts that both positive and negative changes occurred in the land use/ cover pattern in the Nainital town area. During the last two decades the built-up area has increased from 2.43 km^2 in 1990 to 4.38 km^2 in 2010 which accounts for 15.96% of the total sprawl area. The vegetation cover has been decreased from 7.92 km^2 in 1990 to 6.06 km^2 in 2010. -This decreased in vegetation accounts for15.36% of the total town area. The agricultural land has slightly decreased from 1.14 km^2 in 1990to 1.05 km^2 in 2010 which accounts for 0.75% of the total town area. There is no traceable changein water body, it constitute about 0.48 km2 in 1990 and 2010. Due to degradation in vegetation, open space has been increased from 0.20 km^2 in 1990 to 0.22 km^2 in 2010 which accounts 0.15%in area of total town area.

Figure 21 : Diagrammatic illustration of land use/cover change in percent during the lasttwo decades (1990-2010) in the Nainital town area.



120. During the last two decades, how much encroachment in different land categories has been done for different purposes, to understand this, change detection matrix (Table 14) was prepared which reveals that during the last two decades:

(i) about 3.37% area of vegetation covered has been converted into agricultural land, 22.25% area under built up area and 0.85% area under open space.
(ii) about 17.93% area of agricultural land has been converted into vegetative area, 13.37% into built-up area and 0.39% in open space.
(iii) about 12.12% area of open space has been converted into vegetation cover, 14.28% into built-up and 2.16% into agricultural land, and
(iv) no traceable change is detected in water bodies.

Table 14: Land use/cover change matrix showing land encroachment in differentcategories of land (in %) of Nainital town area

Land use/cover categories		Year 1990				
		Built-up area	Vegetation	Agricultural land	Water body	Open space
Year 2010	Built-up area	100.0	22.25	13.37	0.00	14.28
	Vegetation	0.0	73.52	17.93	0.00	12.12
	Agricultural land	0.0	3.37	68.29	0.00	2.16
	Water body	0.0	0.00	0.00	100	0.00
	Open space	0.0	0.85	0.39	0.00	71.42
	Class total	100	100	100	100	100
	Class change	0.00	26.47	31.70	0.00	28.57

2. Industry and Agriculture

121. **Industries of Nainital** are basically agro-based. Being a hilly district the industrial growth is very low. The Government is giving priority to khadi, village, and cottage industries. The non-availability of cultivable land due to the hilly terrain is the greatest restricting factor in the development of agriculture in Nainital. The land is low in fertility except in the valleys. Therefore, the agro-industries do not contribute largely to the economic growth in the district. Sheep rearing for the production of wool and other cottage industries etc. offer much scope for the industrialization of the district. The cultivation in Nainital is carried through terracing the hillside. Crops are cultivated during both Kharif (April – September) and Rabi (October to March) seasons. The predominant are paddy, small millet, and potato in Kharif, and wheat, and barley in Rabi. In plain areas sugar cane is cultivated.

122. Biodiversity of Agricultural Activity and Farming System. In Nainitalarea, the main crops include rice, wheat, maize, pulses, potato, ginger, onion,garlic and pea. There are various kinds of vegetables and fruits including orange, lemon peach, plum, grape, banana, akhrot, pears, apricot, citrus fruits, kafal, strawberry and different species of medicinal plants are also there.Chemical fertilizers and manures both are used by the farmers to enrich the quality of the crops grown by them. The crops mostly depend on the rain.

3. Existing Infrastructure

123. **Water Supply.** The water supply of Nainital is operated and maintained by Uttarakhand Jal Sansthan (UJS), an institution working under Department of Drinking Water, Government of Uttarakhand (GOU). UJS also undertakes small budget capital works. Large capital works and overall planning are carried out by another corporation Uttarakhand Pey Jal Nigam (UPJN) also working under Department of Drinking Water.

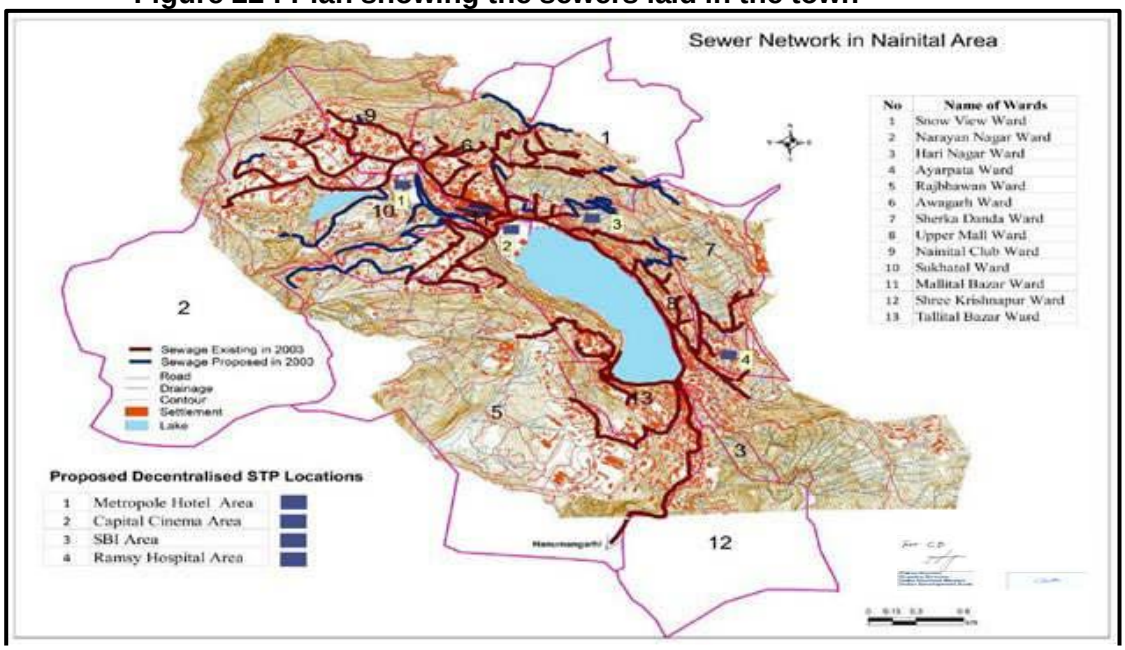
124. Piped water supply was introduced in Nainital in 1898 from the Pardadhara spring situated inside the town. As the City is expanded, water is also tapped through bore wells and an infiltration well located at the periphery of Nainital Lake. These tube wells are now the main sources of water for the City from which it meets about 93% of its total supply; the rest (7% or about 1 MLD) is drawn from surface water. The quality of ground water from tube wells is good therefore it is directly distributed after disinfection. Surface water is subjected to filtration and chlorination before supply. Water supply in the town is satisfactory with a per capita supply of 130 litres per day.

125. **Sewerage**. A skeleton sewerage system was laid in Nainital in the beginning of the 19th century. During 1940-1950, a 300 mm main sewer on Mall road and a 300 mm outfall sewer on Nainital-Haldwani road were laid. The sewage was disposed into ravines near Rusi village about 3 km from Talli Tal (Lake), in a valley on the southern side of the main road Ghati. Some branch sewers were laid in different parts of the City during the period 1940-1960. The growth of the urban population and an inadequate sewer system led to overflowing sewage in storm water drains ultimately discharging into Nainital Lake.

126. To resolve the problem of pollution of the lake, the State Govt. constituted a high-level expert committee, in the Hill Development Department, to evaluate the problem of pollution and silting of lake. The committee opined in 1978 that a well-planned sewer system capable of taking care of additional volume of sewage generated, is essential and should be executed. As per recommendations of the expert committee, the plan for complete reorganization of sewerage system of the town, was prepared in 1978-1979 and has been executed in 3 phases as per the availability of financial resources:

(i) Phase I: Reorganization of the trunk and outfall sewers.
(ii) Phase II: Reorganization of existing branch sewers laid about 30-50 years back.
(iii) Phase III: Laying of sewers in areas where no sewer system exists

Figure 22 : Plan showing the sewers laid in the town



Source: City Development Plan, Nainital (2007)

127. .Based on the topography of the town and the need of STP's, the city was divided into 4 zones.

(i) Zone I: Nainital Lake Catchment Zone
(ii) Zone II: Sukha Tal Zone
(iii) Zone III: Narayana Nagar Zone
(iv) Zone IV: Hari Nagar-Krishnapur Zone

128. A plan of sewerage zone map as per City development plan, 2007 is given at Figure 23 .Details of existing trunk and outfall sewers are given in Table 15.

Figure 23: Plan of sewerage zone map (Source CDP Nainital)

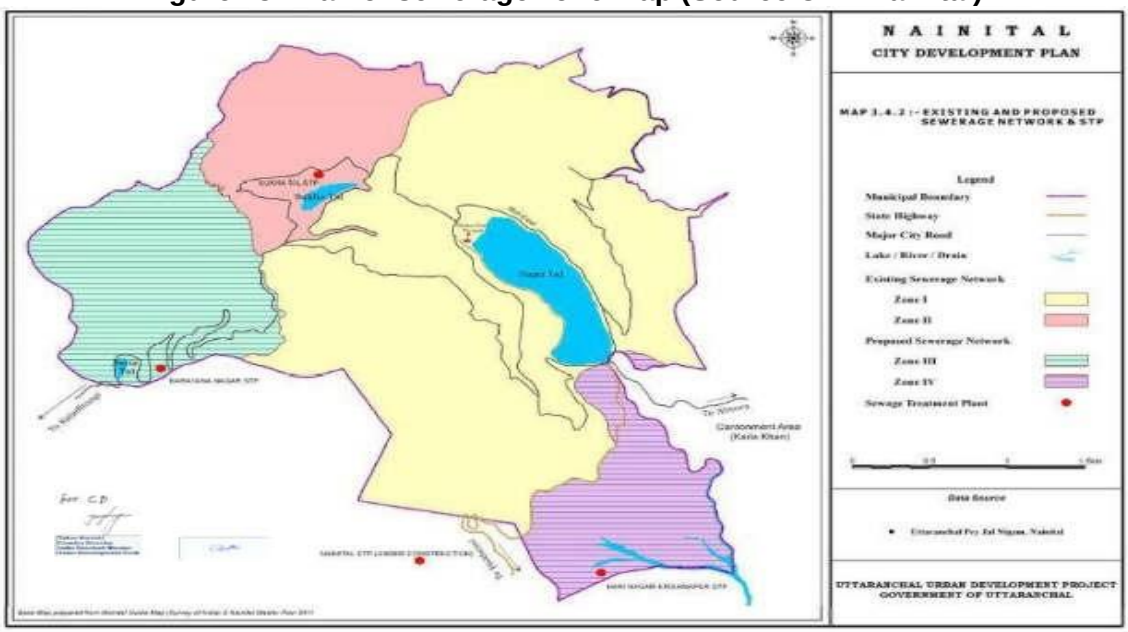


Table 15: Details of Existing Trunk and Outfall Sewer

Sl. No	Sewer	Diameter of the sewer	Year in which laid
1.	Main sewer from old Water works to Pant Statue	300-450 mm dia RCC humepipes	1981-82
2.	Trunk Sewer from Pant Statue to Tallital Post office on upper Mall road, 1.63 Km	600-700 mm dia RCC hume pipes, in place of existing 300mm dia sewer	1981-83
3.	Outfall Sewer from Tallital Post office to sump well no. 1, near Hanuman Garhi tunnel entrance point, 1.8 Km	450-500-600 mm dia	1987-88
4.	Outfall sewer from sump well no.2 to Rusi village, 0.42 Km	450 m dia CI pipes	1988-90

129. As per the discussion with ULB, the existing trunk sewer need to be upgraded since it is overflowing during monsoon and land subsidence is also observed. The existing trunk sewer would also be upgraded to carry ultimate peak flow of year 2051. The existing treatment facility is required to be upgraded to meet requirement up to next 15 years as per pollution control broad norms.

130. At present the sewage of the town, except Harinagar, Krishnapur and Narayan Nagar areas, is being disposed off near Rusi village in STP of capacity 10 MLD (2x5 MLD); primary treatment only). Besides the above, 2 STPs have also been constructed under JNNURM. In Harinagar-I area near Dhobighat and Krishnapur areas, of capacities 0.45 MLD (MBBR) and 0.80 MLD (SBR) respectively. Another plant of 0.45 MLD is under construction in Narayan Nagar under AMRUT. Details of existing STPs in Nainital town are given in Annexure 20.

131. **Storm Water Drainage**. Average annual rainfall in Nainital is 1,583.3 mm. The hills are unstable and many landslides occur. New construction in most of the hills is prohibited yet unauthorized commercial and domestic construction continues posing danger to the natural drainage system and the slope stability. Storm water drains carrying rainwater from the top of hills with very steep slopes develop very high velocities. Due to conversion of vegetated land to built–up areas the run off has also increased substantially. The connection of sewers and storm water drains all over the town is one of the main causes of pollution in Nainital Lake.

132. **Solid Waste Management.** According to the Nainital Nagar Palika Parishad estimates, municipal solid waste generation in City ranges between 12 metric tons (MT) to 18 MT during non-peak and peak tourist seasons, respectively. There is no primary collection system in the town and waste is collected through community bin/containers and open collection points or by street sweeping. The present collection and transportation system involves multiple handling of solid waste. The existing solid waste disposal site is located at Hanumangarh, about 2 km from the city of Nainital-Haldwani road, where waste is openly dumped.

133. **Transportation.** Nainital is well connected with other parts of the State by road network. A National Highway (NH 87) and a State Highway (SH 13) connect the City with Haridwar, Dehradun, and other towns. Nainital City has 85.09 km of roads of which 25.94 km are maintained by NNPP and 59.15 km including 4 km of National Highway are maintained by the Public Works Department (PWD). The traffic carrying capacities are low due to limited widths, intense land use, and encroachments. In most of the areas, roads are very narrow and due to the hilly topography, roads have very steep slopes.

D. Social and Cultural Resources

1. Demography

134. The population of the Nainital Nagarpalika parishad from 1941 to 2011 is presented in Table 15. While in the decade 1961-1971 the decadal growth rate was a high 71%, in the next decade it recorded a 4% low. The 4% decadal growth rate (i.e., less than 0.5 % per annum) is much lower than the natural growth rate of population in India In the decade 1981-91 the growth rate shot up to 20%, and in 1991-2001 decade it recorded 26.67% and in 2001-2011 it recorded 8.88% growth.

135. As of 2011 Indian census, the Nainital Nagarpalika parishad has a population of 42,377 (21,648 Male and 19,729 Female). The Nagarpalika parishad has a gender ratio of 911 as against a state average of 963. The literacy rate is 92.9% (86.9% for males, 81 % for females). There are 35424 populations are Hindus and the remainder are mainly Muslims, Sikhs and Buddhist. Demographic Statistics of Nainital Nagarpalika Parishad is presented in Table 16.

Table 16: Population Growth of Nainital Municipal Area (1941-2011)

Year	Population	Decadal Change (%)
1941	10,000	0.00
1951	12,000	20.00
1961	14,000	16.67
1971	24,000	71.43
1981	25,000	4.17
1991	30,000	20.00
2001	38,000	26.67
2011	41,377	8.88

Source: Nainital City Development Plan, 2007 and Census 2011

Table 17: Demographic Statistics of Nainital Nagarpalika Parishad

Population	Persons	Males	Females
Total	41,377	21,648	19,729
In the age group 0-6 years	3,946	2,079	1,867
Scheduled Castes (SC)	11,583	6,018	5,565
Scheduled Tribes (ST)	280	139	141
Literates	92.90%	86.90%	81%
Illiterate	6,591	2,844	3,747
Hindu	35,424	18,561	16,863
Muslim	4,929	2,598	2,331
Christian	381	164	217
Sikh	310	161	149
Budhist	317	152	165
Jain	5	4	1
Other religion	10	7	3
Total Worker	13,385	10,753	2,632
Main Worker	12,129	9,800	2,329
Main Worker - Cultivator	42	35	7
Main Worker - Agricultural Labourers	23	19	4
Main Worker - Household Industries	173	146	27
Main Worker - Other	11,891	9,600	2,291
Marginal Worker	1,256	953	303
Non Worker	27,992	10,895	17097

(Source: Census of India, 2011)

2. History, Culture and Tourism

136. **Historical Background. Nainital** has an important mythological reference as one of 64 ‘Shakti Peeths’. These centres were created wherever parts of charred body of Sati (Goddess Parvati) fell when Lord Shiva was carrying around her corpse in grief. According to a legend, the left eye (Nain) of Sati dropped in the lake while her body was being carried by Lord Shiva to Kailash Parvat. Hence, the lake was given the name of Nainital, from where the city derives its name. Naina Devi is worshipped as the patron deity of the town. Naina Devi temple is located at the northern end of the lake. The temple was destroyed in the landslide which occurred in 1880. It was subsequently replaced by the present structure.

137. The British occupied Kumaon and Garhwal in 1815. After the British Occupation,E. Gardiner was appointed as the commissioner of Kumaun Division on May'8th 1815 .In 1817 the second commissioner of Kumaun Mr. G.W. Traill has conducted the second revenue settlement of Kumaun , Mr. Traill was the first European to visit Nainital but he did not popularize his visit inrespect for the religious sanctity of the place.

138. In the year 1841, Mr P. Barron a European merchant and an enthusiastic hunter from Rosa, near Shahjahanpur was the first European who took great fancy to this land. Moved by thebeauty of the sparkling lake he wrote: "It is by far the best site I have witnessed in the course of a 1,500 miles trek in the Himalayas." It is relatively lesser known that this region was called "Khasdesh" in ancient times and "Khasis" ruled this region before Christ was born.

139. Nainital had become a popular hill resort by 1847. The Nainital Municipal Board was formally constituted in 1845. It was the second Municipal Board of North Western Provinces. In 1862, Nainital became the summer seat of the North Western Provinces. The town also becamethe summer seat of the U.P. Govt after independence. After it was made the summer Capital, a remarkable expansion of the town occurred with the growth of magnificent bungalows all aroundand construction of facilities such as marketing areas, rest houses, recreation centres, clubs etc. together with the secretariat and other administrative units. It also became an important centre ofeducation for the British who wanted to educate their children in the better air and away from thediscomforts of the plains. After 1963 the summer exodus of the U.P. Government was stopped. The Secretariat building is now being used by divisional and district offices. Later, the town became the summer residence of the governor of the United Provinces. Uttarakhand is 27th stateof India which has been carved out from Uttar Pradesh in 2000.

140. **Tourism.** City of Nainital is the headquarters of Nainital Lake District and Kumaon Mandal.Of the hill towns in the State of Uttarakhand, Nainital occupies a unique place. Known for its salubrious climate and scenic beauty, the town is a popular destination in the northern tourist circuit. Nainital attracts thousands of tourists round the year. Nainital is also an important administrative town in the State having the High Court and well known institutions such as Academy Of Administration, Aryabhatta Research Institute of Observational Sciences (ARIES), Office of Kumaon Mandal Vikas Nigam and Kumaon University. A popular hill station, Nainital hasnumerous tourist spots including Nainital Lake, Naina Peak 8622ft, Himalaya Darshan & Echo Zone, Hanumangarhi and Pt. G.B. Pant High Altitude Zoo, Nainital

(i) **Nainital Yacht Club** The Nainital Yacht Club, situated along the lake, is run by theBoat House Club. It is the highest yacht club in India and among the highest clubsin the world. It was founded in 1910 by the British and, till 1970, was only open tomembers. Today, tourists can pay for a sailing session on the yachts.

(ii) **Jama Masjid** The Jama Masjid of Nainital is located in Mallital area of Nainital is a mosque which was built in 1882 during the British Era for muslims around Nainital. Over the main entrance one can see Arabic inscriptions. The most notable feature is the mihrab where a niche shows the direction towards Mecca

(iii) **Naina Devi Temple** Temple of Naina Devi is located at the upper end of the beautiful Naini lake. This temple is dedicated to the goddess of the town Naina Devi. Its complex becomes the location of the famous Nanda Devi Mela festival which held every year on Nandashtami during September.

(iv) **St John Wilderness Church** St. John in the Wilderness is one of the oldest andfinest churches in Nainital. The Church is dedicated to St. John the Baptist. This Anglican Church was built in 1846 and is one of the earliest buildings erected in Nainita.

141. **Tourism Development Policy.** There has been a steady growth in the number of touristsarriving in Nainital. During the year, tourist influx is reported to be maximum in the months ofMay and June. Master Plan states development of Nainital and surrounding lake towns witha clearly focus on tourism development. The Government of Uttarakhand has also adopted aclear mandate to develop tourism in the state as one of the primary economic development force. The Government feels that 'the unlimited tourism potential of Uttarakhand has not beenfully realized in the absence of a planned and coordinated strategy of tourism development. The vision of tourism development is:

(i) to place Uttarakhand on the tourism map of the world as one of the leading touristdestinations, and to make Uttarakhand synonymous with tourism;
(ii) to develop the manifold tourism related resources of the State in an ecofriendly manner, with the active participation of the private sector and the local host communities; and
(iii) to develop tourism as a major source of employment and income / revenue generation and as a pivot of the economic and social development in the State.

142. **Cultural and Heritage**. Nainital has a rich tradition of religious fairs and occasions relatedto the positions of the stars. At the transition of sun from one constellation to another Sankranti isobserved. Each Sankranti has a fair or festival connected to it somewhere in Kumoun. Nainital celebrates such occasions in an array of events organized round the year. The Uttaraini Mela atChitrashila near Ranibag is observed on Makar Sankranti Day (Approx. 14thJanuary). On BuddhaPurnima Day, in the month of May there is festivity near Budhansthli, while Bhimtal observes Harela Mela on 16th or 17th of July. Nandashtami Festival is observed with full devotion in the district, fairs are organised at Nainadevi temple.

143. **Social System.** District Nainital has rich cultural traditions & heritage. The main towns ofthe district are cosmopolitan and its people are associated with various religions and sets living through generations. Broadly eighty percent of population follows Hindu religion, the rest part belongs to Sikh,Muslim,Christion,Bauddha etc religions. The major part of population follows Kumouni traditions.

144. Marriages are mostly arranged by the parents after tallying horoscopes. The main functions of marriages are Ganesh Pooja, Suwal Pathai, Dhuliargh, Kanya-daan, phere, vida. Thetraditional kumouni barat take a lively colour in presence of Choliya Nritya (Dance) & playing of turais (trumpets), dhol, damua. But now a days people are seen dancing on the tunes of bands in Barat.

145. **Cuisines**. People are mostly rice eating in habit but wheat, maduwa and other grains are alsoconsumed. In pulses, people prefer Urad, Gahat, Bhatt, Masur. Meat is also common among the people. Ceremonial food consists of Kheer, Singhal, Poori, Pua, Bada, Kapa made of Palak, Raita, Khatai etc. The other typical kumouni foods are Chudkani & Bhattiya made of bhatt & Soya been, Gautras made of Gahat, Jholee made from mattha, Gaba vegetable. In towns restaurants provide general food along with Chinese & South Indian dishes. There are people who enjoy fishes, Tharusand Bengali settlers comes in this class.

146. **Fairs & Festivals.** After harvesting season people mostly relax, rejoice, dance and singthus a festival is generated. At the transition of sun from one constellation to another Sankranti isobserved. Each Sankranti has a fair or festival connected to it somewhere in Kumoun. Fooldeyi,Bikhauti, Harela, Ghee Sankranti, Khatarua, Uttaraini are the mostly observed Sankranties throughout the region. Other festivals have the bearings in the moon and the dates changed frequently in Gregorian Calendar. Basant Panchami, Shiv Ratri, Holi, Samvatsar Parwa, Ram Navami, Dashra, Batsavitri, Rakshabandhan, Janmastmi, Nandastmi, Deepawali etc are some ofthe auspicious occasions. Fairs are organised on these occasions on certain places.

147. The Uttaraini Mela at Chitrashila near Ranibag is observed on Makar Sankranti Day (Approx. 14th January). Kumaoni people feed the crows on Uttaraini day by saying 'Khale Kaua khale Ghughuti Bada Khale' .On Buddha Purnima Day, in the month of May there is festivity nearBudhansthli, while Bhimtal observes Harela Mela on 16th or 17th of July. Baishakhi Purnima daybrings rejoicing near Lokhamtal while Kainchi temple premises is gay on 15th June. Kakrighat has Somnath Fair on the last Monday of Baishakh, Garjia is full of festivity on Kartik Purnima dayin the month of November. Nandashtami Festival is observed with full devotion in the district, fairsare organised at Nainadevi temple Nainital and Bhowali.The Kumaoni people use the fortnight ofShradha in late September or early October to remember their passed away ancestors.

148. **Life Style.** At all auspicious occasions tilak made out of processed turmeric with akshat (Pithya) is put on the forehead. Village ladies are seen with a long pithya starting from the uppernose up to forehead. Various superstitions exists as common throughout the country. A black spotis put on the forehead of a child to ward away from evil spirits .

149. Courtesy calls are made on days other than Tuesday and Saturday. Mourning calls are made exclusively on Tuesday and Saturdays. Visit to sick persons are not made on Tuesdays , Thursdays and Saturdays. Females do not pay visit to their mothers on Thursday. Elders are greeted by touching their feet with ovation of pailagon and responded by chirinjivi bhav or saubhagyavati bhav.Others are greeted with folded hands using Namaskar .

150. Married women put round ingoor or sindoor on their forehead . On special occasions married women wear huge golden nose ring called nath. Black beaded (Chareu) garland on theirneck is considered to be the pious symbol of leading a married life for a woman. Golden necklaceis commonly used but poor people use silver in the neck known as Hansuli. So far as the usual dress is concerned females wear sari but there is still a longing for the conventional dress of ghaghara-pichora . Every lady keeps it ready for ceremonial occasions.

151. People live in houses made out of stone or bricks. Few old constructions are made out ofwood also. Wood carvings which was very common in the past are now very rare. In hilly area, roofs have slopes and roofing is done with the help of tin or slates of stone. In villages, animals live in ground floor called Goth and human beings in first floor
.

152. Hill temples are the monuments having mixture of deep sense of art and culture. Sculpturevaries with the time of inception of the temple. The mode of worship is also different in many aspects from that of plains. These temples act as the nucleus of the social and cultural activities.Hill people orgnise Jagars to please local deities.Golu, Bholanath, Sam, Aidi, Gangnath are someof the local deities.

153. **Cultural Traditions.** The tradition of colorful ornamentation on Aanchal cloths is a uniqueKumouni tradition, rooted deep in its long history. In all ritual ceremonies women wear pichora, also known as Rangwali. It is a piece of muslin cloth, 3 mts. in length & One and half mts. in width,which is dyed yellow, it is then printed with design with a padded wooden stick using red colours.At the centre is the sign of Swastik, and the motifs of sun, moon, bell and conch shell

154. Ceremonies and festivals the women set themselves to decorating the floor & walls of their houses with designs & patterns. The material used is the paste of rice mixed with ochre. Thefloor of the worship room & the seat of Gods & Goddesses are decorated with specific tantrik motifs called Peeth or Yantra. A Yantra is a diagrammatic representation of the deity and consistsof linear or septal geometrical permutations of patterns considered as the plan of the terrestrial places where the deity resides.

155. For Namkaran Sanskar, the Aipan on the wooden chauki comprises motifs of sun, moon,bell etc. In the Janeu, the Aipan shows the zodiacal sign of Great bear arranged in hexagons, toinvoke the blessings of Sapta-Rishis. In marriage ceremony, the Dhuliargh Chauki bears a designof big water-jar, symbolising primordial water from which the universe emerged.

E. Environmental Settings of Investment Program Component Sites

156. Proposed Subproject components are located in the immediate surroundings of Nainital town. which is converted into urban use for many years ago, and there is no natural habitat left atthe proposed sites. Proposed STP at Russi village will be constructed on vacant Government landand hence no involuntary land acquisition of private land is anticipated for this project. Proposedsites do not have any notable sensitive environmental features with no tree cover/vegetation. None of the project components are falling within protected or forest areas and no wildlife has been reported within the proposed service area. There are no designated forests, eco-sensitive or protected areas within proposed project activity areas of Nainital sewerage project.

157. Proposed STP site is away from habitations (about 250m from the nearest household) and based on the screening conducted using the Integrated Biodiversity Assessment Tool (IBAT),it has been found that there is no Protected area within 10 km buffer from the proposed STP location at Russi Village. Due to nature of components, the existing infrastructure components donot fall under the ambit of any environmental related regulations, and therefore there is no requirement of environmental permissions or clearances. No AC pipes are there in the existing facilities which may create hazardous conditions for the workers and surrounding community. Therefore, there is no direct risks or impacts on biodiversity and natural resources

158. Site environmental features of all subproject sites and photographs are presented in the following Table 21.

Table 18: Site Environmental Features

S. No	Subproject component	Environmental Features of the Site	Photographs
1	**Sewage Treatment Plant (STP)**	The proposed 17.5 MLD STP location (co-ordinates: 29.364851^0 N, 79.448198^0 E) is near Russi village replacing the 10 (2x5) MLD old STP which are not functioning. The existing STPs were constructed at two levels and it is planned to demolish the plant units (sedimentation tanks) and construct the new STP on that part and adjoining land. Land is owned by Uttarakhand Pey Jal Nigam (UPJN). The available land is about 5.30 acres (21,446 sq.m) out of which 3.79 acres (15,350 sq.m) will be required for the new STP as per the design consideration. Peyjal Nigam vide letter number 1943/Nainital Sewer/26 dated 5th October, 2020 has provided 'no objection' to UUSDA for use of the existing oxidation plant premises in Russi village. Proposed STP site do not have any notable sensitive environmental features with no notable tree cover/vegetation. There are no protected areas, wetlands, mangroves or estuaries in or near the project location. No notable wildlife is also present. Proposed STP site is away from habitations (about 250m from the nearest household) and a natural rivulet (Bhatti-Gadhera)is at a distance of 88 m from the boundary of STP. STP layout plan is developed such that odour generating units (such as inlet/raw water sump, and sludge handling facilities) are proposed to be kept away from the nearby houses with future development potential.. There are no eco-sensitive or protected areas within proposed project activity areas. A biodiversity screening based on IBAT indicates that there is no Protected areas within 10 km of STP location at Russi village. Therefore, there is no direct risks or impacts on biodiversity and natural resources. Considering that the sludge from the SBR process is	**Proposed 18 MLD STP Location at Russi village**  

S. No	Subproject component	Environmental Features of the Site	Photographs
		composed of both inorganic and organic materials, the sludge can be used for fertilizer in agriculture land. Any remaining can be disposed to an identified landfill site, which is at Gaujajali Uttar Village in Haldwani Block in Nainital District. It is located 30 km towards South from District headquarters Nainital. (Latitude 29°125.40' N, Longitude 79°320.40' E) The process to identify the Government approved new site for landfill is underway and will be updated in next revised IEE report. An underground treated effluent storage tank of 630 Kl capacity within the STP premise. The drawing and design of this storage tank is underway and will be updated in IEE report after finalization. An existing sedimentation tank (5000 m^3) near Russi village will be used as additional storage for excess treated effluent for irrigation purposes. The STP will have a backup generator, which is an emergency diesel generator set (green generator)) as emergency power for common and essential services/ utilities. During last one year, it was observed that the land slide was occurred in the close proximity of STP in the month of October 2021 and again in September 2022. Keeping the fact of landslide in mind, the STP was moved about 20 meter toward North west direction from earlier proposed location in detailed design of STP. The geo-investigation of the proposed area is underway, the proposed STP will be constructed with following all the suggestions and remedial measures suggested by the geologist.	**Existing 5 MLD STP at Upper Level at Russi Village (Sedimentation Tank)**  **Landfill site at Gaujajali Uttar Village in Haldwani Block in Nainital District** 

S. No	Subproject component	Environmental Features of the Site	Photographs
2	**Sewer network**	Under the subproject, Total length of pipe laying under this project is 11.9 Km from which 1.7 Km (0.5 Km proposed from Children Park to Pant statue and 1.2 Km from Pant Statue to Tallital Post Office existing pipeline) along the mall road, 1.8 Km laying of rising main with 250 mm dia Ductile Iron (DI-K9) pipe from Children Park to Tallital Post office along Thandi Sadak, 1.9 Km pipe laying of trunk sewer with 450 mm dia DI-K9 pipe from Tallital post office to Hanuman Garhi, 4.4 Km pipe laying of pressure sewer with 450 mm dia DI- K9 pipe from Hanuman Garhi to Russi bypass and 2.1 Km laying (450 mm dia DI-K9 pipe) of rising main from Russi bypass to Russi STP. The open cut and trenchless methods are being adopted as the sewer alignment is along Naini Lake and the busy road, where open excavation is not possible. Small pits shall be excavated at almost every 100 meter and the pipe lying work will be executed through these pits only. This will help in reduced traffic disruptions and inconvenience to local public, shopkeepers as well as tourists. During the execution, the existing trunk of 1.2 Km will be rehabilitated from Pant Statue to Tallital Post Office. New trunk sewer will be laid in other stretches from Tallital Post Office up to the proposed STP with an alternate arrangement for the function of the existing sewer. At the time of laying of the new trunk sewer, the upstream and downstream manholes will be plugged at that stretch, isolating that particular sewer. The sewage will be bypassed (pumped) to the downstream manhole from Upstream manhole avoiding sewer line under execution. Once the connection is made, the new sewer will start functioning. The network will be of the conventional gravity collection type, conveying the sewage to discharge into inlet chamber of the new STP. The subproject proposes to construct 140 numbers in-situ RCC circular manholes along the trunk sewer network within the ROW of government roads, and Sewer house service connection up to property chambers are proposed for 600 housesDuring pipe laying works tree cutting is not envisaged as per design, however If any tree is required	 **NH High Density area**  **A view of the road from Children Park to Tallital post office (Thandi Sadak)**

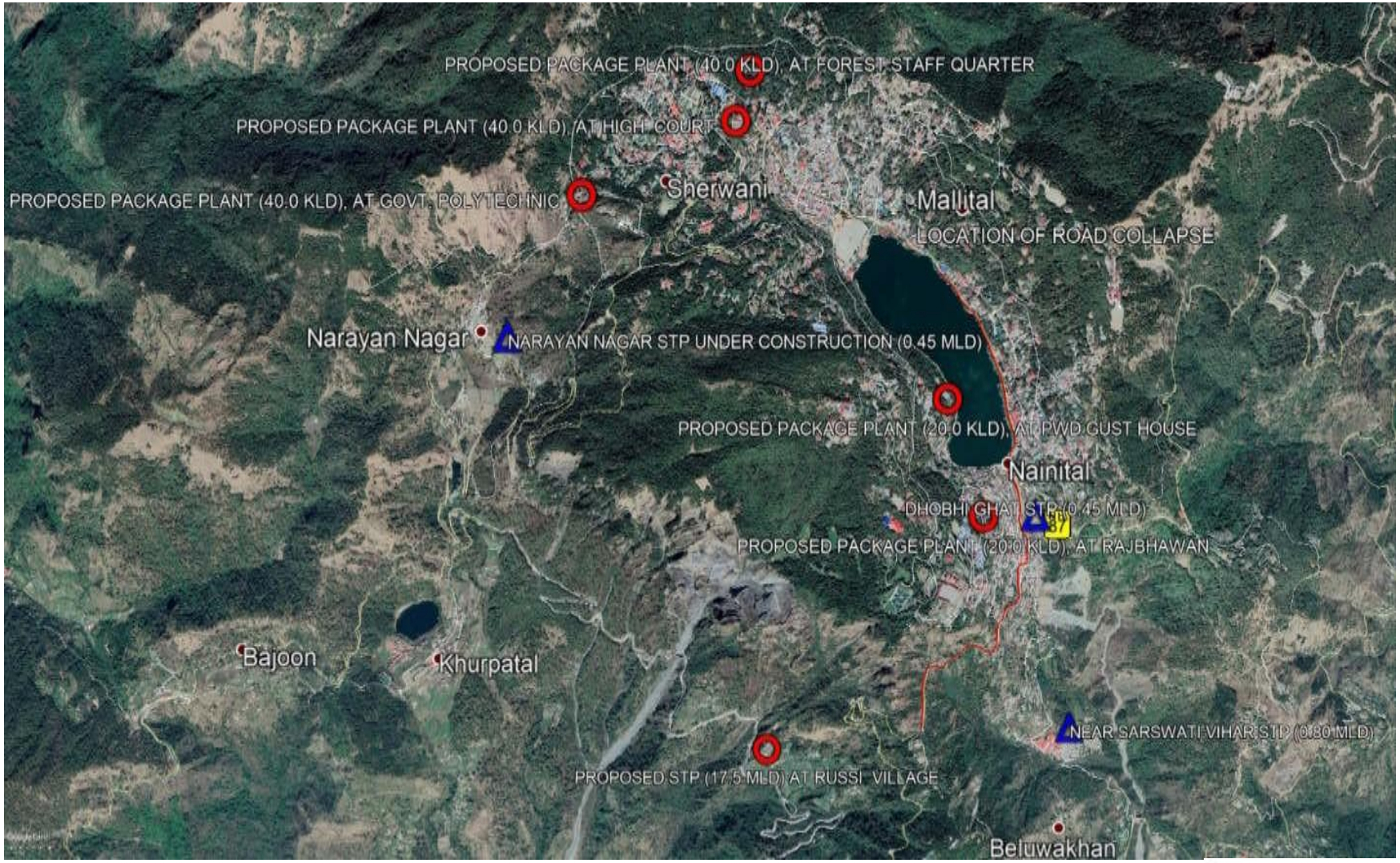
S. No	Subproject component	Environmental Features of the Site	Photographs
		to be cut, compensatory tree plantation will be carried out in 1:3 ratio as per UUSDA policy. There are no structures (either temporary or permanent) common property resources (CPRs) on the proposed pipe right of way. There are no environmentally sensitive, and archeologically protected areas in the proposed sewernetwork alignment .as per the detailed design.	
3	**Outfall sewer alignment from STP to discharge point**	The excess/surplus treated effluent after reuse shall be discharged into the nearby Bhatti-Gadhera rivulet from the STP which ultimately meets the Nihal river (a tributary of Bhakra Nadi) downstream as per guidelines and approval of the Uttarakhand Environmental Protection and Pollution Control Board (UEPPCB). The Bhatti-Gadhera rivulet passes at88 m distance from the proposed STP boundary and it travels around 3km before it meets the Nihal river. In the entire stretch upto Nihal Nadi, it is devoid of any population The Bhatti-Gadhera rivulet remains mostly dry except during rains. It has been confirmed by the UUSDA that there are no water intake points in the immediate downstream of Nihal river. River also carries the untreated wastewater from the adjacent areas. Considering the existing status of river and the degree of treatment, no significant impacts envisaged.. In order to safeguard the interest of users of treated effluent, it is proposed to apply technology/process to achieve very low BOD (BOD10) and suspended solids in the treated effluent. Proper systems should be put in place at the proposed STP to ensure that treated wastewater at all times meet the stipulated standards prior to its discharge in water bodies.	  **Pictures showing Bhatti Gadhera (rivulet)**

S. No	Subproject component	Environmental Features of the Site	Photographs
4	**Pre- fabricated Sewage Treatment Plant**	With an objective to reuse the treated sewage and reduce the fresh water requirements, five (5) packaged STPs have been proposed in the subproject. These STPs, of 20 KLD capacity each, will be installed in government buildings/ compounds which are: High Court Building Complex (40 KLD) PWD guest house (20 KLD) Forest Staff quarter (20 KLD) Polytechnic college (40 KLD) Raj Bhawan Complex (40 KLD) Land requirement for the 20 KLD STPs is 40 Sq.m. The STP shall be comprises of screening and biological aeration system, dual media, pressure sand filtration and disinfection facility. The treated water can be used for gardening and flushing. During rainy season, there will not be requirement for recycle water for gardens / parks, and hence arrangement for bypass of sewage from Packaged STP to nearbypublic sewer shall be made by gravity/pumping system. Treated sewage after chlorination from packaged STP shall be reused within complex for gardening. However, incase of emergency or major maintenance; the treated sewage can be discharged into nearby trunk sewer There are no environmentally sensitive and archeologically protected areas in the proposed STP locations.	 **Forest Staff quarter (20 KLD)**  **PWD guest house (20 KLD)**

S. No	Subproject component	Environmental Features of the Site	Photographs
5	**Existing Sewage Pumping Station**	An existing pumping satiation in children park will be utilized to pump the sewage from children park to Tallital Post office. The NOC from UJS and audit of this SPS is underway and will be updated in next revised SEMR and IEE report.	
6.	**Existing sedimentation tank of 5 MLD**	Treated effluent (partial quantity up to 10%) will be pumped to the existing sedimentation tank located at the higher elevation from the Russi village (about 600 m from STP), which will be utilized for irrigation purpose by the vegetable growing community of the village with following the prescribed standard (Refer Table 2 of Appendix 2) for irrigation purpose. The geo-coordinates of the tank are 29°22'0.17"N, 79°27'15.76"E.	 

Figure 22: Location of proposed 17.5 MLD STP at Russi Village showing distance of nearest house and discharge point from the proposed STP location

Figure 23: Google map showing location of proposed and existing Sewerage Components and alignment of proposed Trunk Sewer (Existing and Proposed) at Nainital



VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

159. Potential environmental impacts of the proposed infrastructure components are presentedin this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

160. Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

(i) **Location impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
(ii) **Design impacts** include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.
(iii) **Pre-Construction Impacts** include impacts which are anticipated during construction works but planning are required for proposed mitigation measures before start of construction works i.e. during SIP period such as taking consents from various departments, planning for construction and workers camps, deployment of safety officer, arrangement of required barricades and caution boards etc.
(iv) **Construction impacts** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
(v) **Operation and maintenance (O and M) impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

161. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent).

162. This section of the IEE reviews possible project-related impacts, in order to identify issuesrequiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks has been analyzed during pre-construction, and will be analyzed during construction, and operational stages in the context of the project's area of influence.

163. The ADB Rapid Environmental Assessment Checklists for sewerage (Appendix 1) have been used to screen the project for environmental impacts and to determine the scope of the IEE.

164. In the case of both projects (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) negative impacts associated with sewage facilities such as odour treated wastewater discharge are already considered in design / siting of facilities, (iii) most of the

predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iv) mostly being located in the built-up area of Nainital town / urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur. However, NOC is required for some identified location from concerned authority. No works are proposed in the forest areas.

B. Pre-Construction Impacts – Design and Location

1. Location impact

165. **Odour nuisance from STP.** As presented in the baseline profile, the proposed STP site is proposed away from habitation (250 m), and site is mostly vacant, and do not have any notablesensitive environmental features with no tree cover / vegetation. The proposed treatment technology, SBR, will be an aerobic process and conducted in a compact and a closed system with automated operation, Odour nuisance will be very minimal and negligible. Limited bad odors may be generated from wet well, primary treatment units and sludge treatment and smell generated can be mitigated through dense plantation around STP site. Mitigation measures to avoid smell and visual pollution shall be taken in consideration during design in Service Improvement Plan preparation period by contractor. However, to account for future development potential around the sites, and to enhance the environmental benefits following measures should be included in the STP site planning and design:

(i) There are few habitations within 300m near to the proposed STP site and the nearest household is about 250m distance. Therefore, all the precautions should be taken during construction to minimize the impacts on nearby residents. Additionally, designs should ensure that odour and air pollution from the operation of the STPs do not affect the health of the residents near the STP.
(ii) Provide a green buffer zone of 10-20 m wide all around the STP with local varieties of trees in multi-rows. This will act as a barrier and visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation.
(iii) Develop layout plan of STP such that odour generating units (such as inlet/raw water sump, and sludge handling facilities) are located away from the surrounding area with future development potential.
(iv) Odor sensitive design and standby power arrangements are suggested to safeguard the health and safety of the nearby community.
(v) If necessary, Odour modelling will be conducted during the detailed design, and any measures that may be required will be undertaken as part of the implementation. The process of odour modeling is underway and will be updated in SEMR and next revised IEE report.

166. **Social and Cultural Resources.** There are no notable or significant archeological placesor protected monuments or areas in and around project area. Therefore, no impacts envisaged but risk of uncovering archeological remains, given the long history of town, during the excavations cannot be ruled out completely. Construction contractors therefore should follow thebelow measures in conducting any excavation work:

(i) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work;

(ii) Stop work immediately to allow further investigation if any finds are suspected;
(iii) Inform local Archeological Department / Museum office if a find is suspected and take any action, they require to ensure its removal or protection in situ
(iv) Prepare a chance find protocol (sample is provided in Appendix 9).

167. **Tree cutting at project sites**. The proposed STP site at Russi village is vacant and no notable tree cover or vegetation is present, hence no trees cutting are required for construction as per the detailed design. Trunk sewer pipelines will be laid in the vacant spaces adjacent tothe roads within road right of way. In narrow roads, where there is no vacant ROW, the sewer pipeline will be buried at the middle of the road. There are no notable trees in the alignment; therefore, no tree cutting is envisaged in the preliminary design phase. Following measures needto be implemented to minimize and/or compensate for the loss of tree cover:

(i) Minimize removal of trees by adopting to site condition and with appropriate layoutdesign of STP or any other site with trees
(ii) Obtain prior permission for tree cutting at sites that may require tree cutting finalizedduring detailed design
(iii) Plant and maintain 3 trees for each tree that is felled. as per UUSDA policy

168. **Natural Hazards at Nainital:** Due to the fragile eco-system and geo-dynamic terrain, Uttarakhand State is highly vulnerable to natural disasters like earthquakes, landslides, forest fires, and cloud burst etc. Nainital town, the Lesser Himalayan famous tourist destination of Uttarakhand has been repeatedly devastated by natural hazards since 1866, while after 1841 Habitation in the same started. Tectonically active fragile mountains together with fast pace of urbanization enhanced vulnerability of the area. The rainfall is largely responsible for initiation of slope instability and landslides in the area. In the past, Nainital town has witnessed mass movements in 1866, 1867, 1880, 1893, 1898, 1924, 1989 and 1998 while recently in 2008, 2014, 2015 and 2018 (Balia Nala landslides). These inflicted heavy loss of life, infrastructure, property and geo-environment.

169. According to hazard zoning in the Vulnerability Atlas of India, **Nainital city** and adjoining region in western Himalayas is a very active seismic region of Himalayan belt, stretching from Pamir - Hindukush to Arkans. According to seismic zoning map of India, Nainital city lies in ZoneIV and falls under “very high” to “high” category earthquake zone.

170. The problem of landslide**,** subsidence and erosion of soil is common in Nainital town particularly in the periphery of the Naini Lake. This is due to a combination of several factors like geological movements, structure, lithology, water seepage, soil cover, vegetation cover, weather and climate change. Landslide and soil erosion from the adjoining hills causes heavy silt deposition in the lake.

171. The detailed Geotechnical study for slope stability and construction methodology is underway for the proposed STP site and the recommendations of this study will be strictly followed during construction work of the STP and will be updated in next revised IEE.

172. A CRVA has been conducted for the project and following recommendations has been included in the updated IEE.

(i) Training/workshop on climatic vulnerability to be conducted during the project work.
(ii) Involvement of relevant stakeholders and decision makers to be confirmed.

(iii) Conservatory approach must be followed during the construction and post construction work.
(iv) All the activities of the project to be carried out as per the prescribed standard method and these activities will definitely contribute to minimize the carbon footprint and methane emission in the concerned areas.

2. Design impacts

173. **Design of the proposed components.** The Central Public Health and Environmental Engineering Organization (CPHEEO) manual suggests a design period of 15/30 years in general while designing the systems for sewerage components. It is proposed to consider 2051 as the design year for all the components in order to maintain unanimity in the design period and design population. Accordingly, 2021 shall be the base year and 2036 the intermediate year to cross check the designs pertaining to intermediate demand. The rate of water supply has been taken as 135 LPCD for 100% population. Sewage generation is 82% of water supply (including 2% to account for infiltration). Technical design of all the elements of sewerage (STP, reuse arrangements, sewer mains including manholes and house connections, etc., follows the relevant national planning and design guidelines.

174. Proposed STP site is located close to a natural nalla (rivulet) which ultimately meets with Nihal river in the downstream. The rivulet carries treated effluent from the existing STP and with run off/waste water of the surrounding areas and flow is considerable only during rainy season. Following environmental considerations are already included in the project to avoid and/or minimize adverse impacts and enhance positive benefits:

(i) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically).
(ii) Recovering wash water from treatment process to optimize the water use
(iii) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs
(iv) Designing the entire system to maintain optimal flow and terminal pressure, and optimizing the overall energy usage
(v) Avoiding usage of asbestos containing materials
(vi) Reducing the incidence of water borne diseases by providing 100% population including urban poor with improved sanitation facility
(viii) Reuse of treated wastewater from STP for non-potable uses thereby reducing the load in freshwater resources
(ix) Adopting a comprehensive approach of sewerage system to cover a sizeable population of the project area with safe collection, conveyance and treatment of sewage generated in the town
(x) Provision of appropriate personal protection equipment to the workers and staff

175. **Use of Hazardous/Harmful substances in Wastewater Treatment.** Wastewater treatment may involve application hazardous / harmful chemicals. Measures are required to reduce the usage as well the handle if any hazardous substances safely following prevailing rules and regulations. Disinfection with chlorine is proposed at STP. There is invariably a safety risk when chlorine is handled. Safety precautions are necessary to ensure the safety of workers and citizens. Following measures are suggested:

(i) Reduce the use of chemicals in the treatment process to the extent possible

provide non-chemical alternatives or easily recoverable and/or reusable chemicals or biocompatible alternatives.

(ii) Establish proper handling / storage / application system according to the relevant standards, safety precautions and prevent accidental release / spill

(iii) Provide leak/spill detection, collection / capture and safe disposal facilities such as chlorine absorption and neutralization facility

(iv) Provide ventilation, lighting, entry and exit facilities; visible and audible alarm facilities to alert chemical/chlorine leak

(v) Facility for isolation in the event of major leakages

(vi) Eye wash and shower facility

(vii) Personal protection and safety equipment for the operators (masks, oxygen cylinders, gloves, etc.,)

(viii) Provide training to the staff in safe handling and application of chemicals, materialsafety, and standard operating procedures and emergency responses

(ix) Develop emergency response procedures.

176. **Design of Sewage Treatment Plant.** The proposed 18 MLD STP location is near Russi village where the old STPs (2x 5 MLD) exist. There is no need for terminal sewage pumping station for STP as due to huge level difference (300 m difference between Russi village and town),the raw sewage through trunk sewer will be received by gravity. It is planned to demolish the plantunits (sedimentation tanks) at lower level and construct the new STP on that part and adjoining land area. As for treatment process at STP, bidders shall propose any one of treatment process amongst: Extended Aeration (EA), Moving Bed Bio-Reactor (MBBR), Sequencing Batch Reactor(SBR) and Membrane Bio Reactor (MBR). The treatment process shall have biological nitrification, de-nitrification and phosphorous removal facility followed by disinfection by chlorine. Nevertheless, the treated effluent must meet the effluent quality standards in accordance with latest National Green Tribunal (NGT) order (Appl. no. 1069/2018, dated 30th April, 2019). As the bid is DBO type, detailed design of the STP has been carried out by the contractor to the following specific discharge standards (Table 18). With an objective to reuse the treated sewage and reduce the fresh water requirements, five (5) packaged STPs have been proposed in the subproject. These STPs, of 20/ 40 KLD capacity each, will be installed in government buildings/ compounds.

177. It is proposed to discharge the treated sewage into the Nihal river through nearby Bhatti –Gadhera rivulet within the norms prescribed by MoEF&CC/Central Pollution Control Board (CPCB) standards. It is proposed to provide disinfection for reduction of coliforms to treated sewage before discharge into nearby water body. The tolerance limits for discharge of treated sewage into inland surface water in accordance with latest National Green Tribunal (NGT) order will be followed **(**latest as per NGT order, Appl. no. 1069/2018, dated 30th April, 2019). Earlier for STPs in India, the standards notified by Ministry of Environment, Forests and Climate Change (MOEFCC) in 2017 (see column (4) in Table 15 below) were applicable. It is also to be noted that, in April 2019, the National Green Tribunal (NGT) in one of its orders directed MOEFCC to reconsider stringent standards for STPs. suggested by CPCB in 2015. The strident standards also facilitate maximum utilization of treated wastewater for reuse in various purposes.

Table 19 : Treated Wastewater Characteristics for STP Design

S. No	Parameter	Proposed Discharge Standards for STP (latest as per NGT order, Application no. 1069/2018,dated 30th April, 2019) to be as follows	MOEF&CC STP Discharge Standards, 2017	CPCB discharge standards, 2015#	IFC Guideline value for sewage discharge	WHO Guideline Value for safe use in agriculture
1	pH	5.5 – 9.0	6 – 9	6.5-9.0	6 - 9	6 – 9
3	Biochemical Oxygen Demand (BOD) (mg/l)	≤10	<30 <20 (metro cities)	<10	30	-
4	Chemical Oxygen Demand (COD) (mg/l)	≤50	-	50	125	-
5	Total Suspended Solids (TSS) (mg/l)	≤20	<100 and <50 (metro cities)	<20	50	-
6	Total Nitrogen (mg/l)	≤ 10	-	<10	10	-
7	Ammonical Nitrogen (mg/l)	<5	-	<5	-	-
8	Residual Chlorine, mg/L	≤ 1	-	-	-	-
9	Total Phosphate as P (mg/l) (for discharge into pond, lake)	≤ 1.0	-	-	2	-
10	Fecal Coliform MPN/100 ml	Desireable-100 Permissible- 230	<1000	<100	-	<1000
11	Oil and grease, mg/l		-	-	10	-
13	Nematodes, number of eggs per litre	-	-	-	-	1

MOEF&CC= Ministry of Environment, Forest and Climate Change; CPCB = Central Pollution Control Board; IFC =International Finance Corporation, the World Bank Group

in April 2019, the National Green Tribunal (NGT) in one of its orders directed MOEFCC to reconsider the standards issued in 2015 for STPs.

179. Appropriate design of STP is being adopted in the project which includes energy efficient pumps and technology suitable for treatment and disposal of sewage. Best suitable technology will be adopted for sewage treatment; hence, no design impacts will arise during proposed works. Treated wastewater Reuse / disposal. The UUSDA promotes the reuse of treated sewage for non-potable applications, and also to make sewerage projects environmentally sustainable. Government of Uttarakhand adopted the policy to ensure “improved health status of urban population, specially the poor and under privileged, through the provision of sustainable sanitation services and protection of environment”. A portion of the treated effluent shall be collected in the underground treated effluent storage tank by gravity. The treated effluent shall be used for gardening, landscaping, cleaning, car washing, and in miscellaneous maintenance purposes. Balance treated effluent will be discharged into the adjoining rivulet at a distance of 88m via existing outfall drain.

178. As a contingency measure, it requires regular monitoring of treated water quality, and emergency alerts to users in any event of deterioration of quality. As the sewerage subproject is

proposed under DBO model, the reuse plan will be prepared by the contractor during the detailed design phase in consultation with the Nagar Palika Parishad and affected stakeholders and reuse modalities will be firmed up.

179. **Reuse Options.** Following the CPHEEO guidelines (Appendix 10), the draft Guidelines on reuse provides the following reuse applications:

(i) Agriculture, horticulture, irrigation
(ii) Gardening in park
(iii) Road washing and water sprinkling to reduce fugitive dust
(iv) Industries including mining
(v) Recreational ponds and lakes
(vi) Social forestry
(vii) Construction Activities
(viii) Firefighting and other municipal uses
(ix) Flushing of manholes

180. **Use of treated wastewater for irrigation.** Use of wastewater for irrigation is associated with some health risks – from germs in wastewater, which may contaminate food and spread disease, health risk to farm workers from worms (helminths) and nematodes and chemical risk isassociated if industrial wastewater enter the sewers. If the wastewater with bacteriological contaminants are used for food crops like lettuce, tomato, which are eaten without peeling or cooking, it will present a greater health risk if precaution such as such washing with chlorinated water or storing for adequate time in normal temperature before use (at least 10 days). According to the WHO, effluent which is used to irrigate trees, industrial/commercial (not food, like cotton) and fodder crops, fruit trees, and pasture should have less than one viable nematode egg per liter. Effluent used for the irrigation of food crops, sports fields, public parks, should have and less than one viable nematode egg per liter and less than 1000 fecal coliforms per 100 milliliters. These shall be considered in the Reuse Plan that will be prepared during the detailed design and complied accordingly.

181. **Disposal of treated wastewater.** Excess or unused treated effluent will be discharged bygravity to the nearest Bhatti-Gadhera rivulet via an existing outfall drain as per norms stated by pollution control board. The excess / surplus / unused treated wastewater will be ultimately fall inthe Nihal river through the Bhatti-Gadhera rivulet. As the wastewater is treated to stringent disposal standards, no notable impacts envisaged. The river is seasonal and flow is considerable only during rainy season.

182. There are no water intakes or abstraction points in the downstream proximity of the Nihalriver. STP site is mostly barren land with some shrubs and bushes. Considering the existing statusof land, and the degree of treatment, no significant impacts envisaged. Proper systems should be put in place at the proposed STP to ensure that treated wastewater at all times meet the stipulated standards prior to its disposal in the river. Any change / lowering of treatment efficiencyduring operation may lead to poor quality of wastewater and may further pollute the surroundings. It is therefore critical that STP treats the sewage as designed. Operation and maintenance of STPand change in incoming sewage quality will have impact on the treatment efficiency. Thistherefore requires following monitoring:

(i) Obtain of consent of UEPPCB for discharge of treated wastewater into nearby drains.
(ii) Regularly monitor the treated wastewater quality at STP and ensure that it meets

thedischarge standards

(iii) Monitor water quality periodically during operation phase as per the EnvironmentalMonitoring Plan

183. **Sludge treatment and disposal.** Sewage sludge generally consists of organic matter, pathogens, metals and micro pollutants. The concentration of parameters such as metals can be influenced by input to the sewers system from industry. Since no industrial wastewater is allowed into sewers, it is unlikely that sludge contains heavy metals. Heavy metal concentration may not be ruled out completely as the chemicals used in treatment may potentially contain heavy metals, which will then leach into the sludge.

184. Subproject includes sludge management infrastructure in STP, including system for sludge collection, thickening, solar drying, and disposal at landfill/identified site. This includes a Sludge Sump to collect sludge; returning arrangement for supernatant from the sump to inlet/equalization tank for treatment; pumping sludge to sludge thickener and pumping thickened to mechanical sludge dewatering system (such as centrifuge). It also requires contractor to establish a shed where the dewatered sludge cake can be further air dried for 15 days. This is indicative sludge management system, and DBO contractor will design the system meeting these requirements.

185. The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organicfertilizer for application to the land. Adequate drying is however necessary to ensure maximum kill of enteric bacteria. To achieve adequate drying minimum drying period (15 days) shall be ensured. The drying period, which will be varying depending on the season will be determined during operation and be followed. A sludge management plan will be developed by the DBO contractor during the detailed design phase. Proper sludge handling methods should be employed. Personal Protection Equipment should be provided to the workers.

186. Contractor will propose the sludge management plan with best methods for reuse of sludge as per guidelines of CPHEEO (guidelines are attached as Appendix 10) and best international practices in consultation with PMU and Nagar Palika. Properly dried sludge can be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests shall be conducted to confirm the concentrations below the following standards. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 have been adopted here. Rules stipulate that “In order to ensure safe application of compost, the following specifications for compost quality shall be met”.

Table 20: Standards for Sludge Reuse as Manure

Standards for Composting. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 (Schedule II A, Standards for Composting) have been adopted here. According to the standards “In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:			
Parameters	**Units**	**Organic Compost (FCO 2009)**	**Phosphate Rich Organic Manure (FCO 2013)**
Arsenic	mg/kg	10	10
Cadmium	mg/	5	5

Chromium	mg/kg	50	50
Copper	mg/kg	300	300
Lead	mg/kg	100	100
Mercury	mg/kg	0.15	0.15
Nickel	mg/kg	50	50
Zinc	mg/kg	1000	1000
C/N ratio	-	<20	<20:1
pH	-	6.5 – 7.5	(1:5 solution) maximum 6.7
Moisture, percent by weight, maximum		15.0 – 25.0	25.0
Bulk density	g/cm3	<1	Less than 1.6
Total Organic Carbon, percent by weight, minimum	percent by weight	12	7.9
Total Nitrogen (as N), percent by weight, minimum	percent by weight	0.8	0.4
Total Phosphate (as P205) percent by weight, minimum	percent by weight	0.4	10.4
Total Potassium (as K20), percent by weight, minimum	percent by weight	0.4	-
Odour		Absence of foul Odor	
Particle size		minimum 90% material should pass through 4.0 mm is sieve	minimum 90% material should pass through 4.0 mm is sieve
Conductivity, not more than	dsm-1	4	8.2

** compost (final product) exceeding the above stated concentration limits shall not be used for food crops. however, it may be utilized for purposes other than growing food crops.*

FCO = Fertilizer Control Order, Department of Agriculture, Government of India

187. In order to ensure the safe use of dried sludge, following should be followed:

(i) Prepare a dried Sludge utilization plan with the help of Agriculture Department / Nagar Palika Parishad; plan should also include if any additional processing is required forsludge to use as soil conditioner

(ii) Plan should clearly various potential uses and demand in and around project areaand surroundings

(iii) Establish usage limits, where required, (geographical / crops / type of application /type of soils etc.); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations.

(iv) Any remaining can be disposed to an identified landfill site, which is at Gaujajali Uttar Village in Haldwani Block in Nainital District. It is located 24 km towards South from district headquarters Nainital. and 2 KM from Haldwani. The identification of new landfill site is underway and the same will be updated in next revised IEE
(v) Monitor sludge quality during operation phase as per the Environmental Monitoring Plan, ensure that it meets the quality parameters established by FCO
(vi) In case of sludge not meeting the quality parameters, it shall not be used as soil condition, and shall be disposed at appropriate disposal site (if it falls under hazardous category, it shall be disposed as per the Hazardous Waste Management Rules, 2016).

188. **Mixing of industrial effluent in wastewater.** One of the critical aspects in sewerage system operation is, change in raw sewage characteristics at inlet of sewage treatment plant may affect the process and output quality. STP is designed for municipal wastewater, which does not include industrial effluent. Characteristics of industrial effluent widely vary depending on the type of industry, and therefore disposal of effluent into sewers may greatly vary the inlet quality at STP and will upset process and affect the efficiency. Mixing of industrial effluent will severely deteriorate the quality of treated wastewater, and therefore the proposed reuse plan. Reuse of such water may have significant impact on public health, and on land and water. Following measures should be incorporated to safeguard the sewerage system and the intended reuse:

(i) No industrial wastewater shall be allowed to dispose into municipal sewers
(ii) As there is a risk of potential mixing of industrial waste, no domestic wastewater from industrial units shall be allowed into municipal sewers
(iii) Ensure that there is no illegal discharge through manholes or inspection chambers
(iv) Conduct public awareness programs in coordination with UEPPCB and Nainital Nagar Palika Parishad.
(v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated wastewater quality complies with the effluent standards.

189. **Sewer system – collection and conveyance.** The sewerage system is designed as a separate system of sewage collection (i.e., caters only to domestic wastewater). There is considerable length of existing/proposed surface drains in the project area that can be used for disposal of storm runoff. The underground gravity sewers will carry sewage from households to trunk sewers and further to STPs. To maximize the benefits as intended, Nainital Municipality should ensure that all existing septic tanks in areas that are being provided by sewers are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. are some of the issues that needs to be critically looked into during the sewer system design. A properly designed system is a must for system sustainability. Measures such as the following shall be included in sewer system design to ensure that the system provides the benefits as intended:

(i) Limit the sewer depth where possible
(ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);
(iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least300 mm)
(iv) In unavoidable, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided)

(v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes;
(vi) Design manhole covers to withstand anticipated loads and ensure that the coverscan be readily replaced if broken to minimize silt/garbage entry
(vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope and gas vents in gravity mains to prevent buildup of solids and hydrogen sulfide generation
(viii) Take necessary precautionary measures to protect sewer network, and to avoid disposal of solid wastes, debris, wastewater into newly laid sewers from the timeit is constructed to the start of operation phase

C. Pre-construction Impacts

190. Utilities. Telephone lines, electric poles and wires, water lines within the proposed projectlocations may require to be shifted in few cases. To mitigate the adverse impacts due to relocationof the utilities, the contractor, in collaboration with Nagar Palika will:

(i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; and
(ii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services
(iii) informing the local community in advance if utilities will be disrupted during construction; and
(iv) Require contractors to prepare spoils management plan and traffic management plan.

191. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up construction camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust and noise and to prevent social conflicts, shortages of amenities and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, swamps or in areas which will inconvenience the community. Construction sites will be selected by DBO contractor in compliance with these conditions and the same will be reflected in Site Environmental Management Plan (SEMP) which has been prepared by DBO contractor prior to start of construction and approved by PIU before start the construction. Material stockpiles will be protected by bunds during the monsoon season to prevent silt runoff into drains.The subproject is likely to generate soil from excavations, which needs to be disposed of safely. The following measures should be considered for disposal of surplus and/or waste soil:

(i) The excavated soil should be removed from construction area at the earliest forbeneficial reuse such as land raising / filling of excavated areas.
(ii) Soil should be covered with tarpaulin sheets during the transportation.
(iii) Soil transportation should not be done during the peak hours and should avoid narrowand heavy traffic routes and important religious or tourist sites

192. **Site selection of sources of materials**. Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns,ponding and water logging, and water pollution. To mitigate the potential environmental impacts,locations of quarry site/s and borrow pit/s (for loose material other than stones) would be

assessedby PIU. Priority would be sites already permitted by Mines and Geology Department. If new sitesare necessary, these would be located away from population centers, drinking water intakes andstreams, cultivable lands, and natural drainage systems; and in structurally stable areas. It will bethe construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of Department of Mines and Geology and local revenue administration. If additional quarries are required after construction is started, then the construction contractorshall use the mentioned criteria to select new quarry sites, with written approval of PIU.

D. Construction Impacts

193. The civil works for the subproject includes construction of STP plant. This work will be confined to sites, and construction will include general activities like site clearance, excavation for foundations, and creation of concrete structures will be one of the major construction activities for this project. Most such structures will be constructed from reinforced concrete (RC), where steel reinforcing rods and bars are placed and attached by hand to create an interior skeleton for the foundations, walls, columns, plinths, etc., and heavy-duty metal and timber/plywood formwork is bolted around the outside to build a mould into which pre-mixed concrete is poured. Once the concrete has set, the formwork is removed, and the concrete surface is finished by masons by hand if necessary. Some buildings, such as the pump station, facilities, etc., may be constructed from brick work, in which case this work will be done using standard house-building techniques.

194. Some components of STP may comprise a variety of prefabricated elements (in case of 5 nos packaged STPs) which will be installed on site as ready-made individual units. These will bedirectly brought from the manufacturers place to the sites lifted into position by crane, affixed to plinths or other installation points, and connected up to pipe work and the electricity supply. Sincethese works are confined to the boundary of identified sites, there is no direct or significant interference of construction work with the surrounding land use. However, construction dust, noise, use of local roads for transportation of construction material, waste, labour camps etc., will have a negative impact, which needs to be avoided or mitigated properly.

195. The subproject will install a total of around 11.9 Km from which 1.7 Km (0.5 Km proposed from Children Park to Pant statue and 1.2 Km from Pant Statue to Tallital Post Office existing pipeline) along the mall road, 1.8 Km laying of rising main with 250 mm dia Ductile Iron (DI-K9) pipe from Children Park to Tallital Post office along Thandi Sadak, 1.9 Km pipe laying of trunk sewer with 450 mm dia DI-K9 pipe from Tallital post office to Hanuman Garhi, 4.4 Km pipe laying of pressure sewer with 450 mm dia DI- K9 pipe from Hanuman Garhi to Russi bypass and 2.1 Km laying (450 mm dia DI-K9 pipe) of rising main from Russi bypass to Russi STP will be laid entirely using trenchless/open cut methods withkeeping fact of the road alongwhich sewer will be laid is mostly busy and main walking area for the residents/ tourists in mind.

196. During the execution, the existing trunk will be rehabilitated from Pant Statue to Tallital Post Office. New trunk sewer will be laid in other stretches from Tallital Post Office up to the proposed STP with an alternate arrangement for the function of the existing sewer. At the time of laying of the new trunk sewer, the upstream and downstream manholes will be plugged at that stretch, isolating that particular sewer. The sewage will be bypassed (pumped) to the downstream manhole from Upstream manhole avoiding sewer line under execution. Once the connection is made, the new sewer will start functioning. The network will be of the conventional gravity collection type, conveying the sewage to discharge into inlet chamber of the new STP. The subproject proposes to construct 140 numbers in-situ RCC circular manholes along the trunk sewer network within the ROW of government roads, and Sewer house service connection

up to property chambers are proposed for 600 houses Laying of trunk /collection sewer mains pipeline are proposed within the boundaries of RoW of government roads. No impact (either temporary or permanent) on structures and common property resources (CPRs) is envisaged. However, during laying of pipeline, due to loss of access,temporary livelihood loss to roadside vendors, Kiosks, is envisaged. In narrow roads, where thereis no vacant RoW, the pipeline will be buried within the roadway and there could be some temporary impacts in narrow roads.

197. Sufficient care will be taken while laying so that existing utilities and cables are not damaged and pipes are not thrown into the trenches or dragged, but carefully laid in the trenches. Trenches deeper than 1.5 m will be protected by shoring/bracings to avoid collapse of trenches, and also to avoid any risk to surrounding buildings. Once they are laid, pipes will be joined as per specification and then tested for any cracks of leakages. The minimum working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. Extraneous soil after backfilling of trenches shall be used for filling low lying area or stored/ dumped in approved debris disposal sites.

198. Although construction of these project components involves quite simple techniques of civil work, the invasive nature of excavation and the project locations in the built-up areas of the town where there are a variety of human activities, will result in impacts to the environment and sensitive receptors such as schools, religious places, hospitals and the community in general. Although these anticipated impacts are temporary and for short duration, require proper mitigationmeasures to limit the impacts to acceptable levels. Physical impacts will be reduced by the method of working and scheduling of work. Likely impacts of construction phase, and appropriate mitigation measures are discussed below:

199. **Sources of Materials.** Significant amount of gravel, sand, coarse aggregate, and cement will be required for this project. The construction contractor will be required to:

(i) Use material sources permitted by government only;
(ii) Verify suitability of all material sources and obtain approval of PIU; and
(iii) Submit to PIU on a monthly basis documentation of sources of materials. If contractor is purchasing ready mix concrete, asphalt/macadam and aggregates from third party, contractor will assure that all the parties/ suppliers are having CTE/CTO from UEPPCB and will collect the copy of these certificates and submit to PIU/ DSC consultants.

200. **Air Quality.** Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. These however will be temporary limiting to construction activities only. To mitigate the impacts, construction contractors will be required to:

(i) Plan the work sites properly, and demarcate the sites for stockpiling of, soils, gravel, and other construction materials away from the traffic, vehicle, general worker movement to avoid disturbance of loose materials
(ii) Damp down exposed soil and any stockpiled material on site by water sprinkling;
(iii) Use tarpaulins to cover sand and other loose material when transported by trucks;
(iv) Clean wheels and undercarriage of haul trucks prior to leaving construction site
(v) Don't allow access in the work area except workers to limit soil disturbance and prevent access by barricading and security personnel

(vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly and limit idling time of construction vehicles to 3 to 5 minutes to minimize local air pollution. contractor's vehicles and equipment should compulsorily have PUC and submit PUC to PIU before deployment at site
(vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers etc. if specifically established for this project.
(viii) If contractor is purchasing ready mix concrete, asphalt/macadam and aggregates from third party, contractor will assure that all the partier/ suppliers are having CTE/CTO from UEPPCB and will collect the copy of these certificates and submit to PIU/consultants; PIU will approve the source only after all the certificates are submitted
(ix) Conduct ambient air quality monitoring periodically as per Environmental Management Plan (EMP).

201. **Surface Water Quality: *Works during rains***. Run-off from stockpiled materials and chemical contamination from fuels and lubricants during construction works can contaminate downstream surface water quality of the streams. These potential impacts are temporary and short-term duration only. However, to ensure that these are mitigated, construction contractor will be required to:

(i) Prepare and implement a spoils management plan (Appendix 11);
(ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered bytarpaulins or plastic sheets;
(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will bedisposed, consult with PIU on designated disposal areas;
(iv) Inspect all the drainage at construction site/construction camp/labor camp etc. and clearall the drainage lines so that no water stagnation/flooding may occur during heavy rainfall
(v) As for a possible avoid trench works and excavation works (pipe laying) during monsoonseason to avoid any water logging and accident due to it
(vi) If open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc.
(vii) Inspect and verify all the emergency measures and emergency control system before startof monsoon, keep the emergency response committee on high alert during monsoon/heavy rain fall
(viii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(ix) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
(x) Dispose any wastes generated by construction activities in designated sites; and Conduct surface quality inspection according to the Environmental Management Plan (EMP).

202. **Noise and Vibration Levels.** Construction works will be conducted along the roads in urban/semi urban area, where there are houses, schools and hospitals, religious places and small-scale businesses. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads, operation of construction equipment like concrete mixers, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have impact on nearly

buildings. This impact is negative but short-term, and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
(ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
(iii) As far as possible use new construction machineries and keep all the old machineries in good and maintained state.
(iv) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor;
(v) Maintain maximum sound levels should not exceed the WHO guideline values for noise levels.

(vi) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
(vii) Consult the custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.
(viii) Conduct Noise monitoring according to the Environmental Management Plan (EMP).

203. **Landscape and Aesthetics.** Some trees may be required to cut due to which landscapeand aesthetics of those sites will be reduced. The construction works will produce excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. Haphazard disposal of these will have negative impacts on landscape and overall aesthetics. These impacts are negative but are of short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Take all the efforts to reduce numbers of tree cutting by amending design;
(ii) Compensatory plantation in the ratio of 1:3 is required to increase landscape and aesthetics of the sites where tree cutting has been done
(iii) Prepare and implement spoils management plan;
(iv) Avoid stockpiling of excess excavated soils;
(v) Coordinate with ULB for beneficial uses of excess excavated soils or immediately dispose to designated areas;
(vi) Recover used oil and lubricants and reuse or remove from the sites;
(vii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
(viii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(ix) Request PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

204. **Groundwater Quality.** Increased demand for groundwater is anticipated during the construction phase for construction activities and personal consumption by workers. Even a small project can require 100 m^3/day of water. Uncontrolled extraction of water may affect availability of water to locals. It is expected that most fill material will generally be compacted dry. The pressure

testing of pipelines will be carried out with compressed air. The testing of water retaining structures such as pumping stations, water will be used but limited to a single filling of the structure.

205. Groundwater resource evaluation by CGWB for the year 2004 has been done for only twoblocks (Ramnagar and Haldwani) in the district, which fall in the plain area. The ground water development in the entire Nainital district is very low. In the hilly tract; structural disjunctions viz. faults, joints, lineaments and fracture systems along with deeply weathered zones hold promising prospects for future groundwater development.

206. In addition, construction waste, if left unattended, will result in percolation of leachate through the soil strata reaching the groundwater table contaminating These potential impacts are temporary and short-term duration only. It is necessary that arrangement for safe drinking water is made prior to start of work. Water will be supplied for consumption only after adequate analysis and requisite treatment. The workers may also be trained on the need for judicious use of freshwater resources. The contractors will use water in consideration to its value as a resource. Mitigation measures will include:

(i) Prevent pollutants from contaminating the soil and the groundwater;
(ii) All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned;
(iii) Storage of lubricants and fuel at least 50 m from water bodies;
(iv) Storage of fuel and lubricants in double hulled tanks. Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bonded 110%;
(v) Daily control of machinery and vehicles for leakages;
(vi) Collection of waste during construction activities;
(vii) Provide uncontaminated water for dust suppression;
(viii) Enclose the construction area to prevent unauthorized access

207. **Accessibility.** Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Prepare and implement a Traffic Management Plan (Appendix 12)
(ii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(iii) Schedule transport and hauling activities during non-peak hours;
(iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
(v) Keep the site free from all unnecessary obstructions;
(vi) Drive vehicles in a considerate manner;
(vii) Coordinate with Traffic Police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
(viii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

208. Wherever road width is very narrow, there will be temporary loss of access to pedestriansand vehicular traffic (including 2-wheelers) during the laying of pipes. Under those circumstances,contractor shall adopt following measures:

(i) Inform the affected local population 1-week in advance about the work schedule
(ii) Plan and execute the work in such a way that the period of disturbance/ loss of access are minimum.
(iii) Provide pedestrian access in all the locations until normalcy is restored. Provide wooden/metal planks over the open trenches at each house to maintain the access.

209. **Trenchless Pipe Installation**. Trenchless pipe laying involves the use of horizontal direction drilling (HDD) which involves a hydraulic machinery to drill a horizontal tunnel for a new pipe, so no trenches are dug, and excavation is limited to the entry and exit points. Noise generated due to HDD may affect the neighboring communities and other sensitive receptors (such as students at schools and other educational institutes, patients at hospitals etc.) The identification of trenchless pipeline location is underway and will be updated in next revised IEE.

210. During drilling bentonite slurry may be used to cooling the drill bit, lubricating the drill bit and drill rods, increasing the stability of the borehole, etc. A part of the original bentonite slurry may be recycled and reused, while the remaining slurry may spill out to the watercourses. If the bentonite slurry is not properly collected and treated, it will contaminate the adjacent watercourse. The contractors' mitigation measures will include but not necessarily be limited to the following measures:

(i) Pipes shall be installed by the horizontal directional drilling (HDD) methods where required. If the method is not feasible for any road, the contractor shall inform the Project Manager and gain prior approval for an alternative method or for open trench method.
(ii) Excavation material shall be removed from the conduit as the work progresses. No accumulation of excavated material within the conduit will be permitted.
(iii) The contractor shall provide sediment and erosion control measures in accordance with local environmental legislation.
(iv) The contractor shall supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction. Spent drilling fluids and cuttings shall be confined to the entrance and exit pits.
(v) The contractor shall take all necessary precautions to minimize the damage to the adjacent properties. Drilling fluid/ bentonite slurry that enters the pipe shall be removed by flushing or other suitable methods. Sediment tanks of sufficient capacity constructed from pre-formed individual cells of approximately 6-8m3 capacities shall be used for settling wastewaters prior to disposal.
(vi) The contractor shall be responsible for cleanup and restoration of the site.
(vii) Pits excavated to permit connection of bored pipe shall be backfilled, and disturbed areas shall be restored to their original state or better. Sections of sidewalks, curbs, and gutters or other permanent improvements damaged during HDD operations shall be repaired or replaced at the contractor's expense.

211. **Traffic diversion and/or road closure**. Laying of sewer lines and construction of drainssimultaneously may significantly impact the traffic movement. This should be avoided as far as possible by proper planning of construction works. If traffic diversion and/or road closure is required for the proposed works, prior consent from traffic department will be required and prior information to affected areas and public should be disseminated through consultations by DSC. Proper road signage and traffic aids should be provided at site. Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems.

Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan drainage network and sewer line works to minimize traffic disturbance / blockades; as the both water and sewer lines are to be laid in all the roads and streets in the town, work planning is crucial to minimize the inconvenience to public due to repeated excavations
(ii) Prepare and implement a Traffic Management Plan (Appendix 12)
(iii) Duly consider and select sections for trenchless method of pipe laying based on traffic conditions
(iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
(v) Keep the site free from all unnecessary obstructions;
(vi) Coordinate with Traffic Police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours;
(vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.
(viii) Maintain sufficient access to houses and shopkeepers (commercial establishments) during pipe/sewer laying work through metal sheets and temporary bridges

212. **Socio-Economic – Income.** The project components will be located in government landand there is no requirement for land acquisition or any resettlement. Construction works will impede the access of residents to specific site in limited cases. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

(i) Prepare and implement spoils management plan (Appendix 11);
(ii) Leave spaces for access between mounds of soil;
(iii) Provide walkways and metal sheets where required to maintain access across forpeople and vehicles;
(iv) Increase workforce in the areas with predominantly institutions, place of worship,business establishment, hospitals, and schools;
(v) Consult businesses and institutions regarding operating hours and factoring this inwork schedules; and
(vi) Provide sign boards for pedestrians to inform nature and duration of constructionworks and contact numbers for concerns/complaints.

213. **Socio-Economic – Employment**. Manpower will be required during the 36-months construction stage. This can result in generation of temporary employment and increase in local revenue. Thus, potential impact is positive and long-term. The construction contractor will be required to employ local labour force, to the maximum extent, possible.

214. **Occupational Health and Safety**. Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

(i) Comply with all national, state and local labor laws (Appendix 6);
(ii) Following best practice health and safety guidelines: IFC's General EHS Guidelines19, WHO Interim Guidance (and its updates) on Water, Sanitation, Hygiene and Waste management for the COVID19 virus (Appendix 13), and Sector Specific (Water and Sanitation) Guidelines20;

(iii) ADB's Interim Advisory Note on Protecting the Safety and Well-Being of Workers and Communities from COVID-19 (2020) (Appendix 24)
(iv) Develop and implement site-specific occupational health and safety (OHS) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training21 for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;

[19]https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B%2BGeneral%2BEHS%2B Guidelines.pdf?MOD=AJPERES

[20]https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES

[21] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence

(v) Conduct work in confine spaces, trenches, and at height with suitable precautions and using standards and safe construction methods; do not adopt adhoc methods; all trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 6-7 m by adopting trenchless technology
(vi) Ensure that qualified first aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(vii) Provide medical insurance coverage for workers;
(viii) Secure all installations from unauthorized intrusion and accident risks;
(ix) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following:
(x) Work schedule should be adjusted to avoid peak temperature hours (12 – 3 PM)
(xi) Provide appropriate shade near the workplace; allow periodic resting and provide adequate water
(xii) Provide necessary medicine and facilities to take care of dehydration related health issues
(xiii) Provide supplies of potable drinking water;
(xiv) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
(xv) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(xvi) 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;
(xvii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(xviii) Ensure moving equipment is outfitted with audible back-up alarms;
(xix) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
(xx) Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
(xxi) Conduct regular health check-ups for workers
(xxii) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites.

215. **Occupational Health and Safety Plan due to COVID 19 Pandemic.** PMU, PIUs, Consultants and contractors to ensure that: (i) package wise details and evidences such as

but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

photographs/display board for grievance redress mechanism (GRM)/health and safety (H&S) measures taken at work sites due to COVID 19 pandemic are included in monthly monitoring report; and (ii) ensure that efficient implementation of the H&S Plan developed by the project in response to COVID-19 pandemic. Important protocols or measures in the H&S Plan are to ensure that the following are complied with at the offices and worksites of the project: (i) screening of employees and workers; (ii) record keeping of screening results; (iii) availability and use of appropriate PPEs; (iv) social distancing; (v) proper office set up reconfiguration to ensure social distancing; (vi) new office and work site meeting arrangements; (vii) regular disinfection of work areas, vehicles and equipment; and (viii) provision of adequate ventilation in indoor spaces or wearing masks, among others. PIU safeguards officer with the assistance of the safeguards experts of DSCs and Contractors EHS officers to take precautions, provide continuous induction and continue conducting regular safeguards implementation trainings including implementation monitoring of regular usage of PPEs and COVID-19 related safety measures. Key reminders for the PMU, PIUs, contractors, and workers to comply with the following occupational health and safety measures as stated in the agreed OHS Plan:

(i) Ensure project staff, consultants, contractors, and workers have in their mobile devices the Aarogya Setu App, which is a mobile application developed and recommended by the government to proactively reach out to and inform the users of the app regarding risks, best practices and relevant advisories pertaining to the containment of COVID-19;
(ii) Mandatory isolation of the personnel or workers, either asymptomatic or showing symptoms, who have had direct contact with anyone tested positive for COVID-19. Follow the isolation procedures issued by the government;
(iii) Proper disposal of used PPE following guidelines and procedures issued by the government;
(iv) Conduct daily briefing on the developments of COVID-19 in the state or country, either through emails, meetings or daily toolbox talks;
(v) When possible, allow work from home arrangement based on the nature of jobs;
(vi) If necessary, pick up and drop off facility be extended to staff (based on the distance of the staff residence from office and on availability of safe mode of transport);
(vii) Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing. Do not convene in-person meetings of more than 10 people;
(viii) If possible, conduct all meetings via conference calls. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussions;
(ix) Contractor to help its workers arrange a systematic procurement of all daily needs and groceries at worksites. This will avoid each and every worker going to shops for these daily needs;
(x) Contractor to arrange for contactless payment of wages to workers, where possible;
(xi) Allow distributed break times for workers to maintain social distancing and reduce contact;
(xii) Remind employees and workers to maintain good health by getting adequate sleep; eating a balanced and healthy diet, avoiding alcohol/smoking; and consuming plenty of fluids; and
(xiii) Remind employees and workers to extend their adherence to the H&S protocols at their respective homes. Infection may happen beyond the borders of offices and work sites.

216. **Asbestos Containing Materials.** No Asbestos containing material (ACM) is proposed tobe used in the subproject construction. There are least possibilities of presence of ACM in the existing water supply/sewerage infrastructures. Given the dangerous nature of this material for both workers and citizens, additional measure should be taken to protect the health of all parties in the event (however unlikely) that AC pipes are encountered. It is suggested not to remove the AC pipes and lay new pipes parallel to it and left AC pipes in-situ. This will remove risks of handling and disposal of AC pipes. Further, prior to start of construction works, PIU will develop a protocol to be applied in any instance that AC pipes are encountered, to ensure that appropriate action is taken. This should be based on the approach recommended by the United States EnvironmentalProtection Agency (USEPA),[22]and amongst other things, should involve:

(i) Training of all personnel (including manual labourers) to enable them to understand the dangers of AC pipes and to be able to recognize them in situ;
(ii) Reporting procedures to inform PIU immediately if AC pipes are encountered;
(iii) Development and application of a detailed H&S procedure to protect both workers and citizens. This should comply with national and international standards for dealing with asbestos, and should include: (a) removal of all persons to a safe distance; (b) usage of appropriate breathing apparatus and protective equipment by persons delegated to deal with the AC material; and (c) Procedures for the safe removal and long-term disposal of all asbestos- containing material encountered.

217. **Community Health and Safety.** Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan routes to avoid times of peak-pedestrian activities.
(ii) Liaise with PIU in identifying risk areas on route cards/maps.
(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
(iv) Provide road signs and flag persons to warn of on-going trenching activities.

218. Some parts of the project areas are characterized by narrow roads. Particularly, the areas located on slopes have very narrow roads with sharp turns and are accessible only to pedestrians.Besides impeding the access, the trench excavation and pipe laying will pose safety risks to pedestrians and the people living in these areas. The construction contractor will be required to:

(i) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily andwork shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned
(ii) All trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoidopen cutting method for trenches deeper than 6-7 m by adopting trenchless technology

[22] In the USA, standards and approaches for handling asbestos are prescribed by the Occupational Health and Safety Administration (OHSA) and the Environmental Protection Agency (EPA) and can be found at http://www.osha.gov/SLTC/asbestos

(iii) Survey the surrounding vulnerable buildings for likely issues in structural stability /differential settlement during the excavation works
(iv) Provide prior information to the local people about the nature and duration of work
(v) Conduct awareness program on safety during the construction work
(vi) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day
(vii) Provide hard barricades, and deploy security personnel to ensure safe movement ofpeople and also to prevent unnecessary entry and to avoid accidental fall into open trenches

219. Establishment and Operation of Construction Camps and Workers Facilities. It is likely that the contract may employ workers from outside project area, and therefore may provide temporary workers accommodation during the construction phase. Proper provision and maintenance of facilities is necessary for proper living conditions and avoid health, environment and safety issues. Workers camps may also adverse impacts on surrounding communities. Operation of construction camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Consult PIU before locating project offices, sheds, and construction plants;
(ii) Minimize removal of vegetation and disallow cutting of trees;
(iii) Provide drinking water, water for other uses, and sanitation facilities for employees;
(iv) Provided temporary rest and eating area at all work sites
(v) Ensure conditions of livability at work camps are maintained at the highest standardspossible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GIsheets, tarpaulins, etc., shall not be used as accommodation for workers; accommodation shall meet the IFC standards for workers accommodation[23] which include: provision of safe housing, availability of electricity, plumbing, water and sanitation, adequate fire protection and dormitory/room facilities; accommodation shall be in the range from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters(surface) per worker, a minimum ceiling height of 2.10 meters; a reasonable numberof workers are allowed to share the same room – (standards range from 2 to 8 workers); workers with accompanying families shall be provided with a proper and safe accommodation (IFC benchmark standards for workers accommodation is provided in Appendix 14).Prohibit employees from poaching wildlife and cutting of trees for firewood;
(vi) Train employees in the storage and handling of materials which can potentially causesoil contamination;
(vii) Recover used oil and lubricants and reuse or remove from the site;
(viii) Manage solid waste according to the following preference hierarchy: reuse, recyclingand disposal to designated areas;
(ix) Remove all wreckage, rubbish, or temporary structures which are no longer required;and
(x) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

[23]https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

220. **Social and Cultural Resources.** For this project, excavation will occur at locations known not to have archaeological values, so it could be that there is a low risk of such impacts. Nevertheless, the construction contractor will be required to:

(i) Follow the protocol for chance finds in any excavation work;
(ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work;
(iii) Stop work immediately to allow further investigation if any finds are suspected;
(iv) Inform local Archaeological Department / Museum office if a find is suspected; takeany action they require ensuring its removal or protection in situ.

221. **Debris disposal.** Prior to the commencement of works, contractor shall identify a debris disposal site in consultation with the PIU and DSC consultants. Contractor will follow all the prescribed rules during construction and adhering to following criteria:(including but not limited to)

(i) The site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, top-soil stripping, stacking and preservation should be undertaken prior to initiation of any activities.
(ii) Debris disposal site shall be at least 200 m away from surface water bodies.
(iii) No residential areas shall be located within 100 m downwind side of the site.
(iv) The site is minimum 250 m. away from sensitive locations like hospitals, religious places, ponds/lakes or other water bodies.
(v) The local governing body and community shall be consulted while selecting the site.

222. **Night works.** Most of the construction works shall be undertaken only during day hours. Night works are required only in the extreme conditions such as road having heavy traffic in daytime and/or no alternate access can be provided for the road users, extreme climaticconditions (extreme hot during summers), religious fairs/celebrations in daytime etc. Contractorsare required to take prior approval from PIU/consultants and concerned town authorities for night works. Contractors are required to adhere following conditions for night works including those prescribed by concerned authorities:

(i) Prepare a night work protocol and obtain prior approval from PIU, and strictly implement and report on implementation of protocol during the workers
(ii) Contractors should have handheld noise level meter for measurement of noise during night hours
(iii) Contractors should have handheld lux meter for the measurement of illumination during night hours
(iv) Preferably electrical connections are available for running equipment otherwise soundproof/super silent Diesel Generator set should be available
(v) Sound level should not increase as prescribe by CPCB
(vi) Illumination should be as follows-

Table 21 : Illumination Standards for Night Working

Minimum illumination	Areas to be illuminated	Type of work activity
54	Illumination throughout the workarea	General work area lighting, and performance of visual tasks of large size, or medium contrast, or low requireaccuracy
108	Illumination of work area and areas adjacent to equipment	Performance of visual tasks of medium size, or low to medium contrast, or medium required accuracy
216	Illumination of task	Performance of visual tasks of smallsize, or low contrast or high required accuracy or fine finish

(vii) As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site
(viii) All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime
(ix) Workers engaged in night works should have adequate rest/sleep in daytime before start of night works
(x) Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night
(xi) All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements
(xii) Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests
(xiii) Horns should not be permitted by equipment and vehicles
(xiv) Workers should not shout and create noise
(xv) First aid and emergency vehicles should be available at site
(xvi) Emergency preparedness plan should be operative during night works
(xvii) Old persons and pregnant women and women having small kids should not work in nighttime
(xviii) All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise
(xix) All the vehicles should be checked for working head lamps, tail lamps, inner lightsetc. before start of night works
(xx) PIU/DSC site engineers and contractor's safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and video graphic records as well as register the observations.
(xxi) Night works should be stopped early in the morning at least one hour before startof pedestrian/traffic movement
(xxii) After completion of night works all the site should be cleaned and maintained obstruction free for daytime movement of vehicles and pedestrians
(xxiii) Drivers and workers should be alert and responsive during night works
(xxiv) All the wages to workers working in night hours should be as per the applicablelabour acts
(xxv) Avoid any nuisance which may create problems to nearby habitants and workpeacefully during night hours
(xxvi) Night works should not be conducted near hospitals and during peak seasons suchas peak tourist season, students' exam times etc.

223. **Reinstatement of Working Areas on Completion**. The contractor will reinstate all working areas and access routes as work proceeds during construction. All plant, equipment,

materials, temporary infrastructure and vehicles will be removed at the earliest opportunity and the surface of the ground restored as near as practicable to its original condition.

E. Operation and Maintenance Impacts

224. Operation and Maintenance of the sewerage systems will be carried out by DBO contractor for 5 years and then by Nainital Nagar Palika Parishad directly or through an external operator.The sewerage system is intended to collect, convey, treat and dispose the sewage safely from the Nainital town. Operation will involve collection and conveyance of wastewater from houses toSTP; treatment of sewage at STP to meet the disposal standards; and final disposal of treated wastewater, and treatment and disposal of sludge.

225. It has to be ensured that the contractor obtains/renew the relevant consents and approvals from UEPPCB for operation of STP. Also, the treated effluent should meet the parameters as set by CPCB/UEPPCB. Contractor will also ensure compliances to all the conditions as mentioned inthe CTO.

226. Treated wastewater is proposed to be utilized in reuse applications following the Manual on Sewerage and Sewage Treatment Systems, CPHEEO, Ministry of Urban Development, Govt.of India (Appendix 10) and accordingly reuse plan will be prepared by the contractor in consultation with Nagar Palika Parishad, PMU and PIU and the affected stakeholders (local farmers) near Russi village during the detailed design phase. As stated previously, subproject will be implemented under design-build-operate (DBO) modality and the successful bidder / DBO contactor will carry out detailed designs, therefore at present the subproject is designed in outline only. The treated wastewater if utilized for reuse purposes as per the Reuse plan, there will be no negative impacts, and in fact it will enhance environmental benefits in the form of water savings. Various measures to safeguard environment and health environment in utilizing the treated wastewater, including required quality for various process will be established in the reuse plan and will be implemented accordingly. All necessary safety, mitigation and monitoring measures as suggested in the reuse plan shall be implemented.

227. The excess / unused wastewater, if any, will be finally discharged into Nihal River, (througha rivulet) which runs dry except during monsoon. It carries untreated wastewater and solid wastesfrom habitations along its course. Considering the existing status of river and the degree of treatment, no significant impacts envisaged. Proper systems should be put in place at the proposed STP to ensure that treated wastewater at all times meet the stipulated standards prior to its discharge. Operation and maintenance of STP and change in incoming sewage quality will have impact on the treatment efficiency.

228. Subproject includes sludge management infrastructure in STP, including system for sludge collection, thickening, solar drying, and disposal at landfill/identified site. This includes a sludge sump to collect sludge from aeration basins; returning arrangement for supernatant from the sump to inlet/equalization tank for treatment; pumping sludge to sludge thickener and pumping thickened to mechanical sludge dewatering system (such as centrifuge). It also requires contractor to establish a shed where the dewatered sludge cake can be further air dried for 15 days. This is indicative sludge management system, and contractor will validate design the system meeting these requirements and prepare sludge management plan. The sludge can be used for fertilizer in agriculture land. Any remaining can be disposed to an identified landfill site, which is at Gaujajali Uttar Village in Haldwani Block in Nainital District. It is located about 30 km towards South from District head quarters Nainital. and 2 KM from Haldwani. The updated IEE will include more the details of disposal site. If the sludge is managed accordingly, there will no

impacts The identification of new landfill site is underway and the same will be updated in next revised IEE.

229. STP operational procedures will be firmed up during the detailed design phase, includingthe amount of automated or manual operation. It must be ensured that the facility is operated withstandard operating procedures and only by trained staffs. Ensuring uninterrupted power supply with back-up facility is a must. Standard operating procedures and operation manual prepared by the DBO contractor will be followed . Besides routine operation, this should cover all necessaryitems such as preventive maintenance, periodic maintenance and emergency maintenance, replacement of pumps, motors, and other electro-mechanical parts as per the design life to optimize energy use and system efficiency etc., Adequate resources – technical and financial, has been taken into consideration in the project design. Manual will also include safety awarenessand mock drills for worker safety.

230. The system shall have a design life of 30 years, during which time, the system shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action, if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

231. During the operation phase, it is necessary that the facility is operated by trained staffs asper the standard operating procedures. Following measures are suggested for implementation / compliance during the operation phase:

(i) Ensure that treated wastewater meets the established discharge standards all times; conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards;
(ii) Ensure implementation of Reuse Plan, and ensure intended quality for each direct reuse
(iii) Assess composition and characteristics of sludge from the first batch operation atthe initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan
(iv) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops.
(v) Ensure valid consent to operate (CTO) from UEPPCB for operation of STP.
(vi) Ensure that all conditions/standards prescribed by UEPPCB are compiled duly
(vii) Ensure that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case of any accident and/or maintenance activity, ensure that the staff follows documented procedures only
(viii) Implement Emergency Response System (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 15.
(ix) Ensure proper knowledge transfer, hands-on training to municipal staff engaged inSTP operation has been provided by contractor prior to handover of facility;
(x) Operate and maintain the facility following standard operating procedures of operational manual;

(xi) Undertake preventive and periodic maintenance activities as required;
(xii) Conduct periodic training to workers; ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations;
(xiii) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers; monitor regularly and ensure that thereis no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with UEPPCB.

232. **Leakage and Overflows.** There are also certain environmental risks from the operation of the sewer system, most notably from leaking sewer pipes as untreated fecal material can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the operating agency establishes a procedure to routinely check the operation and integrity of the sewers, and to implement rapid and effective repairs where necessary. There is an occupation health risk to workers engaged in sewer maintenance activities. Following measuresshould inter alia be followed:

(i) As far as possible, use CCTV mechanism to detect the problems in pipelines and do not engage persons for this purpose (
(ii) As far as possible use mechanized cleaning of manholes and pipelines by using modern techniques and machines and do not engage persons for this purpose and engage persons only if mechanized cleaning is not possible in any way
(iii) Ensure that employees and line management understand the risks through proper instruction, training and supervision.
(iv) Use gas detector before entering any person inside manhole to detect anyhazardous or inflammable gas present inside the manhole.
(v) Provide suitable personal protective equipment that may include waterproof / abrasion-resistant gloves, footwear, eye and respiratory protection. Face visors are particularly effective against splashes. Equipment selection and a proper system for inspection and maintenance are important.
(vi) (Provide adequate welfare facilities, including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers.
(vii) For remote locations portable welfare facilities should be provided.
(viii) Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities.
(ix) Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive dressings.
(x) Make effective arrangements for monitoring the health of staff.
(xi) Keep emergency preparedness plan ready before start of the work on sewage system cleaning

233. **Occupational Health and Safety**. There will be risk of health of workers during operation and maintenance if repair and maintenance crews do not abide by the proper health and safety procedures and therefore they may suffer infectious diseases. The following measures will be implemented:

(i) Ensure routine vaccinations for workers for influenza, tetanus, and Hepatitis “B” (in consultation with appropriate physicians);

(ii) Install railing around all process tanks and pits. Require use of a life line and personal flotation device (PFD) when workers are inside the railing, and ensure rescue buoys and throw bags are readily available;
(iii) Use PFDs when working near waterways;
(iv) Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. Valves to process tanks should be locked to prevent accidental flooding during maintenance;
(v) Use fall protection equipment when working at heights;
(vi) Maintain work areas to minimize slipping and tripping;
(vii) Implement fire and explosion prevention measures in accordance with internationally accepted standards;
(viii) Workers must be trained to recognize potential hazards, use proper work practices and procedures, recognize adverse health effects, understand the physical signs and reactions related to exposures, and are familiar with appropriate emergency evacuation procedures. They must also be trained to select and use the appropriate PPE;
(ix) Provide all the personal protective equipment like gum boots, nose mask, gloves etc. for the protection of workers;
(x) The workplace will be equipped with fire detectors, alarm systems and fire-fighting equipment. The equipment will be periodically inspected and maintained in good working condition;
(xi) Providing adequate personnel facilities, including washing areas and areas to change clothes before and after work;
(xii) Medical check-up will be conducted on regular basis and the health conditions willbe monitored;
(xiii) First aid facilities required to attend immediately for meeting emergency situations will be made available at the facility;
(xiv) Maintain good housekeeping in waste processing and storage areas;
(xv) Conduct detailed identification and marking of all electrical connections prior to any maintenance work;
(xvi) Use specially trained personnel to demount electrical parts; (xvii) Provide safe means of access and egress from confined places, such as stairs and ladders, and safety ropes;
(xvii) Avoid operating combustion equipment for prolonged periods unless the area is actively ventilated; and
(xviii) Avoid exposure to excessive noise levels beyond permissible limits set out by local and international regulations.
(xix)

234. When installing or repairing mains adjacent to roadways, implement procedures and traffic controls, such as:

(i) Establishment of work zones so as to separate workers from traffic and from equipment as much as possible;
(ii) Reduction of allowed vehicle speeds in work zones;
(iii) Use of high-visibility safety apparel or reflectorized vests for workers in the vicinity of traffic;
(iv) For night work, provision of proper illumination for the work space, while controllingglare so as not to blind workers and passing motorists; and
(v) Locate all underground utilities before digging.

235. **Community Health and Safet**y. Neighboring community is likely to be temporarily disrupted due to mismanagement of overflows, hazardous waste and materials and odor and noise nuisance. However, public safety in respect of operational impacts is best secured throughthe prevention of unauthorized access. Operational staff will be trained in and comply with all the provisions of the UUSDA Health and Safety requirements, delineated by the contractor before handing over the plant.

(i) Develop and implement appropriate protocols to reduce risks to safety, publichealth, and environment that include well-written instructions;
(ii) Response to overflows by preventing, containing, minimizing, the overflow where it is feasible and safe to do so;
(iii) Develop a contingency plan (site-specific);
(iv) Protect components of sewage pumping stations from flood damage where it is feasible to do so (for instance, protecting components from rising flood water to enable reinstating more rapidly);
(v) Train operators on release prevention, including drills specific to hazardous materials as part of emergency preparedness response training;
(vi) Implement inspection programs to maintain the mechanical integrity and operability of pressure vessels, tanks, piping systems, relief and vent valvesystems, containment infrastructure, emergency shutdown systems, controls and pumps, and associated process equipment;
(vii) Prepare written Standard Operating Procedures (SOPs) for filling containers or equipment as well as for transfer operations by personnel trained in the safe transfer and filling of the hazardous material, and in spill prevention and response;
(viii) Transport and dispose waste residues from screens in legal and approved disposal sites;
(ix) Make available spill response equipment sufficient to handle at least initial stagesof a spill;
(x) Train and educate operational personnel on response activities in the event of spill, release, or chemical emergency; and Provide quality monitoring tests for groundwater and surface water resources adjacent to project locations.

236. **Pathogens and Vectors**. Workers and staff at wastewater and sludge treatment facilities and fields where treated wastewater or sludge is applied, as well as operators of sludge collection vehicles, can be exposed to the many pathogens contained in sewage. Processing of sewage can generate bio-aerosols which are suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity. Workersmay also be exposed to endotoxins, which are produced within a microorganism and released upon destruction of the cell and which can be carried by airborne dust particles. Vectors for sewage pathogens include insects (e.g. flies), rodents (e.g. rats) and birds (e.g. gulls). Mitigation. Recommended measures to prevent, minimize, and control exposure to pathogens and vectors include wastewater and sludge treatment, and land application. Specific mitigation measures thatwill be employed include

(i) Safety training program for workers, safe handling and personal hygiene practicesto minimize exposure to pathogens and vectors;
(ii) Use of vacuum trucks or tugs for removal of fecal sludge instead of manual methods;

(iii) Provide and require use of suitable personal protective clothing and equipment toprevent contact with wastewater (e.g., rubber gloves, aprons, boots, etc.). Provide prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective clothing and goggles to prevent contact withspray and splashes;
(iv) Provide areas for workers to shower and change clothes before leaving work and provide laundry service for work clothes. This practice also helps minimize chemical and radionuclide exposure;
(v) Encourage workers at wastewater facilities to wash hands frequently;
(vi) Provide worker immunization (e.g. for Hepatitis B and tetanus) and health monitoring, including regular physical examinations;
(vii) Reduce aerosol formation and distribution, for example by planting trees around the aeration basin to shield the area from wind and to capture the droplets and particles
(viii) Reducing aeration rate, if possible, but not to the detriment of wastewater treatment efficiency;
(ix) Avoid handling screenings by hand to prevent needle stick injuries;
(x) Maintain good housekeeping in sewage processing and storage areas; and
(xi) Advise individuals with asthma, diabetes, or suppressed immune systems not to work at wastewater treatment facilities, because of their greater risk of infection.

237. **Biological hazards** are among the environmental risks that may adversely impact the health and wellness of the workers and the community. Breakouts of diseases such as diarrhea, flu or pandemics such as the COVID19 shall be avoided. Designs and implementation of treatment systems shall ensure that disease-causing pathogens or viruses are disinfected and will not cause any health issues. The World Health Organization has released an interim guidance on Water, Sanitation, Hygiene and Waste Management for the COVID-19 virus (Appendix 13). Measures on managing wastewater and fecal waste and keeping water supplies safe is critical to avoid the start or spread of any disease.

238. **COVID-19 transmissions through fecal matter and workplace safety measures for waste water works during operation phase.** Coronavirus infections are a serious threat to health systems globally. The U.S. Center for Disease Control (CDC) says: “The virus has been detected in the feces of some patients diagnosed with COVID-19. At this time, the risk of transmission of the virus that causes COVID-19 through sewerage systems is thought to be low. Although transmission of COVID-19 through sewage may be possible, there is no evidence to date that this has occurred. Water supply and wastewater management are essential services and need to be geared up in order to prevent any interruptions due to any pandemic events like COVID-19.The detailed measures required to be adopted to ensure seamless operations during such events are given in Appendix 22.

F. Cumulative Impacts

239. Cumulative impacts are those that result from the successive, incremental, and/or combined effects of a project or activity when added to other existing, planned, and/or reasonably anticipated future ones. The subproject aims to improve sewerage systems in Nainital town by creating required new infrastructures.

240. Works will be spread over entire project area, covering all the roads and streets. Althoughno other notable public works are anticipated during the project implementation on public roads,there will be usual construction activities, such as building construction etc. Given

dry and windyweather conditions, dust generation from cumulative construction activities may be significant, and this may increase the particulate matter concentration in ambient air. Dust control measuressuggested in the EMP aim to minimize the dust generation from the subproject construction activities. Suggested trenchless method, by avoiding excavation, will also help in reducing the overall dust generation from the subproject activities. If there are any road improvement works proposed to be implemented in project area, scheduling of works needs to be coordinated with the respective road agency (ULB or National Highway / Public Works Department) so that improved roads are not subjected for excavation. There is also a need to streamline storm waterdrain development and sewer line works to avoid repeated excavations in the same road/street. The increase in road traffic, disturbance to traffic, public safety and workers safety issues, damageto existing utilities, influx of outstation workers, etc., due to various simultaneous construction works will be notable. However, the measures suggested in the EMP will minimize these impactsgreatly, and therefore effective implementation of EMP must be ensured. Thus, the net impacts are unlikely to be significant.

241. There are no large scale ongoing or proposed developments in the project area, except for the proposed subprojects under UUDP, which includes the Nainital sewerage works. Hence, cumulative impacts will arise mainly from the construction of this proposed drainage and sewerage subprojects and other minor works (if any) under UUDP. The daily activities of construction workers residing temporarily at the subproject area may also contribute to the cumulative impacts.

242. However, such cumulative impacts will be “moderate” in magnitude during the peak of construction phase. Gradually as the construction approaches completion, the magnitude of cumulative impacts will lessen to “low” magnitude. The sensitivity of the resources, natural and artificial, within the main areas of influence has been taken into account, together with the types of works involved and their intensities.

243. Proposed installation of Trunk sewer network may generate cumulative impacts. The valued components identified in this IEE are air quality, water (surface and groundwater) quality, noise, traffic management, socio-economic, ecological resources, and human health.

244. Air quality will be affected during construction. Emissions of common air contaminants andfugitive dust may increase near the construction sites but will be short term and localized. Greenhouse gas emissions may increase due to vehicle and equipment operation, disposal of excavated material, concrete production, etc. But their contribution during construction will not be very significant with the implementation of mitigation measures discussed in this IEE report.

245. Noise levels near the construction sites will increase but the duration will be short. Ground vibrations due to concrete mixers, rollers, and excavators may be annoying, and damages may occur especially to older buildings. But mitigation measures, if implemented as proposed in this IEE report, will minimize these problems.

246. Traffic management during construction will be very important. A traffic management planwill be developed in consultation with relevant local traffic management agencies to ensure that the plan will be effective. After the project construction phase is over, the traffic condition will return to normal, and the operation of the project itself will have a long-term cumulative benefit tothe people.

247. Although there will be temporary increase in the noise levels, fugitive dust, and common air emissions near the construction areas, no adverse residual effects to human health will occur

because the impacts are short-term, localized, and will not be significant with the implementation of mitigation measures discussed in this IEE report

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

248. The active participation of stakeholders including local community, NGOs/CBOs, and themedia in all stages of project preparation and implementations essential for successful implementation as well as operation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure are a must as per the ADB SPS 2009.

249. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are residents, shopkeepers and businesspeople who live and work alongside the roads in which network improvements will be provided, and government and utility agencies responsible for provision of services, Nainital Nagar Palika Parishad, Public Health Engineering Department, and Uttarakhand Pollution Control Board. Secondary stakeholder are NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, the executing and implementing agencies (UDD and UUSDA), Government of India and the ADB.

B. Public Consultation

250. The meaningful consultations[24] and disclosure program are a continuous process throughout the project implementation, including project planning, design and construction. During IEE preparation stage, public consultations were conducted near STP and other locations of proposed sewerage and drainage networks to access the awareness of general public, present sanitation situations, environmental and health conditions in town, their opinion about the proposed project and suggestions. Local residents, businesspersons (vendors, hawkers, shopkeepers etc.), Government officials, women and local residents were consulted during public consultations (January 2020 and January 2021). During the Pre-construction phase, the public consultations with local public, vendors, hawkers and shopkeepers were conducted at various places and nearby construction areas (as shown in Table 22) following COVID 19 protocols. The proposed facilities will cover the entire Nainital city. Key stakeholders were local residents and NGO's from Nanital town from Mall roadto Tallital, Upper Krishna nagar and Hanumngadhi area and are direct beneficiaries. Summary of public consultations are given in Appendix 16.

[24] ADB SPS requires meaningful consultation to be a process that (i) begins early in the project preparation stage andis carried out on as an ongoing process throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of any socio-economic and cultural etc. pressure ; (iv) is gender inclusive and responsive, and is responsive to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures,the sharing of development benefits and opportunities, and implementation issues.

1. Consultation during Project Preparation

251. Institutional consultations were conducted with the Governmental Departments such as Public Works Department, Pollution Control Board, Public Health Engineering Department and Nainital Nagar Palika Parishad. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. Consultations were held at proposed sub- project locations at Roadways stand and Upper mall road, Malla Krishnapur, Hanuman-Gadhi and at the office of Nagar Palika Parishad, by the DPR consultants. The details such as salient features oftechnical provisions in projects, proposed project implementation schedule, benefits as well as possible inconveniences and envisaged adverse impacts; environmental and social, gender inclusion, community awareness and participation, have been shared. The viewpoints of the stakeholders have been incorporated into the draft IEE report for the project. The viewpoints of the stakeholders have been incorporated into the draft IEE report for the project.

Table 22 : List of Public Consultations Held in Subproject Area

Sl. No.	Date	Location	Total participants	Female participants
1	21st Feb 2019	Nagar Palika Parishad Nainital	36	20
2.	15/02/2022	Nainital Mall road	37	0
3.	02 March 2022	Malla krishnapur	05	0
4.	03 March 2022	Roadways Bus stand	14	06
5.	03 March 2022	Tallital Dharamshala	06	02
6.	18 Nov 2022	Soliya Gaon Near Russi Village	16	03
	Total		**114**	**31**

252. Public consultation had been conducted to assess the impact of proposed civil work on the livelihood of the people, local environmental set up and also to prepare Initial Environmental Examination (IEE). The site verification reveals that, all the components of the subprojects are either located on vacant government land or along the existing right-of-way (ROW) of the city. The subproject details have been explained in detail to the people who are involved in public consultation and also asked their suggestions and willingness to complete the proposed civil work.It is observed that people shown their willingness in favour of this proposed water supply and sewerage project. They are agreed to take up house service connections. Details of public consultations are attached in Appendix 16. Points / issues raises / feedback received are listed below:

(i) Awareness and extent of the project and development components
(ii) Benefits of Project for the economic and social up-liftment of Community
(iii) Labour availability in the Project area or requirement of outside labour involvement
(iv) Local disturbances due to Project Construction Work
(v) Necessity of tree felling etc. at project sites
(vi) Water logging and drainage problem if any

(vii) Climatic Conditions
(viii) Drinking water problem
(ix) Sewerage system
(x) Forest and sensitive area nearby the project site
(xi) Movement of wild animal etc.
(xii) Pollution level during construction period specially dust and noise pollution
(xiii) Health and Hygiene
(xiv) Safety of residents during construction phase
(xv) Solid waste disposal system
(xvi) Reuse of treated effluent
(xvii) Disposal of treated effluent in natural water body
(xviii) Requirement of enhancement of other facilities.
(xix) Requirement of Storm Water drainage

253. The important feedback received from the local people during discussions on above topicsare summarized below:

(i) People are concerned about the poor sewerage and water pollution conditions and have shown happiness to know about the proposal.
(ii) It is being an urban area; there are no predominant tribal groups.
(iii) The residents of the area explained that there is no sewer system in all the proposed targeted areas. They are paying money to the private person for sewer cleaning.
(iv) The residents expressed that up gradation of the system is necessary. Moreover, regular maintenance services should be available in the area.
(v) Majority of households have access to Water supply and sewerage system through piped water supply and sewerage system from Uttarakhand Jal Sansthan and few have personal bore well installed by individual owner. But the water pressure is low.
(vi) Generally, the lower income group community is residing in Antipasti Harinagar, and other low laying areas, in Krishnapur area there are people associated with petty business and work as labour. Residents of Sher Ka Danda, Mall road are well off
(vii) Due to this project overall Environment and Sanitation system will be better. Outbreak of common water borne diseases will be less. General people will be benefited through improvement in health & hygiene of the area.
(viii) The local people felt that the consultation was useful as they came to know about the program. They requested to conduct such consultations in the future particularly prior to start of construction works and also during the construction activity.
(ix) There is not any forest, wildlife or any sensitive /unique environmental, component nearby the project area...
(x) There are no historical/cultural and religious sites in nearby the subproject area.
(xi) Solid waste collection facility is poor in this area.
(xii) It was demanded that contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise.
(xiii) In few areas small children play along the roadside. Local people demanded that the contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion.
(xiv) Care should be taken during work at rainy season as the low-lying areas and drains are submerged during rainy period.
(xv) The participants have welcomed the project and expressed that their area will develop.

(xvi) Any damage caused to the public utilities to be repaired by the DBO Contractor.

254. It was observed that people are willing to extend their cooperation as the proposed activities are proposed to enhance the infrastructure service levels and the living standard of the public. The public expressed their concern regarding the nuisance and disturbance (dust, road closure and traffic management activities) during the construction stage which can have impact on their day to day activities. Public demanded for advance notice before construction and proper warning signs along the construction area to avoid accidents and inconvenience. Public opined that an appropriate operation and maintenance system should be in place, especially for sewerage system, for its best functioning and to have the maximum health and aesthetic benefits. Details of public consultations are attached in Appendix 16.

255. Consultation with local farmers near Russi village regarding treated water reuse for irrigation purposes was also conducted.

2. Consultation during construction

256. Prior to start of construction, Nagar Palika Parishad, Nainital and PIU with the assistance of DSC 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 discussvarious environmental issues. At each ward/neighborhood level, focus group meetings will be conducted 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 project monitoring and evaluation.

257. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction and operational phases and also regarding the grievance redress mechanism. Nagar Palika Parishad, Nainital and PIU with the help of consultants will organize public meetings and will appraise the communities about the progress on the implementation of EMP. Meeting will also be organized at the potential hotspots/sensitivelocations before and during the construction. Continuous public consultation will be carried out by the PMU, PIU officials, consultants and contractors throughout the project lifecycle.

C. Information Disclosure

258. Draft IEE has already been disclosed and executive summary of IEE has been translated in the local language and made available at the office of UUSDA-UDD, Nagar Palika, PMU and PIU. Copies of summary have been provided to participants of city level workshop organized in Nainital city. Hard copies of the IEE has been made accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and executive summary in Hindi will beplaced in the official website of the ULB/UUDP/PMU after approval of the IEE by Government andADB. Stakeholders will also be made aware of grievance register and redress mechanism.

259. Public information campaigns via newspaper/radio / TV, to explain the project details to awider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to start of construction, the PIU willissue Notification on the start date of implementation in local newspapers A board showing the details of the project will be displayed at the construction site for the information of general public.

260. 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.

261. Project related information shall be disclosed through public consultation and making relevant documents available in public locations. PMU and PIUs shall provide relevant safeguards information in a timely manner, in an accessible place and in a form and languages understandable to affected person and other stakeholders. For illiterate people, other suitable communication methods like announcement will be used.

262. The following documents shall be made available at the offices of project agencies - PMU,PIU and Block level offices for public reference, and shall also be uploaded on respective websites.

(i) Summary of project and draft IEE (in Hindi and English)
(ii) Draft IEE Report (in English)
(iii) Final IEE Report (in English)
(iv) Updated/amended IEE (in English)
(v) Corrective action plan prepared during project implementation (English)
(vi) Semi-annual Environmental Monitoring Reports (English)

263. A concise summary of project and updated IEE report (in Hindi), providing all necessary details of proposals, implementation arrangements, subproject locations, likely issues and mitigation and monitoring measures and grievance redress mechanism, shall be made available to the stakeholders at consultation meetings. This should also provide contact information of project agency. This summary shall also be displayed at the notice boards of PMU, PIU and otherpublic places. During project implementation, relevant information about any major changes to project scope will be shared with beneficiaries, affected persons, vulnerable groups, and other stakeholders. The above documents will be submitted to ADB for disclosure on ADB website.

VIII. GRIEVANCE REDRESS MECHANISM

A. Project Specific Grievance Redress Mechanism

264. A project-specific grievance redress mechanism (GRM) has been established to receive, evaluate, and facilitate the resolution of Affected Persons (AP's) concerns, complaints and grievances about the social and environmental performance at the level of the project. The PMU has established Grievance Redressal Committee vide a letter no. Social/UUSDA/IEC/182 on dated 10th Feb. 2022. The GRM aims to provide a time bound and transparent mechanism to record and resolve social and environmental concerns linked to the project. The toll free number to register the complaint by the stakeholder/local public is 1800-180-4159.

265. Assessment ofthe GRM designed and implemented for Uttarakhand Urban Sector Development Investment Program (UUSDIP)[25] shows that the system was effective in timely resolution of grievances in a transparent manner.[26] The multichannel, project-specific, three-tier GRM is functional at UUSDIP,hence the design of GRM for UUSDIP[2] takes into account the proposed institutional structure forUUDP[27] and the positive features and learning's from the previous GRM.

266. **Common GRM**. A common GRM is in place for social, environmental, or any other grievances related to the project. Implementation of the resettlement plans/resettlement and indigenous peoples plans (RIPPs)/due diligence reports (DDRs)/initial environmental examination (IEEs) will follow the GRM described below. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons grievances related to the project.

267. As the construction works under the sub-project have to be carried-out in inhabited areas,therefore most of the impacts would be temporary nature and will be construction-related, and therefore it is anticipated that it may lead to some disturbance and inconvenience to local people.In order to provide a direct channel to the affected persons for approaching project authorities and have their grievance recorded and redressed in an appropriate time frame, PMU has established a Grievance Redress Mechanism, which will functional throughout the project period. The letter for Grievance Redressal Committee (GRC) is appended as Appendix 28 in this updated IEE report.

[25]The procedures followed for grievance redresss during implementation of UUSDIP Loan 1 & 2 included the project level GRM, including providing toll free number for grievance registering, Samadhan (www.samadhan.uk.gov.in), portal of Government of Uttarakhand and the Chief Minister's helpline. Complaints received through various channels were mostly minor and pertained to damage to existing water supply pipelines and disruption of water supply during construction, delays in road restoration, pending new connections and increase in Noise and dust levels Complaints related to damage to private property (compound walls/steps, etc.) were less in number. The grievances were resolved in coordination with the contractors. Complaints received were immediately referred by the CAPA/DSC supervision staff to the IPIU Nodal officer (safeguards) and concerned engineer at PIU, who advised them on further action. Follow up with the contractor on complaint resolution was undertaken by PIU Nodal officer CAPA; and DSC and final feedback sought from complainant upon resolution. Complaints requiring inter-departmental coordination were referred to the IPMU for resolution, and feedback provided to complainant. ThePMU kept regular track of grievances through WhatsApp and email also, ensuring registration and follow-up till its successful resolution.

268. A Complaint receiving system has been put in place at each site with the help of Community Awareness & Public Participation Agency (CAPPA). A Complaint Register and Complaint Formswill be made available at the site office of each contractor, with a display board indicating availability of such facility.

269. Public awareness campaigns within entire ULB/Municipal area will ensure that awarenesson grievance redress procedures is generated. The nodal officer- social/environment at field levelthrough Community Awareness & Public Participation Agency (CAPPA) will conduct ULB/Municipal area-based awareness campaigns to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements. Contractors will provide pamphlets to communities prior to start of works and billboards during construction. The pamphlets and billboards will include relevant environmental and social safeguards, GRM information, and contact details of key personnel from PIU and contractors.

270. Affected persons will have the flexibility of conveying grievances/suggestions by droppinggrievance redress/suggestion forms in complaint/suggestion boxes that will be installed by project PIUs or by e-mail, by post, or by writing in a complaints register in ULB offices/complaints registerat contractor's work site. Appendix 17 has the sample grievance registration form. Careful documentation of the name of the complainant, date of receipt of the complaint, address/contactdetails of the person, location of the problem area, and how the problem was resolved will be undertaken and feedback provided to the complainant on action/decision taken. The Safeguard and Safety Officer of town/city level PIU will have the overall responsibility for timely grievance redressal on environmental and social safeguards issues and for registration of grievances, related disclosure, with the assistance of project consultants. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and officials of PIU with assistance from Community Awareness and Public Participation Agency (CAPPA) on-site will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact numbers and names of the concerned PIU safeguard and safety officer, contractors, CAPPA and PIU personal will be posted at all construction sites at visible locations.

[6]Town-level grievance registration data at PIU level indicates that a large number of grievances were registered, pointing to the effectiveness of the multi-channel GRM. No major grievance was received for both the phases of UUSDIP . The GRM helped smoothen the process of project implementation, hence the proposed architecture for the UUDP GRM remains similar, with some refinement, taking into account the changes in institutional setup proposed for project implementation.

[27]Logistics support at field level will be key to successful management of grievance redress under UUDP. The target date for establishment of the first level (PIU level) and second level (Zonal level) of GRM is before loan negotiation.

B. Grievance Redress Process

271. Grievances of affected persons will first be brought to the attention of the Community Awareness and Public Participation Agency (CAPPA), and PIU. Grievances not redressed will be brought to the Town Level Committees (TLC) set up to monitor project implementation in each town. The TLC, acting as a grievance redress committee (GRC) is chaired by the Mayors or Chairpersons with representatives of ward members, the District Magistrate, Commissioner, Uttarakhand Peya Jal Nigam (UPJN), Uttarakhand Jal Sansthan (UJS), Public Works Department (PWD), business, and civil society. As a GRC, the TLC will meet every month (if grievances are brought to the Committee), determine the merit of each grievance, and resolve grievances withina month of receiving the complaint. This will accept complaints regarding the social safeguard issues in implementation of the project. The GRC has been formulated by PMU as per the contract and attached as Appendix 28 The grievances received and actions taken will be included into the environmental monitoring reports submitted to ADB. The following 4-stage process will be followed in grievance redress:

(i) **1st level grievance**: Complaints received (written or oral communication) will be registered in Complaint Register assigning complaint number with date of receipt The PMDSC/PIU will review the complaint and direct the Contractor for necessary action; depending on the type/nature of complaint the Contractor will be given reasonable time for corrective action; the CAPPA will inform the complainant, within 24 hours, thetime frame in which the corrective action will be taken by e-mail or telephonically; if the grievance referred will not fall under the purview of the project/program, the samewill be intimated to the complainant; Contractor will take corrective action or as directed by PMDSC; the CAPPA in coordination with PMDSC will conduct the site visit to check the action taken and its appropriateness. The action taken will be documented in the Complaint Register, and the complaint will be closed if it is satisfactorily addressed (within 7 days of receipt of compliance/grievance) and the complainant will be informed through e-mail/telephonically.
(ii) **2nd level grievance:** In case of no satisfactory action in Level-1, the complainant can approach PMU/DSC for necessary action; CAPPA will assist the complainant in doingso. PMU with the assistance of DSC will initiate action and take the corrective measures as required, and CAPPA will intimate the complainant about the action taken; and Upon satisfaction of complainant, the case will be closed and marked as resolved within 15 days of receipt of compliance/grievance.
(iii) **3rd level grievance: if** complainant would be non-satisfied with the action made or due to noncompliance of grievance at Level 2, the complainant can approach the Grievance Redress Committee (maximum 7 days).

272. **Court of Law.** The complainant can approach Court of Law. However, as none of the impacts are complex, long-term or significant in nature, it is unlikely that there will be any unresolved issues after the first three stage.

273. **Grievance Redress Committee**. The Town Level Committee (TLC) will act as a grievance redress committee (GRC)28 for both social safeguard & environment issues. The TLC

[28]It is suggested for each PIU to have a dedicated WhatsApp group for registration of grievances and receipt of quick

would be chaired by Mayor of Dehradun Municipal Corporation and will have the member from civil society, elected representatives and government officials. Grievances related to Social and environmental safeguards will be handling by TLC29 in its regular meetings. The PMU Social Development and Gender Officer (SCGO) and Environment Specialist and CAPPA will assist the TLC in facilitating in smooth functioning of GRM.

274. The PMU will submit RP/EMP/SEMP implementation report to ADB's review, and will ensure that affected persons will receive compensation and other assistances as per EM prior to commencement of civil works. The issues relating to environment will be redressed as per the guidance provided in EMP/SEMP

275. The project GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM. In case of grievance relatedto land acquisition, resettlement and rehabilitation, the affected persons will have to approach a legal body/court specially proposed under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARRA[30]), 2013.

276. **ADB's Accountability Mechanism.** The People who may /are in future being, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make an effort ingood faith to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach ADB accountability mechanism.

277. **Record-keeping**. The town/city level PIU will both keep records of grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were affected and final outcome. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PMU office, PIU offices, and on the web, as well as reported in monitoring reports submitted to ADB ona semi-annual basis.

278. **Periodic review and documentation of lessons learned**. The PMU project officers (Social and community development officer and Environmental Specialist will periodically review the GRM functioning at PIU/PMDSC/Construction Contractor level and record information on the effectiveness of the mechanism, especially on the project's ability to transparently prevent and address the reported grievances.

279. **Costs.** As part of the EMP cost the construction contractors will be allocating budget for pamphlets and billboards as per requirement All costs involved in resolving the complaints

feedback, to be followed by more formal communication. And Project contractors in all project towns will have a toll-free number with specific working hours for registration of grievances related to UUDP.

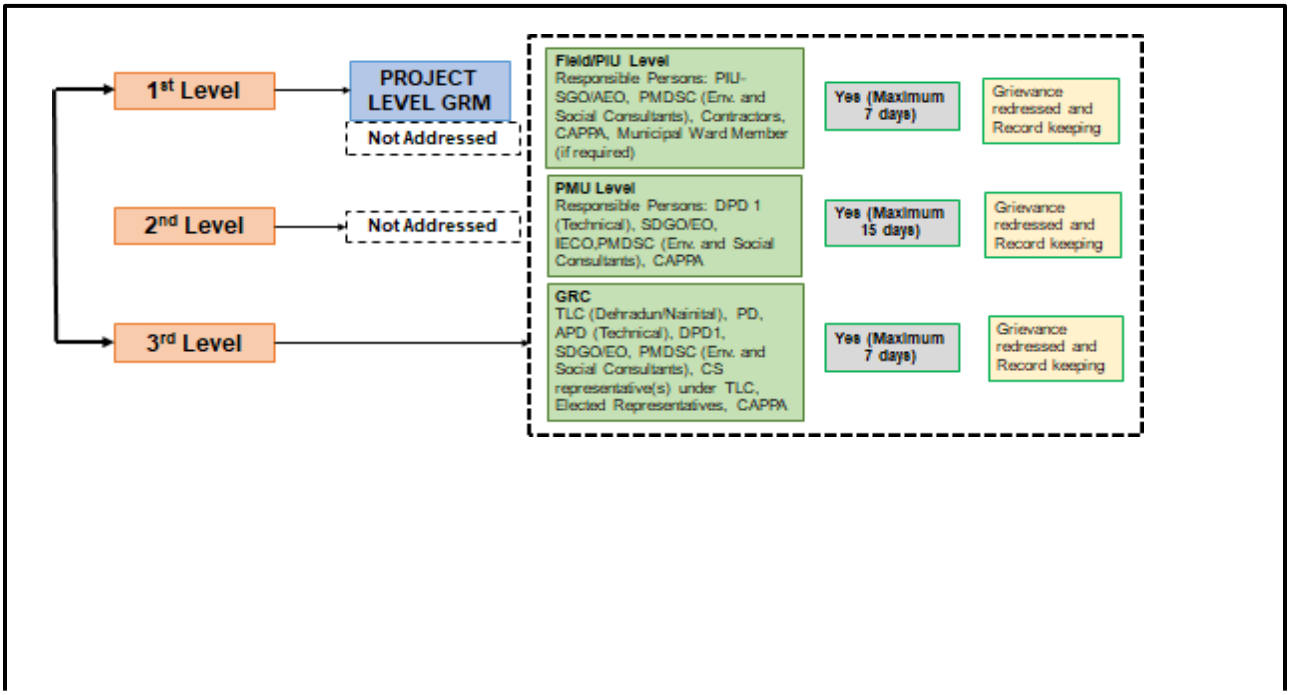
[29]The TLC has been formed at each of the targeted town/city level for planning and monitoring of work, resolve issues related to departmental coordination etc. It is headed by Commissioner /Executive Officer ULB(Chairman) and Executive Engineer of UJS/UJN, public works department (PWD) and head of PIU acting as Member Secretary.

[30] Ministry of Law and Justice. The Act has received the assent of the President on the 26 September 2013

[31]Accountability Mechanism. http://www.adb.org/Accountability-Mechanism/default.asp.

(meetings, consultations, communication and reporting/information dissemination) will be borne by the concerned PIU at town level while costs related to escalated grievances will be met by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

Figure 26: Grievance Redress Process for UIRUDP



AEO = Assistant Environmental Officer; APD = Additional Program Director; CAPPA = Community Awareness and Public Participation Agency; CS = Civil Society DBO = Design Build and Operate Contractor; DPD = Deputy Program Director; EO = Environmental Officer; IECO = Information Education and Communication Officer; PD = Program Director; PIU = Project Implementation Unit; PMDSC = Project Management, Design & Construction Supervision Consultant; PMU = Project Management Unit; SDGO = Social Development and Gender Officer, SGO = Social and Gender Officer; TLC = Town Level Committee

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

280. An Environmental Management Plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable level and monitoring the same. This is presented in the following tables (tables 18 to 23), which show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

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

282. A copy of the EMP must be kept at work sites at all times. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

283. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate budget for compliance with these EMP measures, requirements and actions.

284. The contractor will be required to submit to PIU, for review and approval, a site-specific environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program as per SEMP and (iv) budget for SEMP implementation. No works can commence prior to approval of SEMP.

285. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on and off sites, document checks, and interviews with workers and beneficiaries.

286. The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

Table 23 : Design Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Location impacts of proposed components	Nearby community may be affected due to increased pollution during construction and operation	Adequate pollution control measures to be adopted during construction so that nearby community may have no or minimum impact due to proposed works	DBO Contractor / PIU	Project cost
Sewage Treatment Plant (STP)	Odour nuisance and aesthetics	(i) Provide a green buffer zone of 10-20 m wide all around the STP with trees in multi-rows. This will act as a visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation. (ii) Develop layout plan of STP such that odour generating units (such as sludge / solids handling facilities) are located away from the surrounding area with future development potential.	DBO Contractor / PIU	Project cost
All work sites	Physical cultural resources and chance finds	(i) Ensure that worksites are not located in archeologically sensitive areas; liaise and reconfirm with local Archaeological Department during detailed design phase; (ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work; (iii) Stop work immediately to allow further investigation if any finds are suspected; (iv) Inform local Archeological Department / Museum office if a find is suspected and take any action, they require to ensure its removal or protection in situ.	DBO Contractor / PIU	Project costs
Tree cutting	Tree cutting may result loss of aesthetics and increase in air pollution	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of STP or any other site with trees (ii) Obtain prior permission for tree cutting at STP site or at any other site that may require tree cutting finalized during detailed design (iii) Plant and maintain 3 trees for each tree that is removed	DBO Contractor / PIU	Project cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Site preparation	Removal of solid waste and other nuisance materials	(i) Ensure that the project sites are cleared of solid waste or other nuisance materials (ii) Dispose solid waste from existing sites and materials into designated locations (dumping in vacant lot is not allowed). Appendix 11 provides the documentation for the Materials Recovery Facility and the Checklist for Solid Waste Management Transport	DBO Contractor / PIU	Project costs
Design sewerage system	Non-compliance or non-adherence with the environmental considerations proposed in preliminary designs during detailed design:	Ensure compliance with the following during the detailed design: (i) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically). (iii) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs (v) Designing the entire system to maintain optimal flow and terminal pressure, and optimizing the overall energy usage. (vi) Avoiding usage of asbestos containing materials (vii) Reducing the incidence of water borne diseases (viii) Reuse of treated wastewater from STP for non-potable uses thereby reducing the load in freshwater resources. (x) Provision of appropriate personal protection equipment to the workers and staff	DBO- Contractor / PMU	Project costs
Seismic sensitivity	Damage to infrastructure and potential risks: project area in Severe earthquake risk zone (Zone V)	(i) Designs of project component structures shall comply with relevant codes of design such as Bureau of Indian Standard (BIS) specifications for earthquake resistant design (IS: 1893: Criteria for earthquake resistant design of structures).	DBO Contractor/PIU	Project costs
Landslide	Damage to infrastructure and potential risks: Project area in landslide prone area	Ensure compliance with the following during the detailed design (i) Avoid the area where landslide occurred (ii) Construct the retaining wall as per requirement (iii) Geotechnical investigation for slope stability in the area will be done and incorporated into final design of STP. (iv) The plantation should be done with the soil bounding species. (v) Drainage system should be proper in the concerned area.	DBO Contractor	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Groundwater source	Groundwater contamination	(i) Prepare a source protection plan for tube wells andopen wells (ii) Prevent flow of untreated wastewater in the drains (iii) Ensure proper construction of tube wells including casing pipes to prevent water contamination from well spaces, and due to flooding (iv) Measures should be taken to control the open defecation, and to close all unsafe latrines (for example pit latrines). (v) Awareness programs shall be conducted regardingthe sanitation practices and its effect on groundwater quality	DBO Contractor and ULB/PIU	Project costs and ULB costs
Sewage Treatment Plant (STP)	Hazardous / harmful chemicals	(i) Reduce the use of chemicals in the treatment process to the extent possible; provide non-chemical alternatives or easily recoverable and/or reusable chemicals or biocompatible alternatives. (ii) Establish proper handling / storage / application system according to the relevant standards, safety precautions and prevent accidental release / spill (iii) Provide leak/spill detection, collection / capture and safe disposal facilities such as chlorine absorption and neutralization facility (iv) Provide ventilation, lighting, entry and exit facilities; visible and audible alarm facilities to alert chemical/chlorine leak (v) Facility for isolation in the event of major leakages (vi) Eye wash and shower facility (vii) Personal protection and safety equipment for the operators (masks, oxygen cylinders, gloves, etc.,) (viii) Provide training to the staff in safe handling and application of chemicals, material safety, and standard operating procedures and emergency responses Develop emergency response procedures	DBO Contractor/PIU	Projectcost
Design of STP and sewerage system	Potential risks from natural hazards including severe climate change impacts suchas flooding	(ix) ADB's Guidelines for Climate Proofing Investment in the Water Sector: Water Supply and Sanitation[32] will be followed	DBO Contractor/PMU	Projectcost

<table>
<tr><th>Field</th><th>Anticipated Impact</th><th>Mitigation Measures</th><th>Responsible for Implementation/ Monitoring</th><th>Cost and Source of Funds</th></tr>
<tr><td>Sewage Treatment Plant (STP)</td><td>Inefficient sewage treatment, treated effluent characteristics not satisfying the CPCB/UEPPCB standards</td><td>(i) Ensure that the selected process in appropriate for the town and meets discharge standards and facilitate reuse Treated effluent should meet the criteria set by UEPPCB/CPCB or the following bid specified parameters, whichever are stringent:
<table>
<tr><th>Sl. No.</th><th>Parameters</th><th>Parameters Limit</th></tr>
<tr><td>1</td><td>pH</td><td>5.5-9.0</td></tr>
<tr><td>2</td><td>BOD (mg/l)</td><td>Not more than 10 mg/l</td></tr>
<tr><td>3</td><td>COD (mg/l)</td><td>Not more than 50 mg/l</td></tr>
<tr><td>4</td><td>TSS (mg/l)</td><td>Not more than 20 mg/l</td></tr>
<tr><td>5</td><td>P-Total (mg/l)- for discharge into Ponds/lakes</td><td>Not more than 1.0 mg/l</td></tr>
<tr><td>6</td><td>N-Total (mg/l)</td><td>Not more than 10 mg/l</td></tr>
<tr><td>7</td><td>Fecal Coliform (MPN/100ml)</td><td>Desirable- Less than 100 MPN/100ml
Permissible-230 MPN/100ml</td></tr>
</table></td><td>DBO Contractor / PIU</td><td>Projectcost</td></tr>
<tr><td>Change in raw sewage quality</td><td>Mixing of industrial effluent with sewage</td><td>(i) No industrial wastewater shall be allowed to dispose into municipal sewers
(ii) As there is a risk of potential mixing of industrial waste, no domestic wastewater from industrial units shall be allowed into municipal sewers
(iii) Ensure that there is no illegal discharge through manholes or inspection chambers
(iv) Conduct public awareness programs; in coordination with UEPPCB and CLC.
, (v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated wastewater quality complies with the effluent standards</td><td>DBO Contractor and PIU / PMU</td><td>Project Cost</td></tr>
<tr><td>Sewage Treatment Plant (STP)</td><td>Use of treated wastewater for reuse applications</td><td>Develop wastewater reuse plan in consultation with CLC as per the Sewerage and Wastewater Policy, 2016. The Reuse Plan shall inter alia include the following:
(i) Identify potential reuse application within Nainital municipality limits and its surroundings, and establish quality criteria for each of the use
(ii) For applications that use treated wastewater directly (e.g., agriculture), the quality required for such application in safe manner considering health, environment and crop yield concerns shall be ensured.
)Carryout regular / online monitoring of critical quality parameters of treated wastewater to ensure that they meet the preset standards established for reuse</td><td>DBO Contractor / PIU</td><td>Project cost</td></tr>
</table>

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		vi) Conduct meaningful consultations with local farmers near Russi village regarding the treated water reuse plan (i.e., use of excess treated effluent for irrigation purposes)		
STP	Treated effluent discharge into water channel/drains/rivers and associated impacts on river water and downstream users	(i) Obtain of consent of UEPPCB for discharge of treated wastewater into drains (ii) Conduct a baseline water quality assessment of receiving water body (iii) Regularly monitor the treated wastewater quality at STP and ensure that it meets the discharge standards Monitor water quality periodically during operation phase as per the Environmental MonitoringPlan	DBO Contractor/PIU	ProjectCost
STP	Sludge management and reuse	(i) Prepare a sludge management plan (ii) Prepare a dried Sludge utilization plan within Nainital municipality limits and its surroundings, with the help of Agriculture Department / CLC; plan should also include if any additional processing is required for sludge to use as soil conditioner (iii) Plan should clearly various potential uses and demand Nainital municipality limits and surroundings (iv) Establish usage limits, where required, (geographical / crops / type of application / type of soils etc.,); adopt International good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations. Identify a landfill / suitable site for disposal of surplus dried sludge (vi) Monitor sludge quality during operation phase as per the Environmental Monitoring Plan, ensure that it meets the quality parameters established by FCO (vii) In case of sludge not meeting the quality parameters, it shall not be used as soil condition, and shall be disposed at appropriate disposal site (if it falls under hazardous category, it shall be disposed as per the Hazardous Waste Management Rules, 2016)	DBO Contractor/PIU	Projectcost
STP	Handling and disposal of accumulated waste at identified STP site	(i) Prepare a waste handling and management plan for the work, considering handling, disposal and occupational and public health safety (ii) Assess the working conditions, develop appropriate working method, and work shall be only conducted under continuous supervision of EHS supervisor	DBO Contractor/PIU	Projectcost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(iii) Waste shall not be handled manually; use appropriate equipment (iv) All workers shall be provided with necessary personal protection equipment, including gloves, boots, face / gas masks and oxygen cylinders in handy for emergency use etc.; if gas emission is suspected at any point of time, workers shall use gas masks with oxygen cylinders (v) Inform surrounding public about the work (vi) Fire control and safety equipment shall be provided at the work site (viii) Waste shall be properly covered during transport (viii) Manage the solid waste as per the Solid Waste Management Rules, 2016		
Sewer network – collection and conveyance	Poor design leading to overflows, blockages, and creating nuisance, pollution	(i) Limit the sewer depth where possible (ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible); (iv) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm) In unavoidable, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided) (v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes; (vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry (vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope and gas vents in gravity mains to prevent buildup of solids and hydrogen sulfide generation Take necessary precautionary measures to protect sewer network, and to avoid disposal of solid wastes, debris, wastewater into newly laid sewers fromthe time it is constructed to the start of operation phase	DBO Contractor/PIU	Projectcost
Package STP	Use of treated wastewater for reuse applications	(i) The STP shall be comprises of screening and biological aeration system, dual media, pressure sand filtration and disinfection facility. (ii) . Treated sewage after chlorination from packaged STP shall be reused within complex for gardening During rainy season, there will not be requirement for	DBO Contractor/PIU	Projectcost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		recycle water for gardens / parks, and hence arrangement for bypass of sewage from Packaged STP to nearby public sewer shall be made by gravity/pumping system		
Preparation of plans and protocols	Various impacts	(i) Preparation of Asbestos Cement Management (ACM) Management Plan (ii) Prepare traffic management plan (iii) Prepare occupational health and safety plan Prepare spoils management plan	DBO Contractor and DSC (for ACMplan, if any)	Approval of plans by PIU

[32] Guidelines for Climate Proofing Investment in the Water Sector: Water Supply and Sanitation (adb.org)

Table 29 : Environmental Management Plan of Anticipated Impacts during Pre-Construction

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds	Compliance Status
Environmental monitoring of baseline conditions of air, noise, water and soil	To establish base line environmental conditions	Environmental monitoring through NABL accredited laboratory	Construction contractor	Consultants / PIU	Contractor	Baseline Environmental monitoring has done and results mentioned in this IEE
Legal compliance	Environmental legal noncompliance may attract legal actions. Failure to obtain necessary consents Permits, NOCs etc. can result to design revisions and /or stoppage of works	(i) Obtain all consents, clearances (CTE/CTO from UEPPCB), permits NOCs etc. before start of construction works Ensure that all necessary approvals for construction tobe obtained by contractor are in place before start of construction (ii) Following consents are required- Tree cutting-local authority Storage, handling and transport of hazardous materials- UEPPCB Sand mining, quarries, borrow areas- Department of mines and Geology Traffic diversion/road cutting- local authority, traffic police (iii)Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs etc. (iv)Include in detailed design drawings and	PIU/Consultants in coordination of Nagar Palika Parishad	PMU	Cost of obtaining all consents, permits, clearance, NOCs etc. prior to start of civil works responsibility of PIU.	CTE is obtained and appended as appendix 30

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds	Compliance status
		documents all conditions and provisions; if necessary				
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(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 to include actions to be taken in case of unintentional interruption of services. (iii) inform the local community in advance if utilities will be disrupted during construction). (iv) Require contractors to prepare spoils management plan (Appendix 11) and traffic management plan (Appendix 12)	DBO Contractor in collaboration with PIU and with approval of PMU	(i) List of affected utilities and operators; (ii) Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is morethan 24 hours), spoil management plan (Appendix 11), and traffic management plan (Appendix 12)	Project Cost	Will be complied
Social and Cultural Resources	Ground disturbance can uncover and damage archaeological and historical remains	Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized, and measures are taken to	DBO Contractor and PIU	Chance Finds Protocol	No cost required. Mitigation measures are part of TOR of PIU and Consultant	Resettlement Plan has been updated

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds	Compliance Status
		ensure they are protected and conserved.				
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located	Contractor to finalize locations in consultation and approval of PIU	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas. (ii) Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms	Being Complied - Construction camp details given in SEMP

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds	Cpmpliance status
		within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or otherwater bodies.				
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Prioritize sites already permitted by the Department of Mines and Geology (ii) If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of PMU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PIU.	DBO Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms	will be complied as suggested
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to award of civil works. Following consents are required- Tree cutting- local authority Storage, handling and transport of hazardous materials- UEPPCB	DBO-Hybrid Contractor and PIU and Consultant	Incorporated in final design and communicated to contractors.	No cost required. Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works responsibility of PIU. Mitigation	All required permissions will be obtained before start of any construction work.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds	Compliance status
		Sand mining, quarries, borrow areas- Department of mines and Geology Traffic diversion/road cutting- local authority, traffic police (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. (iv) Include in detailed design drawings and documents all conditions and provisions if necessary			measures are part of TOR of PIU and Consultant	
Updating of IEE and SEMP	Expecting minor impacts, during construction period only and mitigation measures are addressed.	(i) Update IEE based on detailed designs, and submits to ADB for review, approval, and disclosure prior to commencement of work. (ii) Formulate SEMP during implementation and get approval from the PD. (iii) Relevant information shall be disclosed.	PIU and Consultant	PMU	No costs required	IEE updated for sewer networks and STP and SEMP also submitted to PMU
EMP Implementation Training	Irreversible impact to the environment,	Project manager and all key workers of	Contractor, DSC	PIU/PMU	Contractor, Project cost	The EMP orientatio trainings have bee conducted for PM and PIU an contractor staff

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds	Compliance status
	workers, and community.	contractors will be required to undergo EMP implementation training including spoils management, Standard operating procedures (SOP) for construction works; health and safety (H&S), core labor laws, applicable environmental laws etc.				

Table 30 : Environmental Management Plan of Anticipated Impacts during Construction

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
EMP Implementation	Irreversible impact to the environment, workers, and community	(i) Contractor is required to depute a qualified and experienced EHS officer/supervisor for monitoring of EMP implementation measures (ii) Project manager and all key workers will be required to undergo EMP implementation including spoils management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH&S), core labor laws, applicable environmental laws, etc. Refer Appendix 6 for Ambient Air, Noise, Water and Spoil management Plan.	Construction Contractor	(i) Certificate of Completion (Safeguards Compliance Orientation) (ii) Posting of Certification of Completion at worksites (iii) Posting of EMP at worksites	Cost of EMP Implementation Orientation Training to contractor is responsibility of PMU. Other costs responsibility of contractor.
Air Quality	Emissions from construction vehicles, equipment, and machinery used for installation of pipelines resulting to	(i) Plan the work sites properly, and demarcate the sites for stockpiling of, soils, gravel, and other construction materials away from the traffic, vehicle, general worker movement to avoid disturbance of loose materials (ii) Damp down exposed soil and any stockpiled material on site by water sprinkling; (iii) Use tarpaulins to cover sand and other loose material when transported by trucks; (iv) Clean wheels and undercarriage of haul trucks prior to leaving construction site (v) Don't allow access in the work area except workers to	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices; (iv) Certification	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
s	dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.	limit soil disturbance and prevent access by barricading and security personnel (vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly, and limit idling time of construction vehicles to 3 to 5 minutes to minimize local air pollution contractor's vehicles and equipment should compulsorily have PUC and submit to PIU before deployment at site (vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers etc. if specifically established for this project. (viii) If contractor procures any material (such as ready mix concrete, asphalt/macadam, aggregates etc.,) from third party agencies, contractor shall ensure that such agencies have all necessary clearances / permissions as required under the law; these include CTE/CTO from UEPPCB, environmental clearance, etc.,; contractor shall collect the copy of these certificates and submit to PIU; PIU will approve the source only after all the certificates are submitted (ix) Conduct air quality monitoring according to the Environmental Management Plan (EMP).		that vehicles are compliant with Air Act (v) Reports of air quality monitoring	
Surface water quality	Works in rains/ Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during installation of pipelines can contaminate nearby surface water quality.	(i) Prepare and implement a spoils management plan (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas; (iv) Inspect all the drainage at construction site/construction camp/labor camp etc. and clear all the drainage lines so that no water stagnation/flooding may occur during heavy rainfall (v) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (vi) If open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along trenches leading to water bodies; (iii) Records of surface water quality inspection; (iv)Effectiveness of water	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. (vii) Inspect and verify all the emergency measures and emergency control system before start of monsoon, keep the emergency response committee on high alert during monsoon/heavy rain fall (ix) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (x) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (xi) Dispose any wastes generated by construction activities in designated sites; and (xii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).		management measures; (v) No visible degradation to nearby drainages, nallahs or water bodies due to civil works	
Ground Water Quality	Contamination of ground water quality due to spillage of oil and lubricants	• Prepare and implement a spills management plan; • Provide impermeable liner on the ground and place layer of mortar or concrete over it in the oil and lubricants storage areas, provide spillage trap in oil and lubricant store, use dip tray and pump to pour oil from oil and lubricant drums; • Dispose any oil contaminated wastes generated by construction activities in scientific manner; and • Conduct ground water quality monitoring according to the Environmental Management Plan (EMP).	Contractor	(i) Areas for storage of fuels and lubricants and waste materials; (ii) Number of oil traps installed in oil and lubricant storage areas; (iii) Records of ground water quality monitoring;	Cost for implementation of mitigation measures responsibility of contractor.
Noise and Vibration Levels	Increase in noise level due to earth-moving and excavation equipment, and the	(i) Plan activities in consultation with PIU/Consultant so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise-producing equipment and	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	transportation of equipment, materials, and people	vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and (iv) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. (v) Maximum sound levels should not exceed the WHO guideline for noise levels. (vi) Periodical monitoring of noise quality as per EMP		sound barriers; (iii) Equivalent day and night time noise levels (see Appendix 3 of this IEE)	
Landscape and aesthetics	Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items.	(i) Prepare and implement spoils management plan (Appendix 11); (ii) Avoid stockpiling of excess excavated soils; (iii) Coordinate with ULB/PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas; (iv) Recover used oil and lubricants and reuse or remove from the sites; (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (vi) Remove all wreckage, rubbish, or temporary structures which are no longer required; and (vii) Request PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work. (vii)	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel (iii) Worksite clear of any excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers	Cost for implementation of mitigation measures responsibility of contractor.
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	(i) Obtain from PIU the list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service (iii) Inform the local community in advance if utilities will be disrupted during construction	Construction Contractor	Existing Utilities Contingency Plan	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Ecological Resources – Terrestrial	Loss of vegetation and tree cover	(i) Minimize removal of vegetation and disallow cutting of trees; (ii) If tree-removal will be required, obtain tree-cutting permit from the concerned department; and (iii) Plant three native trees for every one that is removed.	Construction Contractor	PIU to report in writing the no of trees cut and planted.	Cost for implementation of mitigation measures responsibility of contractor.
Ecological Resources – Faunal	Hunting, fishing or harm to animals within construction zone	• Prohibit workers from poaching and fishing in river and make awareness among workers • If any animal or fish is entrapped during construction works, provide safe passage for them and do not harm them	Construction Contractor	PIU/Consultants to monitor such activities which can harm to animals and fishes	Cost for implementation of mitigation measures responsibility of contractor.
Land use	Environmental Issues due to land use change	The impact due to change in land use will be negligible due to this project.	Not applicable	Not applicable	Not applicable
Accessibility	Traffic problems and conflicts near project locations and haul road	i) Plan sewer line works to minimize traffic disturbance / blockades; as the sewer lines are to be laid in all the roads and streets in the town, work planning is crucial to minimize the inconvenience to public. (ii) Prepare and implement a Traffic Management Plan (Appendix 12) (ii) Duly consider and select sections for trenchless method of pipe laying based on traffic conditions (iii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (iv) Schedule transport and hauling activities during non-peak hours; (v) Locate entry and exit points in areas where there is low potential for traffic congestion; (vi) Keep the site free from all unnecessary obstructions; (vii) Drive vehicles in a considerate manner; (viii) Coordinate with Traffic Police for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; (ix) Notify affected sensitive receptors 1-week in advance by	Construction Contractor	(i) Traffic route during construction works including number of permanent signage, barricades and flagmen on worksite; (ii) Complaints from sensitive receptors; (iii) Number of signage placed at project location.	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints. (x) Plan and execute the work in such a way that the period of disturbance/ loss of access are minimum. (xi) Provide pedestrian access in all the locations until normalcy is restored. Provide wooden/metal planks over the open trenches at each house to maintain the access.			
Socio-Economic – Income.	Impede the access of residents and customers to nearby shops	(i) Prepare and implement spoils management plan (Appendix 11). Contractor to Implement RP and to follow mitigation measures prescribed (ii) Leave spaces for access between mounds of soil; (ii) Provide walkways and metal sheets where required for people; (iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; (iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Spoils management plan (iii) Number of walkways, signage, and metal sheets placed at project location.	Cost for implementation of mitigation measures responsibility of contractor.
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	(i) Employ local labour force, or to the maximum extent possible (ii) Comply with labor laws	Construction Contractor	(i) Employment records; (ii) Records of sources of materials (iii) Compliance to labor laws (see Appendix 6 of this IEE)	Cost for implementation of mitigation measures responsibility of contractor.
Occupational Health and Safety	Occupational hazards which can arise	(i) Comply with all national, state and local core labor laws (see Appendix 6 of this IEE); Following best practice health and safety guidelines: IFC's General EHS Guidelines[33] and	Construction Contractor	(i) Site-specific OH and S Plan; (ii) Equipped	Cost for implementation of mitigation

[33] *https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES*

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	during work	Sector Specific (Sanitation) Guidelines[34] (ii) Develop and implement site-specific occupational health and safety (OH and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) OH and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (iii) Conduct work in confine spaces, trenches, and at height with suitable precautions and using standards and safe construction methods; do not adopt adhoc methods; all trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 4.5 m by adopting trenchless technology (iv) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (v) Provide medical insurance coverage for workers; (vi) Secure all installations from unauthorized intrusion and accident risks; (vii) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following: (a) work schedule should be adjusted to avoid peak temperature hours (12 – 3 PM); (b) provide appropriate shade near the workplace; allow periodic resting and provide adequate water, and (c) provide necessary medicine and facilities to take care of dehydration related health issues (viii) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;		first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H and S orientation trainings (viii) personal protective equipment; (ix) % of moving equipment outfitted with audible back-up alarms; (xi) permanent sign boards for hazardous areas such as energized electrical devices	measures responsibility of contractor.

[34] *https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-2BWater%2Band%2BSanitation.pdf?MOD=AJPERES*

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(ix) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (x) 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; (xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (xii) Ensure moving equipment is outfitted with audible back-up alarms; (xiii) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; (xiv) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. (xv) Conduct regular health check-ups for workers (xvi) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites (xviii) Provide proper solid and liquid waste management system in workers' campsite, separate from spoils and debris disposal, as their presence can add to existing waste volume at the project sites.		and lines, service rooms housing high voltage equipment, and areas for storage and disposal. (xii) Compliance to core labor laws (see Appendix 6 of this IEE)	
	Health risk of construction workers due to COVID-19. • Prepare the health and	Prepare the health and safety guidance for COVID-19 at work sites and get approval of PMU ; • Strictly follow and implement the H&S guidance for COVID-19 at worksite; • Everyone entering the worksite must wear a mask, gloves and hard shoes.	Construction Contractor	PIU / DSC with the assistance of DBO contractor	Cost for implementation of mitigation measures responsibility of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	safety guidance for COVID-19 at work sites and get approval of PMU; •	• At the entrance of the worksite/camp site every personnel must wash their hands for 20 second with maintaining a distance of at least 1m (3 ft) from each other; • A designated EHS/Medical person should stay all time during work and ensure physical distances (minimum 1m) among workers, disinfecting surfaces that are commonly used and investigate worker/site personnel health and safety. • Discourage site personnel to gather and gossip at any time, rather encourage physical distance while chatting/discussing. • Ensure sufficient stock of soap, sanitizer, washing facility and safe water at the workers' dwelling (both camp site and home). • Encourage frequent hand washing and social distancing at campsite. • Ensure personal distance at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer. • Train workers on how to properly put on, use/wear, and take off protective clothing and equipment. Make these trainings mandatory at worksites and provide 10-15 minutes of a workday for such 'training and encouragement' activities.			
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	(i) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned (ii) All trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 4.5 m by adopting trenchless technology (iii) Survey the surrounding vulnerable buildings for likely issues in structural stability / differential settlement during the excavation works (iv) Provide prior information to the local people about the nature and duration of work.	Construction Contractor	(i) Traffic Management Plan; (ii) Complaints from sensitive receptors	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(v) Plan routes to avoid times of peak-pedestrian activities. (vi) Liaise with PIU/ULB in identifying high-risk areas on route cards/maps. (vii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (viii) Provide road signs and flag persons to warn of on-going trenching activities.			
Safety of sensitive groups (children, elders etc.) and other pedestrians in narrow streets	Trench excavation in in narrow streets will pose high risk to children and elders in the locality	(i) Provide prior information to the local people about the nature and duration of work (ii) Conduct awareness program on safety during the construction work (iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iv) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches	Construction Contractor	Complaints from neighborhood and monitoring of accidents	Cost for implementation of mitigation measures responsibility of contractor.
Night Works	Public inconvenience due to traffic diversion, disturbance due to excessive noise and access loss, occupational health and safety issues etc.	Prepare a night work protocol and obtain prior approval from PIU, and strictly implement and report on implementation of protocol during the workers; Contractors should have handheld noise level meter for measurement of noise during night hours Contractors should have handheld lux meter for the measurement of illumination during night hours Preferably electrical connection is available for running equipment otherwise soundproof/super silent Diesel Generator set should be available Sound level should not increase as prescribe by CPCB Illumination should be as prescribed in protocol As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and	Contractor	Night work plan / protocol submitted by contractor and approved by PIU/Consultant	Contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		avoided in nighttime Workers engaged in night works should have adequate rest/sleep in daytime before start of night works Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests Horns should not be permitted by equipment and vehicles Workers should not shout and create noise First aid and emergency vehicles should be available at site Emergency preparedness plan should be operative during night works Old persons and pregnant women and women having small kids should not work in night-time All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works PIU/DSC site engineers and contractor's safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and video graphic records as well as register the observations. Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement After completion of night works all the site should be cleaned and maintained obstruction free for daytime movement of vehicles and pedestrians Drivers and workers should be alert and responsive during			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		night works All the wages to workers working in night hours should be as per the applicable labour acts Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.			
Work in narrow streets	Will pose high risk to children and elders in the locality	(i) Conduct awareness program on safety during the construction work (ii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iii) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches (iv) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned			Responsibility of contractor.
Trenchless Pipe Installation	Noise generated due to HDD may affect the neighboring communities and other sensitive receptors (such as students at	Pipes shall be installed by the horizontal directional drilling (HDD) methods where required. If the method is not feasible for any road, the contractor shall inform the Project Manager and gain prior approval for an alternative method or for open trench method. Provide outdoor sound blanket or noise curtain wall to help alleviate the noise impact due to HDD. Monitor the noise level to ensure the maximum levelsare not exceeded.	Contractor	Trenchless work plan / protocol submitted by contractor and approved by PIU/ DSC Consultant	Contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	schools and other educational institutes, patients at hospitals etc.). Bentonite slurry spilled out to the watercourses may contaminate the adjacent surface water. •	Excavation material shall be removed from the conduit as the work progresses. No accumulation of excavated material within the conduit will be permitted. • The contractor shall provide sediment and erosion control measures in accordance with local environmental legislation. • The contractor shall supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction. Spent drilling fluids and cuttings shall be confined to the entrance and exit pits. • The contractor shall take all necessary precautions to minimize the damage to the adjacent properties. The contractor shall take all necessary precautions to minimize the damage to the adjacent properties. • Drilling fluid/ bentonite slurry that enters the pipe shall be removed by flushing or other suitable methods. Sediment tanks of sufficient capacity, constructed from pre-formed individual cells of approximately 6-8m^3 capacities shall be used for settling waste-waters prior to disposal. • The contractor shall be responsible for cleanup and restoration of the site. • Pits excavated to permit connection of bored pipe shall be backfilled, and disturbed areas shall be restored to their original state or better. Sections of sidewalks, curbs, and gutters or other permanent improvements damaged during HDD operations shall be repaired or replaced at the contractor's expense.			
Construction camps and worker facilities	Temporary air and noise pollution from machine operation,	(i) Consult with PIU before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide drinking water, water for other uses, and sanitation	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Drinking water and sanitation	Cost for implementation of mitigation measures responsibility of

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	facilities for employees; (iv) Provided temporary rest and eating area at all work sites (v) Ensure conditions of livability at work camps are always maintained at the highest standards possible; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be used as accommodation for workers; accommodation shall meet the IFC standards for workers accommodation which include: provision of safe housing, availability of electricity, plumbing, water and sanitation, adequate fire protection and dormitory/room facilities; accommodation shall be in the range from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters (surface) per worker, a minimum ceiling height of 2.10 meters; a reasonable number of workers are allowed to share the same room – (standards range from 2 to 8 workers); workers with accompanying families shall be provided with a proper and safe accommodation (IFC benchmark standards for workers accommodation is provided in Appendix 14) (vi) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vii) Recover used oil and lubricants and reuse or remove from the site; (viii) Manage solid waste according to the preference hierarchy: reuse, recycling and disposal to designated areas; (ix) Ensure unauthorized persons specially children are not allowed in any worksite at any given time.		facilities for employees	contractor.
Social and Cultural Resources	Risk of archaeological chance finds	(i) Strictly follow the protocol for chance finds in any excavation work; (ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work (iii) Stop work immediately to allow further investigation if any finds are suspected; (iv) Inform local Archeological Department / Museum office if a find is suspected and take any action, they require	Construction Contractor	Records of chance finds	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		to ensure its removal or protection in situ			
Monsoon preparedness	Disruption of utilities and water logging in trenches	(i) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (ii) if open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. (iii) keep emergency response system ready before monsoon/heavy rain fall	Construction Contractor	Monsoon preparedness plan	Cost for implementation of mitigation measures responsibility of contractor.
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of supervisor to ensure EMP implementation (ii) Timely submission of monitoring reports including pictures	Construction contractor	Availability and competency of appointed supervisor Monthly report	Cost for implementation of mitigation measures responsibility of contractor.
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) 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. (vi) 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 re-vegetation specification that forms part of this document. (vii) The contractor must arrange the cancellation of all temporary services. (viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.	Construction Contractor	PIU/Consultant report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O and M are removed; and (iv) worksite clean-up is satisfactory.	Cost for implementation of mitigation measures responsibility of contractor.

Table 31 : Environmental Management Plan of Anticipated Impacts during Operation Stage

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Sewerage system operation: treatment discharge of treated wastewater, sludge	Environmental and health issues due to operation	(i) Ensure that treated wastewater meets the established dischargestandards all times; Conduct regular wastewater quality monitoring (at inlet andat outlet of STP) to ensure that the treated effluent quality complies with design standards; (ii) Conduct baseline water quality assessment of receiving water body prior to start of operation (iii) Ensure implementation of Reuse Plan, and ensure intended quality for each direct reuse (iv) Assess composition and characteristics of sludge from the first batch operation at the initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan (v) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops. (vi) Ensure valid consent to operate (CTO) from UEPPCB for operation of STP (vii) Ensure that all conditions/standards prescribed by UEPPCB are compiled duly (viii) Ensure that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case	O and M contractor for 5 years and then Nagar Palika	Nagar Nigam , Nainital	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		of any accident and/or maintenance activity, ensure that the staff follows documented procedures only (ix) Implement Emergency Response System (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 15. (x) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility; (xi) Operate and maintain the facility following standard operating procedures of operational manual; (xii) Undertake preventive and periodic maintenance activities as required; (xiii) Conduct periodic training to workers; ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations; (xiv) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers; monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers;conduct public awareness programs; in coordination with UEPPCB. (xv) Conventional and centralized water treatment that use filtration and disinfection that inactivates disease			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		causing vectors (xvi) Final disinfection step considered if treatment plant technologies are not able to destroy pathogens and remove viruses (xvii) Workers should wear appropriate PPE which includes protective outerwear, gloves, boots, goggles or a face shield and a mask (xviii) Perform hand hygiene frequently, avoid touching eyes, nose, mouth with unwashed hands			
Sewerage system operation: collection and conveyance	Environmental and health issues due to operation of sewer network	(i) Establish regular maintenance program, including: • Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas. • Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and • Monitoring of sewer flow to identify potential inflows and outflows • Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);	O and M contractor for 5 years and then Nagar Palika	Nagar Palika Nainital	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(ii) Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed; (iii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system. (iv) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers (v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc. (vi) Provide necessary health and safety training to the staff (vii) Provide all necessary personnel protection equipment (viii) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works. • As far as possible use remote / CCTV mechanism to identify/detect the problems in sewers and do notengage persons for this purpose			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		• As far as possible use mechanized cleaning of manholes and sewers by using modern techniques and machines and do not engage persons for this purpose • Ensure that maintenance staff and supervisors understand the risks; provide proper instructions, training and supervision. • Use gas detector to detect any hazardous or inflammable gas in confined areas like sewers /manholes prior to maintenance process • Provide suitable personal protective equipment that may include waterproof / abrasion-resistant gloves, footwear, eye and respiratory protection. Face visors are particularly effective against splashes. Equipment selection and a proper system for inspection and maintenance are important. • Provide adequate welfare facilities, including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers. • For remote locations portable welfare facilities should be provided. • Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities. • Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		dressings. • Make effective arrangements for monitoring the health of staff. • Keep emergency preparedness plan ready before starting the work of sewage system cleaning • Standard Operating Procedure (SOP) for Cleaning of Sewers and Septic Tanks by CPHEEO shoud be followed (http://cpheeo.gov.in/upload/5c0a062b23e94SOPforcleaningofSewersSepticTanks.pdf			
Occupational Health and Safety	Health risk of workers due to COVID-19.	• Prepare and implement a health and safety plan that is based on the developments about COVID-19 at the local and global fronts. All protocols contained in the health and safety plan should comply with all national health and safety regulations related to COVID-19 and with internationally recognized guidelines for dealing with COVID-19, such as the WHO guidelines.	O and M contractor for 5 years and then Nagar Palika Nainital	Nagar Palika, Nainital	O and M cost of contractor
Pathogens and Vectors	Workers may expose to the endotoxins, which are produced within a microorganism and released upon destruction of the cell and which can be carried by airborne dust particles. Vectors for sewage pathogens include insects (e.g. flies), rodents (e.g. rats) and birds (e.g. gulls).	Include in safety training program for workers, safe handling and personal hygiene practices to minimize exposure to pathogens and vectors; • Use vacuum trucks or tugs for removal of fecal sludge instead of manual methods; • Provide and require use of suitable personal protective clothing and equipment to prevent contact with wastewater (e.g., rubber gloves, aprons, boots, etc.). Especially provide prompt medical attention and cover any skin trauma such as cuts and abrasions to prevent infection and use protective	O and M contractor for 5 years and then Nagar Palika Nainital	Nagar Palika Parishad,Nainital	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		clothing and goggles to prevent contact with spray and splashes; • Provide areas for workers to shower and change clothes before leaving work and provide laundry service for work clothes. This practice also helps to minimize chemical and radionuclide exposure; • Encourage workers at wastewater facilities to wash hands frequently; • Provide worker immunization (e.g. for Hepatitis B and tetanus) and health monitoring, including regular physical examinations; • Reduce aerosol formation and distribution, for example by planting trees around the aeration basin to shield the area from wind and to capture the droplets and particles • Reducing aeration rate, if possible • Avoid handling screenings by hand to prevent needle stick injuries; • Maintain good housekeeping in sewage processing and storage areas; • Advise individuals with asthma, diabetes, or suppressed immune systems not to work at wastewater treatment facilities, especially composting facilities, facility because of their greater risk of infection			
Repair and maintenance activities of sewerage Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management, and safety measures. Site inspection checklist to review implementation is appended at Appendix 18..	O and M contractor for 5 years and then Nagar Palika Parishad, Nainital	Nagar Palika, Nainital	O and M cost of contractor
Leakage and	It may affect the sewer	Effective operation to avoid and/or	O and M	Nagar Palika Parishad,	O and M

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Overflows	system, contaminate land, water and create public health issues	immediate clearance of such leaks, blockages; • Implementation of regular O&M schedules.	contractor for 5 years and then Nagar Palika Parishad , Nainital	Nainital	cost of contractor
Asset management	Reduction in NRW Increased efficiency of the system	Preparation and implementation of O and M Manual	O and M contractor for 5 years and then Nagar Palika Parishad, Nainital	Nagar Palika Parishad, Nainital	O and M cost of contractor
Existing SPS	Environmental issues as odour problem, noise problem	Proper maintenance will be required for SPS. Check pump components like impeller condition, stuffing box, shafts, sleeves, wear rings or plates on regular basis to remove the excess noise and odour related issues.	O and M contractor for 5 years and then Nagar Palika Parishad, Nainital	Nagar Palika Parishad, Nainital	O and M cost of contractor

Table 32 : Environmental Monitoring Plan for Construction Stage

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management, chance finds protocol, asbestos pipes management. and safety measures. Site inspection checklist to review implementation is appended at Appendix 18.	Weekly during construction	Supervising staff and safeguards specialist	No costs required
Tree cutting and plantation	STP and sewer pipe laying sites	Obtain permission from concerned authority for any tree cutting and plant trees in the ratio of 1:3.	Weekly during construction	Supervising staff and safeguards specialist	Contractors cost
Ambient air quality	At locations to be decided by the Environment Specialist of PMDSC STP site, pipe laying locations, drainage locations, septic tank/soak pit	PM10, PM2.5, NO2, SO2, CO	Once before start of construction and once in each season (yearly 3 times, except monsoon) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
	locations, construction camps and workers camp locations				
Ambient noise	5 locations (STP site , pipe laying locations construction camps and workers locations) at locations to be decided by the Environment Specialist of PMDSC – construction sites- STP site, pipe laying locations, drainage locations, septic tank, soak pit locations, construction camps and workers camplocations ,	Day time and nighttime noise levels	Once before start of construction and at the start of noisiest construction activities (use of pneumatic drills, breaking of cement or bitumen roads, operation of concrete mixers, trenchless pipe installation)	Contractor	Cost for implementation of monitoring measures responsibility of contractor
	locations (STP site , pipe laying Locations, construction camps and workers camp locations) At locations to be decided by the Environment Specialist of PMDSC - STP site, soak pit locations, pipe laying locations , construction camps and workers camplocations	pH, Elect. Conductivity (at 25^0C), Moisture (at 105^0C), Texture (silt, clay, sand), Calcium (as CaO), Magnesium (as Mg), Permeability, Nitrogen (as N), Sodium (as Na), Phosphate (as PO4), Potassium (as K), Organic Matter, oil and grease	Once before start of construction and once in each season (yearly 3 times, except monsoon) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor
Ground Water quality	5 locations (STP site , pipe laying locations , construction camps and workers camp locations) At 5 locations to be decided by the Environment Specialist of PMDSC - near STP site, pipe laying locations, soak pit locations, construction camps and workers camp	pH, TDS, Total Hardness, Zn, Chloride, Iron, Copper, DO, Manganese, Sulphate, Nitrate, Fluoride, Hg, Cadmium, Cr+6, Arsenic, Lead, Total Alkalinity, Phosphate, Phenolic compound	Once before start of construction and once in each season (yearly 3 times, except monsoon) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
	locations				
Surface water quality	5 locations (Locations shall be selected based on the location of surface water bodies closer to the construction zones and at Nihal river outfall points) At 5 locations to be decided by the Environment Specialist of PMDSC- surface water bodies closer to the construction zones and drainage out fall points	pH, Turbidity, Total Hardness, DO, BOD, COD, Chloride, Hg, Iron, TDS, TSS, Calcium, Zn, Cr+6, Magnesium, Copper, Manganese, Sulphate, Cyanide, Nitrate, Sodium, Potassium, Fluoride, Cadmium, Arsenic, Lead, Boron, Selenium, Aluminium, Total	Once before start of construction and once in each season (yearly 3 times, except monsoon) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor

Table 33 : Environmental Monitoring Plan for Operations Stage

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Monitoring of raw wastewater quality	Inlet of the STP	pH, BOD, COD, TSS, P-Total , N-total, Fecal Coliform (as per Annexure-4)	Monthly once	O and M contractor (DBO contractor) for 5 years and then Nagar Palika Parishad	Contract O and M cost / Nagar Palika Parishad Nainital
Monitoring of treated effluent quality	Outlet of STP	pH, BOD, COD, TSS, P-Total , N-total, Fecal Coliform (as per Annexure-4)	Monthly Once	O and M contractor (DBO Contractor) for 5 years and then Nagar Palika Parishad	Contract O and M cost / Nagar Palika, Nainital
Sludge quality (STP) and suitability as manure	Dried sludge	Analysis for concentration of heavy metals and confirm that value are within the following limits of organic compost **(FCO 2009)** (all units are in mg/kg dry basis except pH) Arsenic - 10.00 Cadmium - 5.00 Chromium - 50.00 Copper- 300.00 Lead - 100.00 Mercury- 0.15 Nickel - 50.00 Zinc- 1000.00 PH - 6.5-7.5	Yearly twice	O and M contractor (DBO Contractor) for 5 years and then Nagar Palika Parishad	Contract Oand M cost / Nagar Palika Parishad, Nainital
Monitoring of plantations	Plantations locations	Nos. of tree survived	Monthly	O and M contractor for 5 years and then Nagar Palika Parishad	Contract Oand M cost / Nagar Palika Parishad, Nainital
Consent to operate (CTO) from UEPPCB	STP	CTO should be renewed before expired	As per UEPPCB	Nagar Palika , Parishad Nainital	Contract O and M cost / Nagar Palika Parishad, Nainital
Trunk Sewer network to	Trunk Sewer	to be included in the O&M plan prepared under	As per O&M	O and M	Contract O

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
sustain operational efficiency and avoid clogging and early occurrence of leakages	network	the project	plan	contractor for 5 years and Nagar Palika Parishad, Nainital	and M cost / Nagar Palika Parishad, Nainital
Achieving targeted wastewater reuse and safe sludge disposal	STP	Volume of wastewater reuse and Quantity of safe sludge disposal	Yearly/ bi-Yearly	Nagar Palika Nainital Parishad,	Nagar Palika Parishad, Nainital
Achieving Septic Tank Closure	Town	Numbers of septic tanks closed; IEC Campaign Details	Yearly/ bi-Yearly	Nagar Palika Parishad, Nainital	Nagar Palika Parishad, Nainital

B. Institutional Requirements

287. The Department of Urban Development (UDD), Government of Uttarakhand is the Executing Agency and Uttarakhand Urban Sector Development Agency (UUSDA) is the Implementing Agency for the Uttarakhand Inclusive Urban Development Project (UIRUDP). UUSDA under UDD is responsible for management, coordination and execution of all activities funded under this project. A Project Management Unit (PMU), established within the UUSDA, will implement the project.

288. **Project Management Unit (PMU).** The PMU is headed by a Program Director (PD), a senior IAS Officer, of Additional Secretary rank; the Program Director will be supported by Additional Program Director (APD), Technical (an officer of Chief Engineer rank), Additional Program Director (APD), Administration (a State Cadre level Administrative Officer or a junior IAS Officer) and a Finance Controller (a State Cadre level Officer from finance discipline). APD Technical will be supported by Deputy Program Directors of Superintendent Engineer rank; DPD 1 will be responsible for Project Implementation and DPD 2 responsible for Procurement Planning and Contracts. DPD 1 is the focal person for coordinating with the PIUs, safeguards and GESI implementation. The Deputy Program Directors will be assisted by Project Managers of Executive Engineer rank and Deputy Project Managers (DPMs) of Assistant Engineer rank. PMU will have a position of Social Development and Gender Officer (SDGO) and Environmental Officer (EO) responsible for safeguards implementation to assist the PMU, DPD 1. The Environmental Officer will assist DPD 1 of PMU for implementation of environmental management plan (EMP) provisions and other environmental issues as per IEE/ EMP in compliance with ADB's SPS 2009 and GoI rules. There will also be an Information, Education and Communication (IEC) Officer. The PMU will support two PIUs, one at Dehradun and the other at Nainital; the PIUs will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities under the UIRUDP. Each PIU will be headed by a Project Manager of Executive Engineer (EE) rank, reporting to the DPD 1. PMU has been designated the JEs and AEs as a safeguard officer and the letter of PMU is appended as Appendix 29 in this updated IEE.

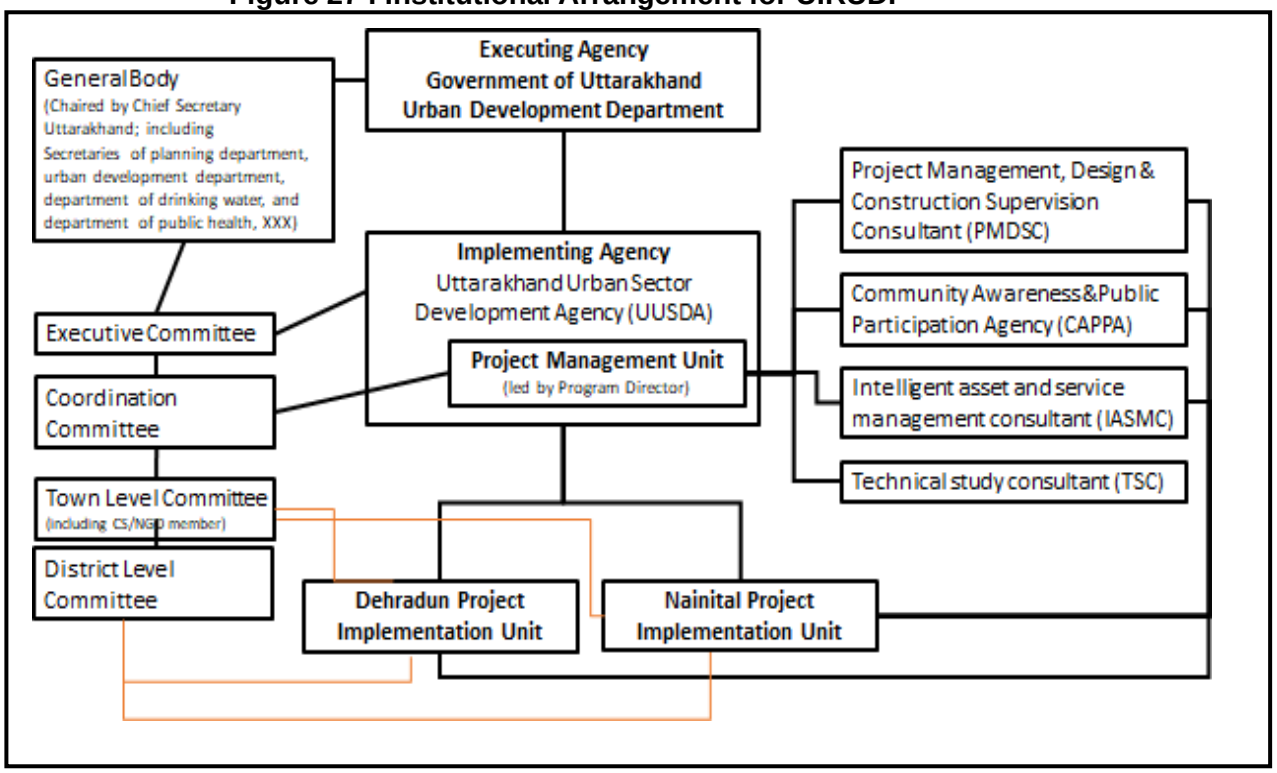
289. **Project Implementation Units (Town/City Level).** Each PIU (established one each in Dehradun and Nainital) will be headed by a Project Manager of Executive Engineer rank. Project Manager will be supported by three Deputy Project Managers of Assistant Engineer (Civil) and Assistant Engineer (electrical and mechanical) rank. Further, Junior Engineers will assist the Deputy Project Managers in project implementation. One of the Junior Engineer will be designated as social focal point (Assistant Social Development Officer) and the other as environmental focal point (Assistant Environmental Officer).

290. **Project Management and Design Supervision Consultant.** PMU will be supported by a Project Management and Design Supervision Consultant (PMDSC) to supervise, monitor and oversee project implementation, support on policy reform related issues and compliance of all thereporting requirements of GoU, other statutory regulatory bodies and Asian Development Bank inline with SPS 2009. PIU will also be supported by the PMDSC on supervision monitoring and to oversee the implementation of projects, including compliance of ADB's SPS 2009 and other environmental and social issues as per relevant State and GoI rules. There will be two Environmental Experts (EE) and two Social, Gender and Resettlement Expert (SGRE) at the PMDSC.

291. **Safeguards Compliance Responsibilities.** DPD 1 will be the focal point for both social and environmental safeguard implementation and compliance. Environmental and Social Development Officers will have the overall responsibility of ensuring compliance with ADB SPS

2009 and will support DPD 1. The PMU will have overall responsibility for implementation of the IEEs, RPs, EMPs, SEMP, GESI action plan, and appropriate monitoring and reporting responsibilities. The Environmental Officer (EO) will be primarily facilitating implementation of EMPs, SEMP and other environmental related compliances with support of Environmental Experts of the PMDSC. The environment experts (EE) of PMDSC will conduct environmental assessments including the finalization of IEEs and prepare semi-annual environmental monitoring reports (SEMR). The PMDSC is also responsible to organize training and capacity development programs. The Social Development and Gender Officer (SDGO) will facilitate implementation, monitoring and reporting of resettlement plans and other relatedcompliances, while IECO will oversee the community awareness, public outreach, training, capacity building preparation of IEC materials, and enhance information, education and communication among the local public, regarding gender, social, environmental related issues ofUIRUDP. An independent agency titled, "Community Action and Public Participation Agency, (CAPPA) will assist the PMU and PIUs in implementation of resettlement plans and function as a community outreach agency for construction facilitation, public disclosure and other communication and capacity building awareness and documentation and reporting as per requirements. Contractor will appoint an Environment, Health and Safety (EHS) supervisor to implement EMP. The safeguard personnel have been appointed at PMU and PIU level as per the office order vide letter no. Social/UUSDA/IEC/186 on dated 17/02/2022 and the letter is appended as Appendix 29

Figure 27 : Institutional Arrangement for UIRUDP



292. Environmental Safeguards roles and responsibilities are summarized below:

293. **Tasks of Environmental Officer at PMU Level**. The following are the key environmental safeguard tasks and responsibilities of the Environmental Officer at the PMU level:

(i) review and approve the updated/final IEEs;
(ii) ensure that the updated/final IEEs/EMPs reflect latest/final project designs from the DBO contractor;
(iii) ensure that EMPs including Health and Safety COVID-19 Plans and associated costs are included in bidding documents and civil works contracts;
(iv) With the help of the PMDSC EE, review and approve the SEMPs from the Contractor;
(v) provide oversight on environmental management aspects of the project, and ensure SEMPs and EMPs are implemented by contractors;
(vi) establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the EMP;
(vii) facilitate and confirm overall compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements, as relevant;
(viii) with the help of the PMDSC EE, review, monitor and evaluate effectiveness with which the SEMPs, EMPs, and Health and Safety Plans are implemented, and recommend necessary corrective actions to be taken;
(ix) with the help of the PMDSC EE, prepare and submit semi-annual monitoring reports (SEMR) to ADB;
(x) ensure timely disclosure of final IEEs/EMPs and SEMRs, including corrective action plan ensure timely disclosure of final IEEs/EMPs and SEMRs, including corrective action plans, if any, in project website and in a form accessible to the public;
(xi) address any grievances brought about through the grievance redress mechanism (GRM) described in this EARF in a timely manner;
(xii) undertake regular review of safeguards related loan covenants, and the compliance in program implementation; and
(xiii) organize periodic capacity building and training programs for UIRUDP stakeholders, PMU, and PIU staff on safeguards.

294. **Project Implementation Units (Town/City Level).** The PIUs will be responsible for the day-to-day activities of project implementation in the field and will have direct supervision to all contractors at subproject sites. Each PIU will have a Junior Engineer, designated as the AssistantEnvironmental Officer (AEO) who will perform the following specific tasks, with support from PMDSC, Environmental Expert:

(i) Ensure compliance with government and ADB requirements on environmental safeguards;
(ii) Oversee day-to-day implementation of SEMPs by contractors, including compliance with all government rules and regulations, and conduct regular site visits/inspections;
(iii) Liaise with local offices of regulatory agencies in obtaining clearances /approvals; assist PMU for clearances obtained at town/city level;
(iv) Take necessary action for obtaining rights of way;
(v) Review and approve contractor SEMPs;
(vi) Review the contractors' monthly reports on SEMP implementation;
(vii) Prepare quarterly monitoring reports and submit to PMU;
(viii) Inform PMU of unanticipated impacts and formulate corrective action plan;
(ix) Recommend issuance of work construction work completion certification to the contractor upon verification of satisfactory post-construction clean-

up.
(x) Ensure continuous public consultation and awareness;
(xi) Coordinate grievance redress process and ensure timely actions by all parties; and
(xii) Support all other environmental safeguards-related activities and tasks of the PMU as may be needed.

295. **Project Management and Design Supervision Consultants**. The PMU and PIU Environmental Officer and Assistant Environmental Officers will be supported by the EE of the PMDSC. Following are the key tasks of Environmental Expert of PMDSC:

(i) Work closely with PMU, PIU and Contractor design teams to include environmental considerations in project location, design and technical specifications;
(ii) Identify statutory clearance / permissions / approvals required and assist the PMUand PIU in obtaining them;
(iii) Assist in including standards/conditions of regulatory clearances and consents, if any, in the project design;
(iv) Assist the PMU and PIU in the review of Contractor' SEMPs;
(v) Prepare updated/final IEEs and EMPs based on the DBO contractor's detailed design, SEMPs, and in accordance with country's environmental legal frameworks and ADB SPS 2009;
(vi) Ensure the quality and format of IEE reports, and other environmental safeguard documents following ADB Handbook of Styles and Usage;
(vii) Lead / assist PIU in public consultations and include inputs from the public consultation in the project design and EMP, and proper documentation in the IEEs;
(viii) Advise / assist PIU in disclosing relevant information on safeguards to affectedpeople and relevant stakeholders;
(ix) Assist the PIU in monitoring the implementation of EMPs/SEMPs and ensure compliance by the Contractors including subcontractors;
(x) Carry out site verification of EMP/SEMP implementation on a regular basis;
(xi) Provide guidance on resolving issues pertaining to effective and efficient implementation of proposed environmental mitigation measures per EMPs/SEMPs during construction phase. Identify, non-compliance or unanticipated impacts, if any, and initiate corrective actions and report to PMU;
(xii) Assist the PIU in the review and approval of monthly monitoring reports submittedby Contractor;
(xiii) Assist the PIU in consolidating and preparing quarterly Environmental Monitoring Reports (EMR) and submit to PMU;
(xiv) Assist the PMU in preparing semi-annual environmental monitoring report per therequirement of ADB;
(xv) Assist the PMU/PIU with any capacity building activities for stakeholders;
(xvi) Assist PIU in establishing GRM for the Project;
(xvii) Assist PIU in grievance redress, advise the contractor on appropriate actions on grievances, ensure timely resolution and proper documentation;
(xviii) Support all other environmental safeguards-related activities and tasks of the PMUand PIUs as may be needed.

296. **Design, Build and Operate (DBO) contractor.** The EMP provisions as per the approvedIEEs are to be included in bidding and contract documents and verified by the PIUs

and PMU. The implementation of EMP will be made binding i.e. mandatory on contractor as part of the employer's requirement in the bid and contract documents. The contractor will be required to appoint an Environment, Health and Safety (EHS) supervisor to implement the EMP, and prepareand submit to PMU and PIU, for review and approval, Site-specific EMP (SEMP) which includes (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measuresfollowing the approved EMP; (iii) monitoring program per EMP; and (iv) budget for SEMP and EMP implementation. No works can commence until SEMP is approved by PMU/PIU. Contractorswill carry out all environmental mitigation and monitoring measures outlined in EMP, approved SEMP and their contracts.

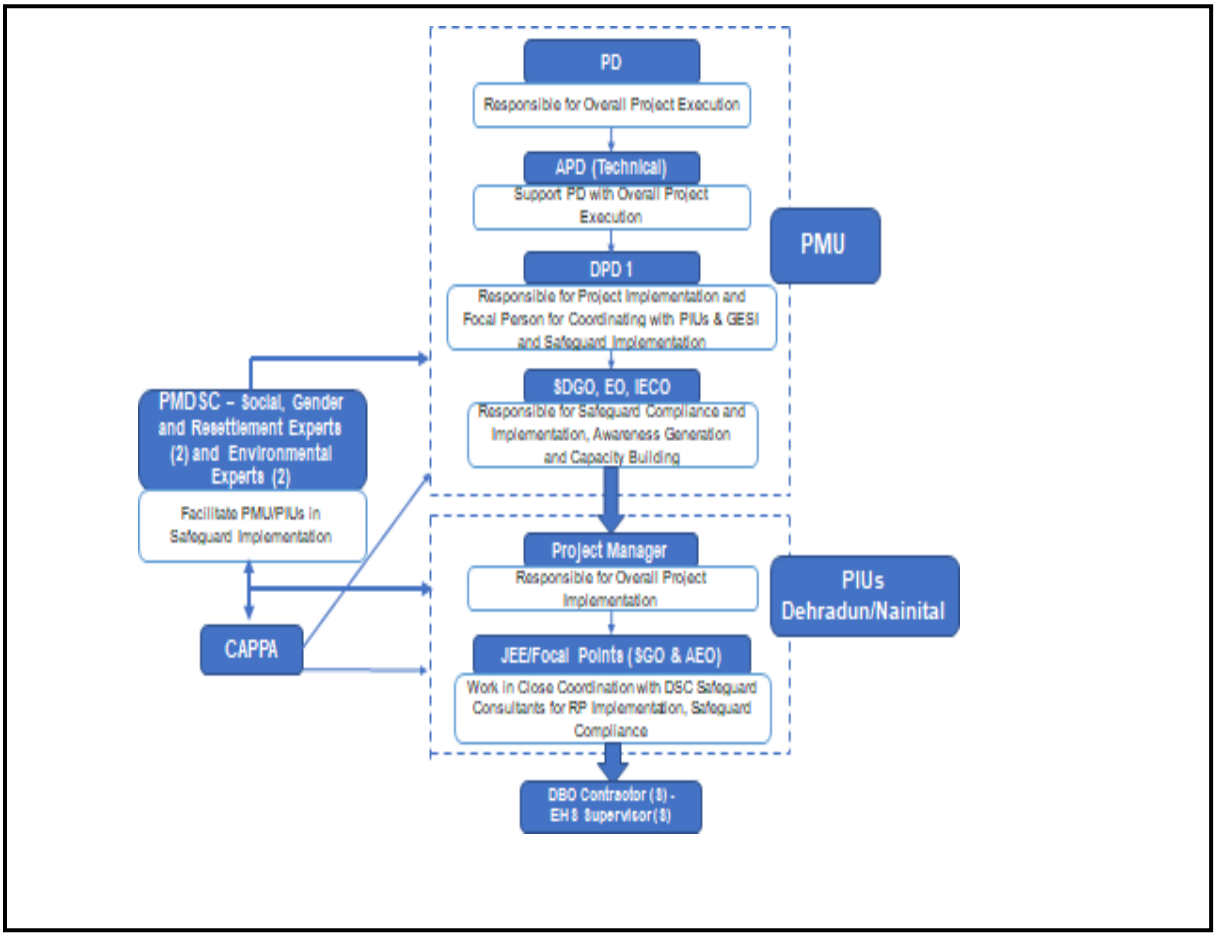
297. A copy of the EMP/approved SEMP will be always kept on-site during the construction period. Non-compliance with, or any deviation from, the conditions set out in the EMP/SEMP constitutes a failure in compliance and will require corrective actions.

298. The PMU and PIUs will ensure that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation, international treaties for construction and maintenance activities;(b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with
(ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites. Key responsibilities of the EHS supervisor are:

(i) Prepare SEMP and submit to PMU/PIU for approval prior to start of construction;
(ii) Ensure implementation of SEMP and report to PIU/PMDSC on any new or unanticipated impacts; seek guidance from the PMU/PIU/PMDSC to address the new or unanticipated impact in accordance with ADB SPS 2009;
(iii) Ensure that necessary pre-construction and construction permits are obtained;
(iv) Conduct orientation and daily briefing sessions to workers on environment, healthand safety;
(v) Ensure that appropriate worker facilities are provided at the workplace and laborcamps as per the contractual provisions;
(vi) Carry out site inspections on a regular basis and prepare site-inspectionchecklists/reports;
(vii) Record EHS incidents and undertake remedial actions;
(viii) Conduct environmental monitoring (air, noise, etc.,) as per the monitoring plan
(ix) Prepare monthly EMP monitoring reports and submit to PIU;
(x) Work closely with PIU AEO and PMDSC EE to ensure communities are aware ofproject-related impacts, mitigation measures, and GRM; and
(xi) Coordinate with the PIU and PMDSC on any grievances received and ensure thatthese are addressed in an effective and timely manner.

299. The following Figure 25 shows the institutional responsibility of safeguard implementationat all stages of the UIRUDP project :

Figure 28 : Institutional Arrangement for Safeguard Implementation, UIRUDP



AEO = Assistant Environmental Officer; APD = Additional Program Director; CAPPA = Community Awareness and Public Participation Agency; DBO = Design Build and Operate Contractor; DPD = Deputy Program Director; EO = Environmental Officer; IECO = Information Education and Communication Officer; PD = Program Director; PIU = Project Implementation Unit; PMDSC = Project Management, Design & Construction Supervision Consultant; PMU = Project Management Unit; SDGO = Social Development and Gender Officer, SGO = Social and Gender Officer

C. Institutional Capacity and Development

300. The Implementing Agency, UUSDA, has experienced project staffs, who have knowledgeand primary experience of ADB supported project implementation from earlier loans. It is hence understood that they have required familiarity with ADB environmental safeguard policies and itsimplementation. PMU SPM and PIU SOs will be trained by PMDSC safeguards experts and CAPPA team on safeguards issues related to the project, GESI action plan and GRM. The IEE, EMP and GESI action plan provided indicative capacity building program which included moduleson: (i) introduction and sensitization to ADB SPS 2009, on environmental, involuntary resettlement and indigenous people policies and requirements; (ii) project related requirements as provided in the IEE, EMP and GESI action plan, (iii) review, updating and preparation of the IEEs, SEMPs, RPs, and DDRs upon the completion of project detailed design; (iii) improved coordination within nodal departments; (iv) monitoring and reporting system; and (v) project GRM. Briefings on safeguards principles, GRM and GESI action plan will also be

conducted to the contractors upon their mobilization by PIU SOs supported by PMDSC and CAPPA

301. The following Table 31 presents the outline of capacity building program to ensure EMP implementation. The estimated cost is Rs. 200,000 (excluding trainings of contractors which will be part of EMP implementation cost during construction) to be covered by the project's capacity building program. The detailed cost and specific modules will be customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the ES of PMDSC. The capacity building program will consider participatory learning methods to the extent possible, including learning by doing, role playing, group exercises, on-the-job training, etc. to ensure effectiveness. A post-training assessment that can be compared to the pre-training assessment may be administered to measure the effectiveness of the program.

Table 31: Outline Capacity Building Program on EMP Implementation

Description	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement - Government of India and Uttarakhand applicable safeguard laws, regulations and policies including but not limited to core labor standards, OH andS, etc. - Incorporation of EMP into the project design and contracts - Monitoring, reporting and corrective action planning	All staff and consultants involved in the project At PMU (combined program for all subprojects)	INR 50,000 (Lump sum)	Included in the overall program cost

2. EMP implementation (1/2 day) - EMP mitigation & monitoring measures -Roles and responsibilities - Public relations, - Consultations - Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Construction site standard operating procedures (SOP) -- Chance find (archeological) protocol - AC pipe protocol - Traffic management plan - Waste management plan - Site clean-up & restoration - COVID 19 safety protocol	All PIU staff, contractor staff and consultants involved in thesubproject At PIU	Rs.100,000 (Lump sum)	Included in subproject cost estimates

Description	**Target Participants and Venue**	**Estimate (INR)**	**Cost and Source of Funds**
3. Contractors Orientation to Workers (1/2 day) - Environment, health and safety in project construction (O H and S, core labor laws, spoils management, COVID 19 etc.)	Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work All workers (including unskilled laborers)	Rs. 50,000	Contractors cost

Summary of Capacity Building cost for EMP Implementation

- Contractor Cost - INR 50,000
- PMU Cost - INR 150,000
- **Total - INR 200,000**

D. Monitoring and Reporting.

302. Immediately after mobilization and prior to commencement of the works, the contractor will submit a compliance report to PIU that all identified pre-construction mitigation measures as detailed in the EMP are undertaken. Contractor should confirm that the staff for EMP implementation (EHS supervisor) is mobilized. PIU will review, and approve the report and allow commencement of works.

303. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. PMDSC will review and advise contractorsfor corrective actions if necessary.

304. Quarterly report shall be prepared PMDSC and PIU and submitted to PMU for review andfurther actions.

305. Based on monthly & quarterly reports and measurements, PMU (assisted by PMDSC) willsubmit Semi-Annual Environmental Monitoring Report (Appendix 19). Once concurrence from theADB is received the report will be disclosed on UUSDA/PMU websites.

306. ADB will review project performance against the project commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system

E. EMP Implementation Cost

307. Most of the mitigation measures require that the contractors to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. There are some of the provisions in bid documents like complianceof the requirements of health and safety during construction works as per applicable labor laws, labor insurance, equipment fitness, provision of labor welfare facilities, healthcare facilities etc. which are unanimously bound to contractor bidding for the project therefore it is understood that costs for such requirements are bound to contractor and no need to consider as cost of EMP implementation. Regardless of this, any costs of mitigation by the construction contractors or consultants are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of PIU/ULB will be provided as part of their management of the project, so this also does not need to be duplicated here. Cost for the capacitybuilding program is included as part of the project. A CRVA study has been done for the project and the study and its recommendations, has been integrated in the updated IEE. Cost ofenvironmental management is given in Table 32.

Table 32: Cost Estimates to Implement EMP

No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
A.	**Mitigation Measures**						
1	Compensatory plantation measures	Construction	lump sum	-		1,000,000	Civil works contract
2	Arrangement of resources for prevention of health risk from COVID 19 pandemic	Construction	lump sum	-		1,500,000	Civil works contract
	Subtotal (A)					**25,00,000**	
B.	**Monitoring Measures#**						
1	Air quality monitoring:	Pre-construction and construction	per sample	60	14500	8,70,000	Civil works contract
2	Noise levels monitoring	Pre-Construction and construction	Per sample	60	4500	2,70,000	Civil works contract

3	Ground Water Quality	Pre-Construction and construction	Per sample	60	10500	5,25,000	Civil works contract
4	Surface Water Quality	Pre-Construction and construction	Per sample	60	10000	6,00,000	Civil works contract
5	Soil Quality	Pre-construction and construction	Per sample	60	10000	6,00,000	Civil works contract
	Subtotal (B)					**28,65,000**	
C.	**Capacity Building**						
1	Introduction and sensitization to environment issues	Pre-construction	lump sum			50,000	PMU
2..	EMP implementation	Construction	lump sum			100000	PMU
3	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	lump sum			50,000	Civil works contract
	Subtotal (C)					**200,000**	

No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
D	**Civil Works$**						
1	Water Sprinkling for dust suppression	Construction	Days	2160	1600	3,456,000	Civil works contract
2	Rainwater Harvesting for water conservation	Construction	Nos.	Per requirement	Lump Sum	1,000,000	Civil works contract
4	Provision for PPEs for labors and supervisory staff	Construction	lump sum			500,000	Civil works contract
	Subtotal (D)					**4,956,000**	
E	**CTE & CTO**						
	Fees for CTE and CTO		lump sum		**50,000**	**50,000**	Project Cost
	Subtotal (E)					**50,000**	
F	**Grievance Redressal and public disclosure Mechanism**						
	Grievance Redressal Mechanism Resolutions	Construction			Lump Sum	500,000	Civil works contract
	Public consultations on Environmental aspects	Construction	Month	84	5000	420,000	Civil works contract

	Sub Total (F)					**920,000**	
	Grand Total (A+B+C+D+E+F)				**INR**	**11,491,000**	
					USD	**138.729**	

Computation of total number of samples for environmental monitoring as per Appendix 23.
$ Excluding, Barricading, road restoration, Traffic Management, these are taken as part of the civil workcost

X. CONCLUSION AND RECOMMENDATION

308. The process described in this document has assessed the environmental impacts of all elements of development of sanitation system in Nainital town. The objective of this subproject isto upgrade the dilapidated sewerage system (mainly Trunk sewer) associated with frequent operation troubles such as blockage/chocking of sewer lines, inadequate capacity due to increase in the population, cesspool/ponding of sewage etc. A holistic approach has been adopted for the development of sewerage system. A comprehensive Sewerage System Management plan shall be planned and implemented for safe & reliable performance of the proposed system & to enable the sewerage system to deliver its intended objectives.

309. Nainital town, the Lesser Himalayan famous tourist destination of Uttarakhand has been repeatedly devastated by natural hazards since 1866. These inflicted heavy loss of life, infrastructure, property and geo-environment. According to Seismic Zoning map of India, Nainital town lies in Zone IV and falls under “very high” to “high” category earthquake zone.

310. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. During the construction phase, impacts mainly arise from the construction dust and noise, the need to dispose of large quantities of waste soil and import a similar amount of sand to support the sewer in the trenches; and from the disturbance of residents, businesses, traffic and important buildings by the construction work. The social impacts (access disruptions) due to construction activities are unavoidable, as the residential and commercial establishments exist along the roads where sewers will be laid. A resettlement plan has also been developed in accordance with ADB SPS 2009 and Government of India laws and regulations.

311. Proposed Subproject components are located in the immediate surroundings of Nainital town. which is converted into urban use for many years ago, and there is no natural habitat left at the proposed sites. The proposed STP land near Russi village is under the possession and ownership of Uttarakhand Pey Jal Nigam, Nainital. Proposed STP site is away from habitations (about 250m from the nearest household) and based on the screening conducted using the Integrated Biodiversity Assessment Tool (IBAT), it has been found that there is no Protected area within 10 km buffer from the proposed STP location at Russi Village. Therefore, there is no direct risks or impacts on biodiversity and natural resources.

312. Projection of population increase in base year of 2021, intermediate year 2036 and ultimate design year of 2051, which are 135,154 in 2021, 179,678 in 2036 and 239,021 in 2051.

Based on the projection of population increase, it has been estimated that the sub-project area will have 14 MLD, 19 MLD & 26 MLD of wastewater during the base, Intermediate & ultimate years respectively. The STP plant will be designed and constructed for the year 2036 (under this contract) with space provision for future expansion. It is proposed to design the STPs to stringent discharge standards suggested by CPCB in 2015 and order of National Green Tribunal (NGT) dated 30th April, 2019. The stringent standards also facilitate maximum utilization of treated wastewater for reuse in various purposes following guidelines of Central Public Health and Environmental Engineering Organization (CPHEEO).

313. With an objective to reuse the treated sewage and reduce the fresh water requirements, five (5) packaged STPs have been proposed in the subproject. These STPs, of 20 KLD capacities each, will be installed in identified government buildings/ compounds. Treated sewage after chlorination from packaged STP shall be reused within complex for gardening. However, in case of emergency or major maintenance; the treated sewage can be discharged into nearby trunk sewer

314. A portion of the treated effluent shall be collected in the 630Kl capacity of treated effluentstorage tank by gravity. The treated effluent can be used for gardening, cleaning, sewer manholesflushing and other purposes within plant premises. In order to safeguard the interest of users of treated effluent, it is proposed to apply technology/process to achieve very low biological oxygendemand (BOD) - BOD10, and suspended solids (SS) in the treated effluent. The surplus treated effluent after reuse shall be discharged into the nearby Bhatti –Gadhera rivulet which ultimately meets the Nihal river downstream. Considering the existing status of rivulet and Nihal River and the degree of treatment, no significant impacts are envisaged. Because of its high content of nitrates, phosphates and other plant nutrients the sludge will be used as organic fertilizer after adequate treatment and drying processes for a period of fifteen days. Any remaining can be disposed to a Government owned landfill site, at Gaujajali Uttar in Haldawani block in Nainital district located about 30 km towards south from district headquarters Nainital. The identification of alternative land is under process and will be finalized after Government approval, the same will be updated in the next revised IEE report. A sludge and treated effluent reuse plan will be developed and implemented by the Contractor in consultation with the Municipality authorities.as per guidelines of CPHEEO.

315. Total length of pipe laying under this project is 11.9 Km from which 1.7 Km (0.5 Km proposed from Children Park to Pant statue and 1.2 Km from Pant Statue to Tallital Post Office existing pipeline) along the mall road under PWD, 1.8 Km laying of rising main with 250 mm dia Ductile Iron (DI-K9) pipe from Children Park to Tallital Post office along Thandi Sadak under irrigation department, 1.9 Km pipe laying of trunk sewer with 450 mm dia DI-K9 pipe from Tallital post office to Hanuman Garhi under NHAI, 4.4 Km pipe laying of pressure sewer with 450 mm dia DI- K9 pipe from Hanuman Garhi to Russi bypass under NHAI and 2.1 Km laying (450 mm dia DI-K9 pipe) of rising main from Russi bypass to Russi STP under PWD.

316. During the execution, the existing trunk will be rehabilitated from Pant Statue to Tallital Post Office. New trunk sewer will be laid in other stretches from Tallital Post Office up to the proposed STP with an alternate arrangement for the function of the existing sewer. At the time of laying of the new trunk sewer, the upstream and downstream manholes will be plugged at that stretch, isolating that particular sewer. The sewage will be bypassed (pumped) to the downstream manhole from Upstream manhole avoiding sewer line under execution. Once the connection is made, the new sewer will start functioning. The network will be of the conventional gravity collection type, conveying the sewage to discharge into inlet chamber of the new STP. The subproject proposes to construct 140 numbers in-situ RCC circular manholes along the

trunk sewer network within the ROW of government roads, and Sewer house service connection up to property chambers are proposed for 600 houses.

317. During pipe laying works tree cutting is not envisaged as per detailed design, however If any tree is required to be cut, compensatory tree plantation will be carried out in 1:3 ratio. There are no structures (either temporary or permanent) or common property resources (CPRs) on the proposed pipe/drain right of way. The pipe laying work will impact few vendors, roadside temporary shops which are anticipated to face temporary income loss during the construction period

318. Except sewer works, all other construction activities will be confined to the selected sites and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupation health and safety aspects. The sewer system will be designed as a separate sewer system that carries only the domestic/municipal wastewater and will not mix with storm water drainage systems. No industrial wastewater will be allowed into the sewers.

319. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to deep trench excavations, especially in narrow roads, dust, access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation that are suggested in the EMP.

320. Anticipated impacts of sewerage system during operation and maintenance will be related to repair of blocks, overflows and leakages in sewers. Sewers are not 100% watertight and leakscan occur at joints. Faulty section will be exposed and repaired following the same basic procedure as when the sewer was built. Also, sewer pipes require regular maintenance as silt inevitably collects in areas of low flow over time. Necessary equipment for cleaning and removalof blockages in the sewers are included in the project.

321. Once the new system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the operation and maintenance manual and standard operating procedures to be developed for all the activities.

322. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on-site and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be longer-term surveys to monitor, treatment efficiency of STP (raw and treated sewage quality), sludge at STPs. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

323. Stakeholders were involved in developing the IEE through face-to-face discussions, on site meetings, and a city level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stakeholders were incorporated into the IEE and the planning and development of the project. The updated IEE will be made available at public locations and will be disclosed to a wider audience via the PMU and ADB websites. The

consultation process will be continued during project implementation to ensure that stakeholders are engaged in the project and have the opportunity to participate in its development and implementation. The project's grievance redress mechanism will provide the citizens with a platform for redress their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

324. The Environmental Management Plan (EMP) proposed in the project includes mitigation measures for identified impacts, training and capacity building activities, a monitoring plan to ensure that the environmental standards are maintained throughout the project construction period and a reporting plan to ensure that the project is implemented as per environmentally sound engineering and construction practices. The total estimated cost for implementing the EMPis approximately **11,491,000**/= (eleven million four hundred ninety-one thousand only). A CRVA study is being done for the project. The study and its recommendations, shall be integrated in theupdated IEE.

325. The IEE and EMP will be included in the bid and contract documents to ensure compliance with the conditions set out in this document. The contractor will be required to submit to PIU, for review and approval, an updated EMP / site environmental management plan (SEMP) including

(i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay downareas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP.

326. The EMP will assist the PMU, PIU, consultants and contractors in mitigating the environmental impacts, and guide them in the environmentally sound execution of the proposed project. The EMP will also ensure efficient lines of communication between PIU/ULB, PMU, consultants and contractor. A copy of the EMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site, and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance. No works are allowed to commence prior to approval of SEMP. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times/

327. The sub-project will benefit the general public by contributing to the long-term improvement of sewerage systems and community livability in Nainital town. The benefits arising from this subproject include: (i) better public health particularly reduction in waterborne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) improvement in quality of water quality due to avoidance of disposal of untreated effluent. Improved sewerage system will also significantly reduce the incidence of waste water accumulation in the subproject area and hence reduce health risks to the citizens and improve the visual quality and landscape character of the area.

328. The potential adverse environmental impacts are mainly related to the construction period, which can be minimized by the mitigation measures and environmentally sound engineering andconstruction practices. Therefore, as per ADB SPS, the project is classified as environmental **Category B** and does not require further environmental impact assessment. However, to conformto government guidelinesconsent to establishment (CTE) for the Sewerage Treatment Plant (STP) has obtained and appended as appendix 30 in this IEE report and CTO (prior to startof operation) will be obtained from Uttrakhand Pollution Control Board(UEPPCB). The CTE is based on preliminary design and PMU will consult the UEPPCB regarding the updating of the CTE based on detailed design, prior to construction.

329. This IEE has been updated by PMU during the detailed design phase to reflect any changes,amendments and will be reviewed and cleared by ADB.

330. This IEE has been updated considering sewerage (STP, pipelines, manholes and household connections) where final designs were completed and approved and SEMP has been submitted by the contractor. Update will be done further with completion of design, surveys and assessments of other components and submit to ADB for review, clearance and disclosure prior to start of any construction activities for these components.

331. **Recommendations.** The following are recommendations applicable to the subproject to ensure no significant impacts:

(i) Recommendations already Implemented with this update:

- Include draft IEE in bid and contract documents - implemented, the ADB approved draft IEE is part of bid documents

- STP designed to meet discharge standards, and ensure proper discharge facilities for surplus wastewater and sludge management facilities

  Conduct safeguards induction to the contractor upon award of contract - safeguard induction done

- Ensure contractor appoints qualified environment, health and safety (EHS) officers prior to start of works - complied

  Obtain all other statutory clearances and NOCs at the earliest time possible and include them in the IEE report before award of contract/before start of construction and ensure conditions/provisions are incorporated in the detailed design – process initiated, necessary permissions are yet to be obtained.

- Update/revise draft IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location - IEE is being updated as per current design updates, further it will be updated in final IEE.
- Strictly supervise EMP implementation - being complied

  Documentation and reporting on a regular basis as indicated in the IEE – will be complied
  Continuous meaningful consultations with stakeholders - being complied
  Timely disclosure of information and establishment of grievance redressal mechanism (GRM) - being implemented
  Involvement of contractors, including subcontractors, in first-level GRM - complied
- Implementation of CRVA recommendations: (i) training/workshop on climatic vulnerability to be conducted during the project work, (ii)involvement of relevant stakeholders and decision makers ; (iii) conservatory approach must be followed during the construction and post construction work and (iv) all the activities of the project will be carried out as per the prescribed standard method and these activities will definitely contribute to minimize the carbon footprint and methane emission in the concerned areas. – being complied and already included in the design

- Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation - PMU, PIUs and consultants are committed for the protection of environment

(ii) Recommendation to be implemented in next update /final IEE

- Update draft IEE based on finalisation of detailed design for sewer trunk (b) pit location for trenchless pipeline laying
- Ensure that the project sites are cleared of solid waste and other nuisance materials disposed in designated disposal sites per Solid Waste Management Rules 2016;
- The contractor should comply with the World Health Organization's interim guidance on Water, Sanitation, Hygiene and Waste Management for the COVID19 virus.
- No work will commence until all the preconstruction requirements are met, including: updated IEE is approved by ADB; COVID19 health and safety plan as part of overall H&S planis prepared by contractor and approved by PMU, (ii) GRM is established and operationalized and (iii) all necessary permissions are obtained
- Ensure that the geotechnical investigation for slope stability is done
- Conduct an environmental compliance audit for existing SPS near children park and storage tank near Russi village
- Ensure the odour modelling of the STP
- Consent to Establish (CTE) for the STP should be updated based on the fional design of STP.

Appendix 1: Rapid Environmental Assessment (REA) Checklist

Sewerage Treatment

Instructions:
The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.

Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: India / Uttarakhand Urban Sector Development Agency (UUSDA) Sewerage Project in Nainital Town

Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project SitingIs the project area			
Densely populated?	√		Subproject activities extends to the entire town including the densely populated areas. There are no major negative impacts envisaged, because Trunk sewer of only 4 km will be laid in ROW of government lands, parallel to the existing sewer mains by trenchless method. This can be constructed without causing disturbance to houses, and commercial establishments.
Heavy with development activities?	√		Nainital town is a developing town; urban expansion is considerable
Adjacent to or within any environmentally sensitive areas?		√	There are no environmentally sensitive areas within or near to any proposed site. No impact however is envisaged due to the proposed subproject components.
Cultural heritage site		√	There is no cultural heritage site in the project area.
Protected Area		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	
Bay		√	
B. Potential Environmental Impacts			

SCREENING QUESTIONS	Yes	No	REMARKS
Will the Project Cause…			
Impairment of historical/ cultural monuments/areas and loss/damage to these sites?		√	Not applicable. There is no historical / cultural monument in the project locations
Interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, andinflux of insects, rodents, etc.?	√		**Anticipated during construction and operations but can be avoided and mitigated**. During construction, sewers will be laid underground and may interfere temporarily with access and other utilities. Coordination with the concerned agencies will be conducted in finalizing alignment and shifting of utilities, if necessary
dislocation or involuntary resettlement ofpeople		√	**Not anticipated** Project does not involve any landacquisition. A Resettlement Plan will be prepared if there are any involuntary resettlement. During the sewer construction, particularly in narrow streets and streets with on street commercial activities, there may be temporary disruption or relocation of hawkers and vendors.
disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups		√	**Not anticipated.** Contractors shall prioritize hiringlocal labor force. Some of the skilled workers may be brought from outside but numbers should not be so large to have impacts on social services
Impairment of downstream water qualitydue to inadequate sewage treatment or release of untreated sewage?		√	**Not anticipated.** It is provided in a combination of underground sewerage system flow from proposed sewerage network connecting totreatment unit at 17.5 MLD STP at Rusi village through existing trunk sewer The excess / surplus treated effluent from STP that is not reused will be discharged to nearby River. River remains mostlydry except during rains, and there are no water intake points in the immediate downstream. River carries the untreated wastewater and solid wastes from the town. Hence No impacts envisaged
SCREENING QUESTIONS	Yes	No	REMARKS
Overflows and flooding of neighboring properties with raw sewage?		√	**Not anticipated.** Risks, climate change factors and forecasted demands are considered in the design and capacity of the sewerage systems. Sewerage system is designed following standards considering 100-years High Flood Level (HFL) with probable flood. Flooding and overflowing will be avoided through regular operation and maintenance.
Noise and vibration due to blasting andother civil works?	√		**Anticipated but temporary**, **site-specific and can be mitigated**. Blasting for underground worksis prohibited in UUSDA works. Nuisance or disturbance due to noise may be experienced but minimized with mitigation measures specified in the EMPs. Scheduling of works and prior information with the affected people will beconducted.

SCREENING QUESTIONS	Yes	No	REMARKS
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	√		**Anticipated but temporary, site-specific andcan be mitigated**. EMPs and contract provisions include requirements for an Occupational Health and Safety (OHS) plan. The contractor's OHS planshall be reviewed and cleared by the PIUs prior to commencement of works
Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		√	**Not anticipated.** This sewerage system will cater only to municipal wastewater, no Industrial wastewater discharge is allowed intothe sewerage system.
Road blocking and temporary flooding due to land excavation during the rainy season?	√		**Anticipated but temporary, site-specific andcan be mitigated** Road blocking for pipe laying works may be required and mitigation measures are required as per IEE/EMP. Underground construction works (sewer laying, foundations) should be carried out in non-monsoon period to avoid flooding.
Noise and dust from construction activities?	√		**Anticipated during construction but temporary, site-specific and can be mitigated**. Short term impact on air quality due to dust generation during construction activities is anticipated. Appropriate dust suppression measures will be taken to minimize dust generation due to construction activities at site. Dust generation will be controlled through water sprinkling, immediate transportation of excess soil, covered transport system etc No significant increase in noise level is anticipated due to construction. All equipment and machineries will conform to the Statutory norms.
traffic disturbances due to construction material transport and wastes?	√		**Anticipated during construction but temporary, site-specific and can be mitigated.** Linear activities like sewer laying along the roads is likely to disrupt traffic. Vehicle movement for construction purpose will increase the traffic. Identification of alternate routes, allowing limited - at least one-way traffic, prior information about the works and alternative arrangements, providing information/sign boards etc. will reduce the impact.
temporary silt runoff due to construction?	√		**Anticipated during construction but temporary, site-specific and can be mitigated**. EMPs and contract provisions include requirement for contractors to provide silt control measures
hazards to public health due to overflowflooding, and groundwater pollution due to failure of sewerage system?		√	**Not anticipated.** Sewerage system will be designed with applicable standards. Adequately trained staff and necessary equipment will be in place for regular operation and maintenance of the system. Proposed treatment system will be efficient and appropriate repair and maintenance procedure will be developed. Sufficient funds for operation will be ensured. Backup power

SCREENING QUESTIONS	Yes	No	REMARKS
			supply system is part of project.
Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in sewage flow and exposure to pathogens in in untreated sewage and unstabilized sludge?	√		**Anticipated during construction but temporary, site-specific and can be mitigated**. Workers may be exposed during cleaning of blockages in sewerage network. However, O&M Manuals will include standard operating procedures. All necessary health and safety training and personal protection equipment will be given to workers and staff during operation of sewerage system. Implementation of contractors' H&S will be strictly enforced by the PIUs.
Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		✓	**Not anticipated**. Most of the unskilled workers will be hired from local labor force. Some skilled workers may be brought from outside, but numbers will not be so large to have impacts on social infrastructure
Social conflicts between construction workers from other areas and community workers?		✓	**Not anticipated.** Most of the unskilled workers will be hired from local labor force. Some skilled workers may be brought from outside, but numbers will not be so large to have impacts on social infrastructure. No conflicts envisaged.
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?	✓		**Anticipated but temporary, site-specific and can be mitigated.** Construction will not involve use of explosives and chemicals. During operations, chemicals such as pH adjusters, flocculants, or coagulants may be used. The EMPs in the current IEEs already include measures and monitoring requirements conforming with IFC EHS Guidelines. O&M Manuals will include health and safety requirements for managing chemicals
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?	✓		**Anticipated but temporary, site-specific and can be mitigated**. Work area will be clearly demarcated with security access for the workers and project- concerned members only. Community health and safety risks are present during construction such as risks from excavations for pipe laying, equipment and vehicle operations which should be identified and implemented in the site-specific EMPs

Checklist for Preliminary Climate Risk Screening

Country/Project Title: India / Uttarakhand Urban Sector Development Agency (UUSDA) Sewerage Project in Nainital Town

Sector: Urban Development
Subsector: Waste Water
Division/Department:
SARD/SAUW

	Screening Questions	Score	Remarks[1]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	1	The subproject sites are in Nainital which is most vulnerable to climate mediated risks. Mountainous regionsare vulnerable to climate change and have shown "above average warming" in the 20th century. Impacts are expected to range fromreduced genetic diversity of species toerratic rainfall leading to flash floods to glacial melt in the Himalayas leading to increased flooding that will affect water resources within the next few decades.The area is earthquake prone and falls ina region of high to very high seismic hazard. The problem of landslide**,** subsidence and erosion of soil is common in Nainital particularly in the periphery of the Naini Lake. This is due to a combination of several factors like geological movements, structure, lithology, water seepage, soil cover, vegetation cover, weather and climate change. Adequate measures will be included in the designs to safeguard facilities from extreme events The detailed engineering aspectswill be undertaken by contractor with the competent authority's approval. No such issue may affect the project
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorologicalparameters (e.g., sea-level, peak river flow, reliable water level,peak wind speed etc)?	0	No such issue may affect theproject
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	No such issue may affect theproject
Performance of projec toutputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities)	0	Weather conditions may disrupt regular operations of water treatment and

	throughout their design life time?		sewage treatment plants. Moreover, componentsrequire continuous power to operate that may be affected bylow precipitation conditions. Back-up powers (such as solarpanels) may be provided in cases of such extreme event. No problem will envisaged in future which likely affect the performance of project output

Options for answers and corresponding score are provided below:

Respons e	**Score**
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, theproject will be assigned a medium risk category. A total score of 5 or more (which include providinga score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): **Medium Risk Category**

Other Comments: The proposed subproject activity involves construction of one new STP and 5 pre-fabricated packaged STPs and the anticipated environmental impacts are very marginal andthe construction activity does not impose any threat to the existing climatic conditions

Appendix 2: Drinking Water Standards, Ambient Air Quality, Vehicle, Diesel Generator Emissions Standards

Table 1: Applicable Drinking Water Quality Standards for ADB funded projects in India

Group	National Standards for Drinking Water[a]			WHO Guidelines for Drinking-Water Quality, 4th Edition, 2011[b]	Applicable Per ADB SPS [c, d]
	Parameter	Unit	Max. Concentration Limits[d]		
Physical	Turbidity	NTU	1 (5)	-	1 (5)
	pH		6.5 – 8.5	none	6.5 – 8.5
	Color	Hazen units	5 (15)	none	5 (15)
	Taste and Odor		Agreeable	-	Agreeable
	TDS	mg/l	500 (2,000)	-	500 (2,000)
	Iron	mg/l	0.3	-	0.3
	Manganese	mg/l	0.1 (0.3)	-	0.1 (0.3)
	Arsenic	mg/l	0.01 (0.05)	0.01	0.01
	Cadmium	mg/l	0.003	0.003	0.003
	Chromium	mg/l	0.05	0.05	0.05
	Cyanide	mg/l	0.05	none	0.05
	Fluoride	mg/l	1 (1.5)	1.5	1 (1.5)
	Lead	mg/l	0.01	0.01	0.01
	Ammonia	mg/l	0.5	none established	0.5
Chemical	Chloride	mg/l	250 (1,000)	none established	250 (1,000)
	Sulphate	mg/l	200 (400)	none	200 (400)
	Nitrate	mg/l	45	50	45
	Copper	mg/l	0.05 (1.5)	2	0.05 (1.5)
	Total Hardness	mg/l	200 (600)	-	200 (600)
	Calcium	mg/l	75 (200)	-	75 (200)
	Zinc	mg/l	5 (15)	none established	5 (15)
	Mercury	mg/l	0.001	0.006	0.001
	Aluminum	mg/l	0.1 (0.3)	none established	0.1 (0.3)
	Residual Chlorine	mg/l	0.2	5	0.2
Micro Germs	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml			

[a] Bureau of India Standard 10200: 2012.

[b] Health-based guideline values.

[c] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

[d] Figures in parenthesis are maximum limits allowed in the absence of alternate source.

Table 2: Surface Water Quality Classification Criteria

Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6 mg/L or more Biochemical Oxygen Demand 5 days 20°C 2mg/L or les
Outdoor bathing (Organized)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/L or more Biochemical Oxygen Demand 5 days 20°C 3mg/L or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4 mg/L or more Biochemical Oxygen Demand 5 days 20°C 3 mg/L or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4 mg/L or more Free Ammonia (as N) 1.2 mg/L or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5 Electrical Conductivity at 25°C micro mhos/cm Max. 2250 Sodium absorption Ratio Max. 26 Boron Max. 2 mg/L

Source: Central Pollution Control Board

mg/L = milligram per liter, ml = milliliter, MPN = Most Probable Number

Table 3: Ambient Air Quality Standards

Parameter	Location [a]	India Ambient Air Quality Standard ($\mu g/m^3$)[b]	WHO Air Quality Guidelines ($\mu g/m^3$)		Applicable Per ADB SPS[e] ($\mu g/m^3$)
			Global Update [c] 2005	Second Edition 2000	
PM_{10}	Industrial Residential, Rural and Other Areas	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)
	Sensitive Area	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)

Parameter	Location [a]	India Ambient Air Quality	WHO Air Quality Guidelines (µg/m^3)		Applicable Per ADB SPS[e]
PM_{25}	Industrial Residential, Rural and Other Areas	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)	-	10 (Annual) 25 (24-hr)
	Sensitive Area	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)		10 (Annual) 25 (24-hr)
SO_2	Industrial Residential, Rural and Other Areas	50 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	50 (Annual) 20 (24-hr) 500 (10-min)
	Sensitive Area	20 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	20 (Annual) 20 (24-hr) 500 (10-min)
NO_2	Industrial Residential, Rural and Other Areas	40 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	40 (Annual) 80 (24-hr) 200 (1-hr)
	Sensitive Area	30 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	30 (Annual) 80 (24-hr) 200 (1-hr)
CO	Industrial Residential, Rural and Other Areas	2,000 (8-hr) 4,000 (1-hr)	-	10,000 (8-hr) 100,000 (15-min)	2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min)
	Sensitive Area	2,000 (8-hr) 4,000 (1-hr)	-	10,000 (8-hr) 100,000 (15-min)	2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min)
Ozone (O_3)	Industrial Residential, Rural and Other Areas	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
	Sensitive Area	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
Lead (Pb)	Industrial, Residential, Rural and Other Areas	0.5 (Annual) 1.0 (24-hr)		0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
	Sensitive Area	0.5 (Annual) 1.0 (24-hr)		0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
Ammonia (NH_3)	Industrial Residential, Rural and Other Areas	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)

	Sensitive Area	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
Parameter	**Location [a]**	**India Ambient Air Quality**	**WHO Air Quality Guidelines (µg/m^3)**		**Applicable Per ADB SPS[e]**
Benzene (C_6H_6)	Industrial Residential, Rural and Other Areas	5 (Annual)			5 (Annual)
	Sensitive Area	5 (Annual)			5 (Annual)
Benzo(o)pyrene (BaP) particulate phase only	Industrial Residential, Rural and Other Areas	0.001 (Annual)			0.001 (Annual)
	Sensitive Area	0.001 (Annual)			0.001 (Annual)
Arsenic (As)	Industrial Residential, Rural and Other Areas	0.006 (Annual)			0.006 (Annual)
	Sensitive Area	0.006 (Annual)			0.006 (Annual)
Nickel (Ni)	Industrial Residential, Rural and Other Areas	0.02 (Annual)			0.02 (Annual)
	Sensitive Area	0.02 (Annual)			0.02 (Annual)

[a] Sensitive area refers to such areas notified by the India Central Government.

[b] Notification by Ministry of Environment and Forests, Government of India Environment (Protection) SeventhAmendment Rules, 2009

[c] WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006

[d] Air Quality Guidelines for Europe Second Edition. WHO 2000.

[e] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency ofthe government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS

Table 4: Vehicle Exhaust Emission Norms

1. Passenger Cars

Norms	CO(g/km)	HC+ NOx(g/km)
1991Norms	14.3-27.1	2.0(Only HC)
1996 Norms	8.68-12.40	3.00-4.36
1998Norms	4.34-6.20	1.50-2.18

India stage 2000 norms	2.72	0.97
Bharat stage-II	2.2	0.5
Bharat Stage-III	2.3	0.35 (combined)
Bharat Stage-IV	1.0	0.18 (combined)

2. Heavy Diesel Vehicles

Norms	CO(g/kmhr)	HC (g/kmhr)	NOx (g/kmhr)	PM(g/kmhr)
1991Norms	14	3.5	18	-
1996 Norms	11.2	2.4	14.4	-
India stage 2000 norms	4.5	1.1	8.0	0.36
Bharat stage-II	4.0	1.1	7.0	0.15
Bharat Stage-III	2.1	1.6	5.0	0.10
Bharat Stage-IV	1.5	0.96	3.5	0.02

Source: Central Pollution Control Board

CO = Carbon Monixide; g/kmhr = grams per kilometer-hour; HC = Hydrocarbons; NOx = oxides of nitrogen; PM = Particulates Matter

Table 5: Emission limits for New DG sets up to 800 KW
(As per Environment (Protection) (Third Amendment) Rules, 2013)

TABLE

Power Category	Emission Limits (g/kW-hr)			Smoke Limit (light absorption coefficient, m^{-1})
	NOx +HC	CO	PM	
Upto 19 KW	≤ 7.5	≤ 3.5	≤ 0.3	≤ 0.7
More than 19 KW upto 75 KW	≤ 4.7	≤ 3.5	≤ 0.3	≤ 0.7
More than 75 KW upto 800 KW	≤ 4.0	≤ 3.5	≤ 0.2	≤ 0.7

Note:

1. The abbreviations used in the Table shall mean as under: NO_x – Oxides of Nitrogen; HC – Hydrocarbon; CO – Carbon Monoxide; and PM – Particulate Matter.
2. Smoke shall not exceed above value throughout the operating load points of the test cycle.
3. The testing shall be done as per D2 – 5 mode cycle of ISO: 8178- Part 4.
4. The above mentioned emission limits shall be applicable for Type Approval and Conformity of Production (COP) carried out by authorised agencies.
5. Every manufacturer, importer or, assembler (hereinafter referred to as manufacturer) of the diesel engine (hereinafter referred to as 'engine') for genset application manufactured or imported into India or, diesel genset (hereinafter referred to as 'product'), assembled or imported into India shall obtain Type Approval and comply with COP of their product(s) for the emission limits which shall be valid for the next COP year or, the date of implementation of the revised norms specified above, whichever earlier.

   Explanation.- The term 'COP year' means the period from 1st April to 31st March.
6. Stack height (in metres), for genset shall be governed as per Central Pollution Control Board (CPCB) guidelines.

DIESEL GENERATOR SETS : STACK HEIGHT

The minimum height of stack to be provided with each generator set can be worked out using the following formula :

H = h+0.2x ÖKVA
H = Total height of stack in metre
h = Height of the building in metres where the generator set is installed
KVA = Total generator capacity of the set in KVA
Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorised as follows:

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula.

Source : Evolved By CPCB
[Emission Regulations Part IV:COINDS/26/1986-87]

Appendix 3: Ambient Air Quality Standards in Respect of Noise

Receptor/ Source	India: National Noise Level Standards[a] (dBA)		WHO Guidelines Value For Noise Levels Measured Out of Doors[b] (One Hour LA_q in dBA)		Applicable Per ADB SPS[c] (dBA)	
	Day	Night	07:00 – 22:00	22:00 – 07:00	Day time	Night time
Industrial area	75	70	70	70	70	70
Commercial Area	65	55	70	70	65	55
Residential Area	55	45	55	45	55	45
Silent Zone	50	40	55	45	50	40

a- Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010.
b- Guidelines for Community Noise. WHO. 1999
c- Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Noise Limits for Diesel Generator Sets

Environment (Protection) Second Amendment Rules vide GSR 371(E), dated 17th May 2002 at serial no.94 and its amendments vide GSR No 520(E) dated 1st July 2003; GSR 448(E), dated 12th July 2004; GSR 315(E) dated 16th May 2005; GSR 464(E) dated 7th August 2006; GSR 566(E) dated 29th August 2007 and GSR 752(E) dated 24th October 2008; G.S.R. 215 (E), dated 15th March, 2011 under the Environment (Protection) Act, 1986)

Noise Limit for Generator Sets run with Diesel

1. Noise limit for diesel generator sets (upto 1000 KVA) manufactured on or after the 1st January, 2005

The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity upto 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface.

The diesel generator sets should be provided with integral acoustic enclosure at the manufacturing stage itself.

The implementation of noise limit for these diesel generator sets shall be regulated as given in paragraph 3 below.

2. Noise limit for DG sets not covered by paragraph 1.

Noise limits for diesel generator sets not covered by paragraph 1, shall be as follows:-

2.1 Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.

2.2 The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, then averaged.

2.3 The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).

2.4 These limits shall be regulated by the State Pollution Control Boards and the State Pollution Control Committees.

2.5 Guidelines for the manufacturers/ users of Diesel Generator sets shall be as under:-

01. The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB (A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A).
02. The user shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper citing and control measures.
03. Installation of DG set must be strictly in compliance with the recommendations of the DG set manufacturer.
04. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

3.0 Limits of Noise for DG Sets (upto 1000 KVA) Manufactured on or after the 1st January, 2005

3.1 Applicability

01. These rules apply to DG sets upto 1000 KVA rated output, manufactured or imported in India, on or after 1st January, 2005.

02. These rules shall not apply to –

a) DG sets manufactured or imported for the purpose of exports outside India; and

b) DG sets intended for the purpose of sample and not for sale in India.

3.2 Requirement of Certification

Every manufacturer or assembler or importer (hereinafter referred to as the "manufacturer") of DG set (hereinafter referred to as "product") to which these regulations apply must have valid certificates of Type Approval and also valid certificates of Conformity of Production for each year, for all the product models being manufactured or assembled or imported from 1st January, 2005 with the noise limit specified in paragraph 1.

3.3 Sale, import or use of DG sets not complying with the rules prohibited

No person shall sell, import or use of a product model, which is not having a valid Type Approval Certificate and Conformity of Production certificate.

Appendix 4: Effluent Discharge Standards for STPs as per National Green Tribunal (NGT) order dated 30.04.2019

Sl. No.	Parameters	Parameters Limit
1	pH	5.5-9.0
2	BOD (mg/l)	Not more than 10 mg/l
3	COD (mg/l)	Not more than 50 mg/l
4	TSS (mg/l)	Not more than 20 mg/l
5	P-Total (mg/l)- for discharge into ponds/lakes	Not more than 1.0 mg/l
6	N-Total (mg/l)	Not more than 10 mg/l
7	Fecal Coliform (MPN/100ml)	Desirable- Less than 100 MPN/100ml Permissible- 230 MPN/100ml

Note: The standards recommended are applicable to entire country irrespective of Mega and Metropolitan Cities The standards will apply not only for new STPs but also for existing/under construction STPs without any delay

Appendix 5: Extract from Construction and Demolition Management Rules, 2016

[Published In the Gazette of India, Part-II, Section-3, Sub-section (ii)]
Ministry of Environment, Forest and Climate Change

NOTIFICATION

New Delhi, the 29th March, 2016

G.S.R. 317(E).-Whereas the Municipal Solid Wastes (Management and Handling) Rules, 2000 published vide notification number S.O. 908(E), dated the 25th September, 2000 by the Government of India in the erstwhile Ministry of Environment and Forests, provided a regulatory frame work for management of Municipal Solid Waste generated in the urban area of the country;

And whereas, to make these rules more effective and to improve the collection, segregation, recycling, treatment and disposal of solid waste in an environmentally sound manner, the Central Government reviewed the existing rules and it was considered necessary to revise the existing rules with a emphasis on the roles and accountability of waste generators and various stakeholders, give thrust to segregation, recovery, reuse, recycle at source, address in detail the management of construction and demolition waste.

And whereas, the draft rules, namely, the Solid Waste Management Rules, 2015 with a separate chapter on construction and demolition waste were published by the Central Government in the Ministry of Environment, Forest and Climate Change vide G.S.R. 451 (E), datedthe 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date of publication of the said notification;

And Whereas, the objections or suggestions received within the stipulated period were duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by sections 6, 25 of the Environment (Protection) Act, 1986 (29 of 1986), and in supersession of the Municipal Solid Wastes (Management and Handling) Rules, 2000, except as respect things done or omitted to be done before such supersession, the Central Government hereby notifies the following rules for Management of Construction and Demolition Waste –

1. **Short title and commencement.**-(1) These rules shall be called the Construction and Demolition Waste Management Rules, 2016.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. **Application.**-The rules shall apply to every waste resulting from construction, re-modeling, repair and demolition of any civil structure of individual or organisation or authority who generates construction and demolition waste such as building materials, debris, rubble.

3. **Definitions** –(1) In these rules, unless the context otherwise requires,-

(a) " ACT' means the Environment (Protection) Act, 1986 (29 of 1986);

(b) "**construction**" means the process of erecting of building or built facility or other structure, or

building of infrastructure including alteration in these entities.;

(c) **"construction and demolition waste"** means the waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure;

(d) **"de-construction"** means a planned selective demolition in which salvage, re-use and recycling of the demolished structure is maximized;

(e) **"demolition"** means breaking down or tearing down buildings and other structures either manually or using mechanical force (by various equipment) or by implosion using explosives.

(f) **"form" means a Form annexed to these rules;**

(g) **"local authority"** means an urban local authority with different nomenclature such as municipal corporation, municipality, nagarpalika, nagarnigam, nagarpanchayat, municipal council including notified area committee and not limited to or any other local authority constituted under the relevant statutes such as gram panchayat, where the management of construction and demolition waste is entrusted to such agency;

(h) **" schedule"** means a schedule annexed to these rules;

(i) **"service provider'** means authorities who provide services like water, sewerage, electricity, telephone, roads, drainage etc. often generate construction and demolition waste during their activities, which includes excavation, demolition and civil work;

(j) **"waste generator" means any person or association of persons** or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbour and Defence establishments who undertakes construction or demolition of any civil structure which generate construction and demolition waste.

(2) Words and expressions used but not defined herein shall have the same meaning defined in the ACT.

(4) Duties of the waste generator -

(1) Every waste generator shall prima-facie be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules.

(2) The generator shall ensure that other waste (such as solid waste) does not get mixed with this waste and is stored and disposed separately.

(3) Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work and keep the concerned

authorities informed regarding the relevant activities from the planning stage to the implementation stage and this should be on project to project basis.

(4) Every waste generator shall keep the construction and demolition waste within the premise or get the waste deposited at collection centre so made by the local body or handover it to the authorised processing facilities of construction and demolition waste; and ensure that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains.

(5) Every waste generator shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities; Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall have to pay for the processing and disposal of construction and demolition waste generated by them, apart from the payment for storage, collection and transportation. The rate shall be fixed by the concerned local authority or any other authority designated by the State Government.

(5) Duties of service provider and their contractors -

(1) The service providers shall prepare within six months from the date of notification of these rules, a comprehensive waste management plan covering segregation, storage, collection, reuse, recycling, transportation and disposal of construction and demolition waste generated within their jurisdiction.

(2) The service providers shall remove all construction and demolition waste and clean the area every day, if possible, or depending upon the duration of the work, the quantity and type of waste generated, appropriate storage and collection, a reasonable timeframe shall be worked out in consultation with the concerned local authority.

(3) In case of the service providers have no logistics support to carry out the work specified in sub-rules (1) and (2) , they shall tie up with the authorised agencies for removal of construction and demolition waste and pay the relevant charges as notified by the local authority.

(6) Duties of local authority-The local authority shall,-

(1) issue detailed directions with regard to proper management of construction and demolition waste within its jurisdiction in accordance with the provisions of these rules and the local authority shall seek detailed plan or undertaking as applicable, from generator of construction and demolition waste;

(2) chalk out stages, methodology and equipment, material involved in the overall activity and final clean up after completion of the construction and demolition ;

(3c) seek assistance from concerned authorities for safe disposal of construction and demolition waste contaminated with industrial hazardous or toxic material or nuclear waste if any;

(4) shall make arrangements and place appropriate containers for collection of waste and shall remove at regular intervals or when they are filled, either through own resources or by appointing private operators;

(5) shall get the collected waste transported to appropriate sites for processing and disposal either through own resources or by appointing private operators;

(6) shall give appropriate incentives to generator for salvaging, processing and or recycling preferably in-situ;

(7) shall examine and sanction the waste management plan of the generators within a period of one month or from the date of approval of building plan, whichever is earlier from the date of its submission;

(8) shall keep track of the generation of construction and demolition waste within its jurisdiction and establish a data base and update once in a year;

(9) shall device appropriate measures in consultation with expert institutions for management of construction and demolition waste generated including processing facility and for using the recycled products in the best possible manner;

(10) shall create a sustained system of information, education and communication for construction and demolition waste through collaboration with expert institutions and civil societies and also disseminate through their own website;

(11) shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads.

(7) Criteria for storage, processing or recycling facilities for construction and demolition waste and application of construction and demolition waste and its products-

(1) The site for storage and processing or recycling facilities for construction and demolition waste shall be selected as per the criteria given in **Schedule I**;

(2) The operator of the facility as specified in sub- rules (1) shall apply in **Form I** for authorization from State Pollution Control Board or Pollution Control Committee.

(3) The operator of the facility shall submit the annual report to the State Pollution Control Board in **Form II.**

(3) Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in **Schedule II.**

(8) Duties of State Pollution Control Board or Pollution Control Committee-

(1) State Pollution Control Board or Pollution Control Committee shall monitor the implementation of these rules by the concerned local bodies and the competent authorities and the annual report shall be sent to the Central Pollution Control Board and the State Government or Union Territory or any other State level nodal agency identified by the State Government or Union Territory administration for generating State level comprehensive data. Such reports shall also contain the comments and suggestions of the State Pollution Control Board or Pollution Control Committee with respect to any comments or changes required;

(2) State Pollution Control Board or Pollution Control Committee shall grant authorization to construction and demolition waste processing facility in **Form-III** as specified under these rules after examining the application received in **Form I**;

(3) State Pollution Control Board or Pollution Control Committee shall prepare annual report in **Form IV** with special emphasis on the implementation status of compliance of these rules and forward report to Central Pollution Control Board before the 31st July for each financial year.

(9) Duties of State Government or Union Territory Administration-

(1) The Secretary in-charge of development in the State Government or Union territory administration shall prepare their policy document with respect to management of construction and demolition of waste in accordance with the provisions of these rules within one year from date of final notification of these rules.

(2) The concerned department in the State Government dealing with land shall be responsible for providing suitable sites for setting up of the storage, processing and recycling facilities for construction and demolition waste.

(3) The Town and Country planning Department shall incorporate the site in the approved land use plan so that there is no disturbance to the processing facility on a long term basis.

(4) Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control.

(10) Duties of the Central Pollution Control Board - (1) The Central Pollution Control Board shall,-

(a) prepare operational guidelines related to environmental management of construction and demolition waste management;

(b) analyze and collate the data received from the State Pollution Control Boards or Pollution Control Committee to review these rules from time to time;

(c) coordinate with all the State Pollution Control Board and Pollution Control Committees for any matter related to development of environmental standards;

(d) forward annual compliance report to Central Government before the 30th August for each financial year based on reports given by State Pollution Control Boards of Pollution Control Committees.

(11) Duties of Bureau of Indian Standards and Indian Roads Congress -The Bureau of Indian Standards and Indian Roads Congress shall be responsible for preparation of code of practices and standards for use of recycled materials and products of construction and demolition waste in respect of construction activities and the role of Indian Road Congress shall be specific to the standards and practices pertaining to construction of roads.

Schedule III
Timeframe for Planning and Implementation
[See Rule 13]

Sl. No.	Compliance Criteria	Cities with population of 01 million and above	Cities with population of 0.5-01 million	Cities with population of less than 0.5 million
1	Formulation of policy by State Government	12 months	12 months	12 months
2	Identification of sites for collection and processing facility	18 months	18 months	18 months
3	Commissioning and implementation of the facility	18 months	24 months	36 months
4	Monitoring by SPCBs	3 times a year – once in 4 months	2 times a year – once in 6 months	2 times a year – once in 6 months

^*The time Schedule is effective from the date of notification of these rules.*

FORM – I
See [Rule 7 (2)]
Application for obtaining authorisation

To,
The Member Secretary

_____Name of the local authority or Name of the agency appointed by the municipal authority :

Correspondence address Telephone No. Fax No.	
Nodal Officer and designation (Officer authorized by the competent authority or agency responsible for operation of processing or recycling or disposal facility)	
Authorisation applied for (Please tick mark)	Setting up of processing or recycling facility of construction and demolition waste
Detailed proposal of construction and demolition waste processing or recycling facility to include the following Location of site approved and allotted by the Competent Authority. Average quantity (in tons per day) and composition of construction and demolition waste to be handled	

Appendix 6: Salient Features of Major Laws Applicable to Establishments Engaged in Construction of Civil Works

(i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be;
(b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.

(iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(v) Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.
(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads and Runways are scheduled employment.
(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out

by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946-It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

(xv) Construction and Demolition Waste Management Rules 2016- This Rule stipulate that-

- Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities
- Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains.
- Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodelling work,
- Large generators shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C & D Waste.
- Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar,
- Large generators shall pay relevant charges for collection, transportation,

processing and disposal as notified by the concerned authorities;

(xvi) Solid Waste Management Rules 2016- As per this Rule responsibility of Solid Waste Generator is as below.

- segregate and store the waste generated in three separate streams namely bio- degradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;
- store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; and
- No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.

(xvii) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government. Salient features of this Act are given below.

Employer shall-

- Provide and maintain, at suitable point, sufficient quantity of wholesome drinking water, such point shall be at least 6 meters away from any washing areas, urinals or toilets
- Provide sufficient urinals and latrines at convenient place, easily accessible by workers
- Provide free of charge, temporary living accommodations near to work sites with separate cooking place, bathing and lavatory facilities and restore the site as pre conditions after completing the construction works
- Provide crèche with proper accommodation, ventilation, lighting, cleanliness and sanitation if more than fifty female workers are engaged
- Provide first aid facilities in all construction sites

For safety of workers employer shall provide-

- Safe access to site and work place
- Safety in demolition works
- Safety in use of explosives
- Safety in operation of transporting equipment's and appoint competent person to drive or operate such vehicles and equipment's
- Safety in lifting appliance, hoist and lifting gears

- Adequate and suitable lighting to every work place and approach
- Prevention of inhalation of dust, smoke, fumes, gases during construction works and provide adequate ventilation in work place and confined space
- Safety in material handling and stacking/un stacking
- Safeguarding the machinery with fly-wheel of moving parts
- Safe handling and use of plants operated by compressed air
- Fire safety
- Limit of weight to be lifted by workers individually
- Safety in electric wires, apparatus, tools and equipment
- Provide safety net, safety sheet, safety belts while working at height (more than1.6 mtrs as per OSHA)
- Providing scaffolding, ladders and stairs, lifting appliances, chains and accessories where required
- Safety in pile works, concrete works, hot asphalt, tar, insulation, demolition works, excavation, underground construction and handling materials
- Provide and maintain medical facilities for workers
- Any other matters for the safety and health of workers

Appendix 7: IBAT Proximity Report for Proposed 17.5 MLD STP at Nainital

IBAT

Proximity Report

IND UDDP - NANITAL PROPOSED STP 18MLD

Country: India

Location: [29.4, 79.4]

Date of analysis: 16 June 2020

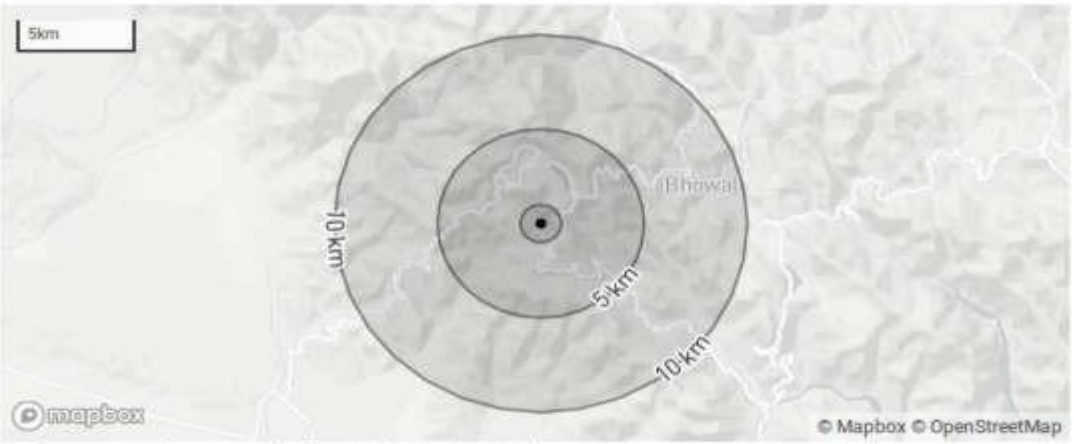
Buffers applied: 1.0 km | 5.0 km | 10.0 km

Generated by: Ninette Pajarillaga

Company/Subscriber: ADB

Overlaps with:

Protected Areas	0
Key Biodiversity Areas	0
IUCN Red List	64



Displaying project location and buffers: 1.0 km, 5.0 km, 10.0 km

About this report

This report presents the results of [954-9763] proximity analysis to identify the biodiversity features and species which are located within the following buffers: 1.0 km, 5.0 km, 10.0 km.

This report is one part of a package generated by IBAT on 16 June 2020 that includes full list of all species, protected areas, Key Biodiversity Areas in CSV format, maps showing the area of interest in relation to these features, and a 'How to read IBAT reports' document.

Data used to generate this report

- UNEP-WCMC and IUCN, 2020. Protected Planet: The World Database on Protected Areas (WDPA)[On-line], Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net - June 2020.
- BirdLife International (on behalf of the KBA Partnership), 2019. Key Biodiversity Areas - October 2019.
- IUCN, 2020. IUCN Red List of Threatened Species - June 2020.

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Protected Areas

The following protected areas are found within 1.0 km, 5.0 km, 10.0 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

No protected areas within buffer distance

Key Biodiversity Areas

The following key biodiversity areas are found within 1.0 km, 5.0 km, 10.0 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

No KBAs within buffer distance

IUCN Red List of Threatened Species

The following threatened species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.

Species name	Common name	IUCN Category	Taxonomic Class
Amblyceps arunchalensis		EN	Actinopterygii
Anacyclus pyrethrum	Atlas daisy	VU	Magnoliopsida
Antigone antigone	Sarus crane	VU	Aves
Aonyx cinereus	Asian small-clawed otter	VU	Mammalia
Aquila heliaca	Eastern imperial eagle	VU	Aves
Aquila nipalensis	Steppe eagle	EN	Aves
Aquila rapax	Tawny eagle	VU	Aves
Axis porcinus	Hog deer	EN	Mammalia

IBAT

Species name	Common name	IUCN Category	Taxonomic Class
Aythya ferina	Common pochard	VU	Aves
Bangana almorae		VU	Actinopterygii
Batagur dhongoka	Three-striped roofed turtle	CR	Reptilia
Bovista paludosa	Fen puffball	VU	Agaricomycetes
Buceros bicornis	Great hornbill	VU	Aves
Catreus wallichii	Cheer pheasant	VU	Aves
Chaetornis striata	Bristled grassbird	VU	Aves
Ciconia episcopus	Asian woollyneck	VU	Aves
Clanga clanga	Greater spotted eagle	VU	Aves
Clanga hastata	Indian spotted eagle	VU	Aves
Crocodylus palustris	Mugger	VU	Reptilia
Cuon alpinus	Dhole	EN	Mammalia
Cyprinus carpio		VU	Actinopterygii
Elephas maximus	Asian elephant	EN	Mammalia
Emberiza aureola	Yellow-breasted bunting	CR	Aves
Falco cherrug	Saker falcon	EN	Aves
Francolinus gularis	Swamp francolin	VU	Aves

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Species name	Common name	IUCN Category	Taxonomic Class
Gallinago nemoricola	Wood snipe	VU	Aves
Gyps bengalensis	White-rumped vulture	CR	Aves
Gyps indicus	Indian vulture	CR	Aves
Gyps tenuirostris	Slender-billed vulture	CR	Aves
Haliaeetus leucoryphus	Pallas's fish-eagle	EN	Aves
Houbaropsis bengalensis	Bengal florican	CR	Aves
Indotestudo elongata	Elongated tortoise	CR	Reptilia
Leptoptilos javanicus	Lesser adjutant	VU	Aves
Lutrogale perspicillata	Smooth-coated otter	VU	Mammalia
Manis crassicaudata	Indian pangolin	EN	Mammalia
Manis pentadactyla	Chinese pangolin	CR	Mammalia
Marmaronetta angustirostris	Marbled teal	VU	Aves
Melursus ursinus	Sloth bear	VU	Mammalia
Moschus leucogaster	Himalayan muskdeer	EN	Mammalia
Mulleripicus pulverulentus	Great slaty woodpecker	VU	Aves
Nanorana minica		VU	Amphibia
Neophron percnopterus	Egyptian vulture	EN	Aves

IBAT

Species name	Common name	IUCN Category	Taxonomic Class
Ophiophagus hannah	King cobra	VU	Reptilia
Ophrysia superciliosa	Himalayan quail	CR	Aves
Oryza malampuzhaensis		VU	Liliopsida
Oxyura leucocephala	White-headed duck	EN	Aves
Panthera pardus	Leopard	VU	Mammalia
Panthera tigris	Tiger	EN	Mammalia
Ploceus megarhynchus	Finn's weaver	VU	Aves
Prinia cinereocapilla	Grey-crowned prinia	VU	Aves
Prionailurus viverrinus	Fishing cat	VU	Mammalia
Rhinoceros unicornis	Greater one-horned rhino	VU	Mammalia
Rusa unicolor	Sambar	VU	Mammalia
Rynchops albicollis	Indian skimmer	VU	Aves
Sarcogyps calvus	Red-headed vulture	CR	Aves
Saxicola insignis	White-throated bushchat	VU	Aves
Saxicola macrorhynchus	White-browed bushchat	VU	Aves
Sterna acuticauda	Black-bellied tern	EN	Aves
Tetracerus quadricornis	Four-horned antelope	VU	Mammalia

IBAT

Species name	Common name	IUCN Category	Taxonomic Class
Tor putitora		EN	Actinopterygii
Tricula mahadevensis		VU	Gastropoda
Ursus thibetanus	Asiatic black bear	VU	Mammalia
Vanellus gregarius	Sociable lapwing	CR	Aves
Wallago attu		VU	Actinopterygii

IBAT

Recommended citation

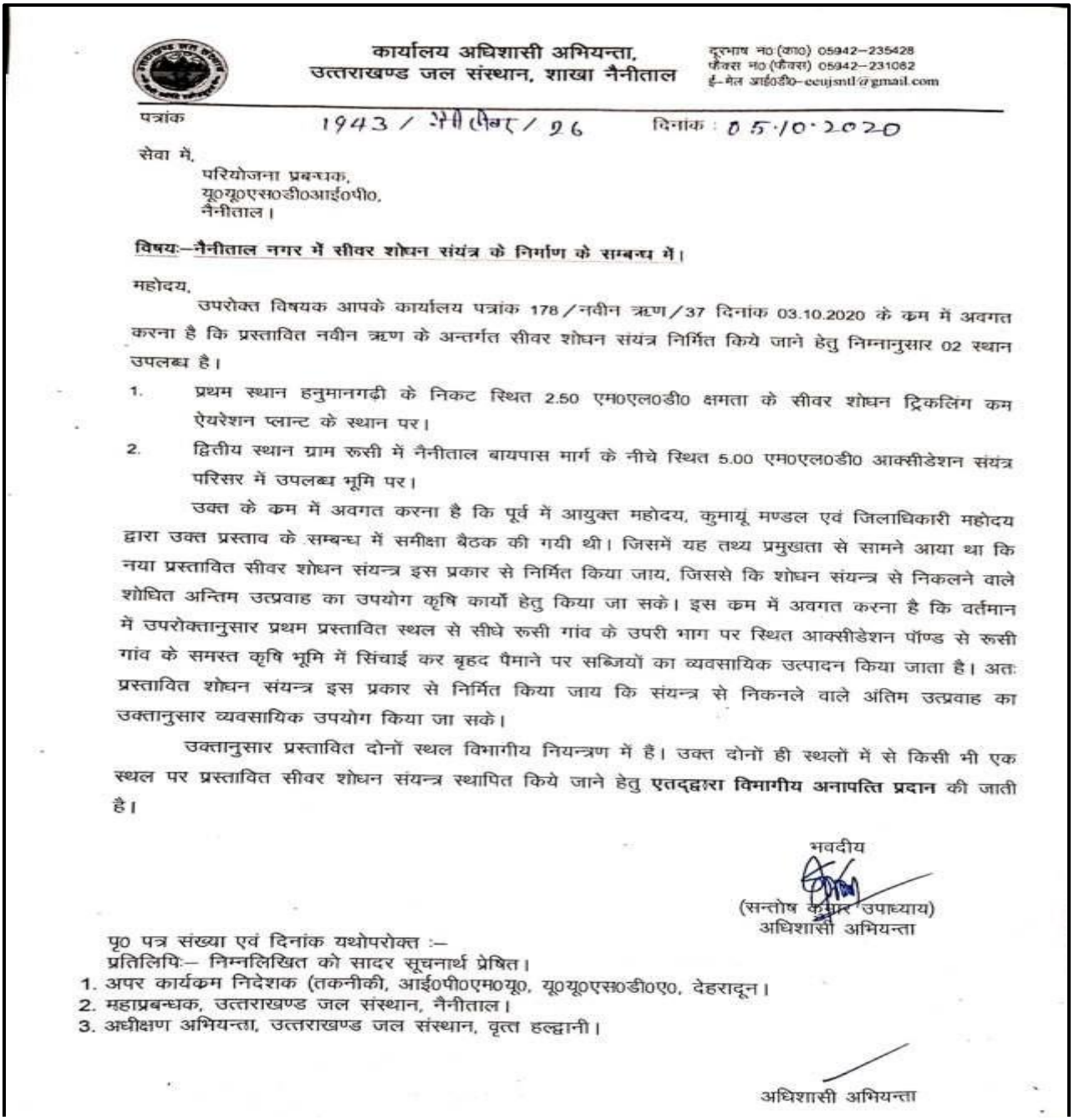
IBAT Proximity Report, 2018. Generated under licence 954-9763 from the Integrated Biodiversity Assessment Tool on 16/06/2020. http://www.ibat-alliance.org

How to use this report

This report provides an indication of the potential biodiversity-related features - protected areas, key biodiversity areas and species - close to the specified location. It provides an early indication of potential biodiversity concerns, and can provide valuable guidance in making decisions. For example, this information can be helpful when assessing the potential environmental risk and impact of a site, categorising investments/projects, preparing the terms of reference for an impact assessment, focusing attention on key species of conservation concern and sites of known conservation value, and reviewing the results of an impact assessment.

The report does not provide details of potential indirect, downstream or cumulative impacts. Furthermore, the report should be regarded as a "first-step", providing a set of conservation values sourced from global data sets, and is not a substitute for further investigation and due diligence, especially concerning national and/or local conservation priorities.

Appendix 8: Land NOC for the Proposed STP Land at Russi Village,Nainital



कार्यालय अधिशासी अभियन्ता,
उत्तराखण्ड जल संस्थान, शाखा नैनीताल

दूरभाष नं0 (का0) 05942–235428
फैक्स नं0 (फैक्स) 05942–231082
ई–मेल आई0डी0–eeujsntl@gmail.com

पत्रांक 1943 / Nainital / 26 दिनांक : 05·10·2020

सेवा में,
परियोजना प्रबन्धक,
यू0यू0एस0डी0आई0पी0,
नैनीताल।

विषयः—नैनीताल नगर में सीवर शोधन संयंत्र के निर्माण के सम्बन्ध में।

महोदय,

उपरोक्त विषयक आपके कार्यालय पत्रांक 178/नवीन ऋण/37 दिनांक 03.10.2020 के क्रम में अवगत करना है कि प्रस्तावित नवीन ऋण के अन्तर्गत सीवर शोधन संयंत्र निर्मित किये जाने हेतु निम्नानुसार 02 स्थान उपलब्ध है।

1. प्रथम स्थान हनुमानगढ़ी के निकट स्थित 2.50 एम0एल0डी0 क्षमता के सीवर शोधन ट्रिकलिंग कम ऐयरेशन प्लान्ट के स्थान पर।
2. द्वितीय स्थान ग्राम रूसी में नैनीताल बायपास मार्ग के नीचे स्थित 5.00 एम0एल0डी0 आक्सीडेशन संयंत्र परिसर में उपलब्ध भूमि पर।

उक्त के क्रम में अवगत करना है कि पूर्व में आयुक्त महोदय, कुमायूं मण्डल एवं जिलाधिकारी महोदय द्वारा उक्त प्रस्ताव के सम्बन्ध में समीक्षा बैठक की गयी थी। जिसमें यह तथ्य प्रमुखता से सामने आया था कि नया प्रस्तावित सीवर शोधन संयन्त्र इस प्रकार से निर्मित किया जाय, जिससे कि शोधन संयन्त्र से निकलने वाले शोधित अन्तिम उत्प्रवाह का उपयोग कृषि कार्यों हेतु किया जा सके। इस क्रम में अवगत करना है कि वर्तमान में उपरोक्तानुसार प्रथम प्रस्तावित स्थल से सीधे रूसी गांव के उपरी भाग पर स्थित आक्सीडेशन पॉण्ड से रूसी गांव के समस्त कृषि भूमि में सिंचाई कर बृहद पैमाने पर सब्जियों का व्यवसायिक उत्पादन किया जाता है। अतः प्रस्तावित शोधन संयन्त्र इस प्रकार से निर्मित किया जाय कि संयन्त्र से निकनले वाले अंतिम उत्प्रवाह का उक्तानुसार व्यवसायिक उपयोग किया जा सके।

उक्तानुसार प्रस्तावित दोनों स्थल विभागीय नियन्त्रण में हैं। उक्त दोनों ही स्थलों में से किसी भी एक स्थल पर प्रस्तावित सीवर शोधन संयन्त्र स्थापित किये जाने हेतु **एतद्द्वारा विभागीय अनापत्ति प्रदान** की जाती है।

भवदीय

(सन्तोष कुमार उपाध्याय)
अधिशासी अभियन्ता

पृ0 पत्र संख्या एवं दिनांक यथोपरोक्त :—
प्रतिलिपिः— निम्नलिखित को सादर सूचनार्थ प्रेषित।
1. अपर कार्यक्रम निदेशक (तकनीकी, आई0पी0एम0यू0, यू0यू0एस0डी0ए0, देहरादून।
2. महाप्रबन्धक, उत्तराखण्ड जल संस्थान, नैनीताल।
3. अधीक्षण अभियन्ता, उत्तराखण्ड जल संस्थान, वृत्त हल्द्वानी।

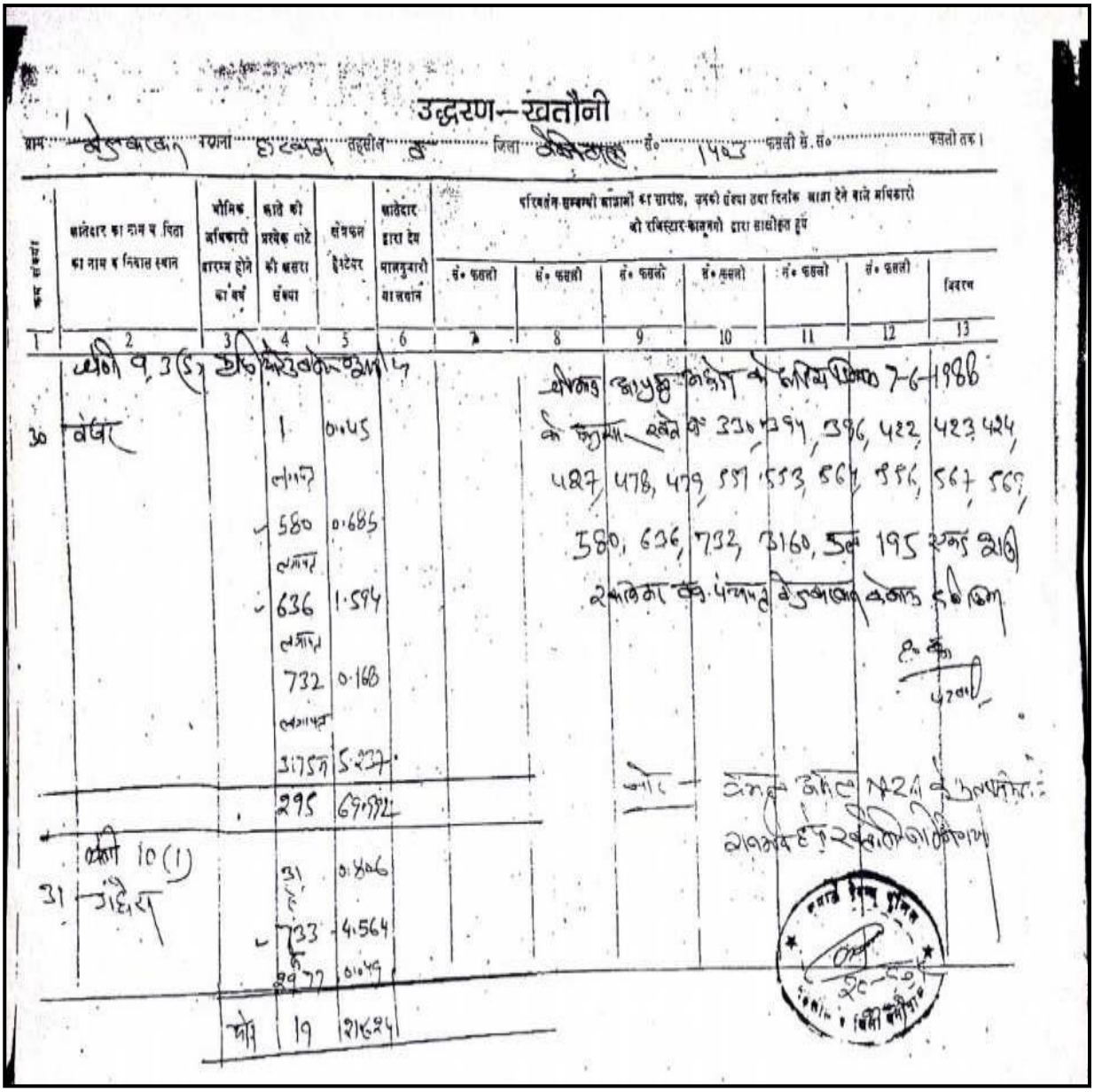
अधिशासी अभियन्ता

TRANSCRIPTION

Executive Engineer, Uttarakhand Peyjal Nigam vide it's letter 1943/Nainital Sewer/26 dated 05.10.2020 in response to the letter issued by UUSDA letter number 178/ Naveen loan/ 37 December dated 03.10.2020 for NOC for use of land at existing oxidation plant premises forwarded the No objection Letter stating the said land in Roosi village site is under the

possession of the department and UJN has no objection in transferring the land to UUSDA for the construction of STP under ADB's new loan

Based on the joint inspection done by the Sarpanch, Revenue Inspector, Junior Engineer-Uttarakhand Peyjal Nigam and Assistant Engineer Uttarakhand Peyjal Nigam, Nainital for proposed transfer of barren land under the khatoni number 636, 580, 733 (total khasra 03, area 2.145 Hectare) of gross are of 2.145 hectare is transferred to Uttarakhand Peyjal Nigam for construction of one unit of Sewerage treatment plant.



उद्धरण–खतौनी

क्रम संख्या	आसेदार का नाम व पिता का नाम व निवास स्थान	भौमिक अधिकारी प्रारम्भ होने का वर्ष	खाते की प्रवेक पाटे की खसरा संख्या	क्षेत्रफल हैक्टेयर	आसेदार द्वारा देय मालगुजारी या लगान	परिवर्तन सम्बन्धी आज्ञाओं का संक्षेप, उनकी संख्या तथा दिनांक आज्ञा देने वाले अधिकारी की रजिस्टर-कानूनगो द्वारा साक्षीकृत हुए						
						सं० फसली	सं० फसली	सं० फसली	सं० फसली	सं० फसली	सं० फसली	विवरण
1	2	3	4	5	6	7	8	9	10	11	12	13
30	वेखा		1	0.045								
			580	0.685								
			636	1.594								
			732	0.168								
			3175	5.227								
			295	69.992								
31			31	0.406								
			733	4.564								
			2977	0.045								
	जोड़		19	21624								

संयुक्त निरीक्षण का प्रमाण पत्र--

ईको संवर्धन एवं प्र० पी० के सीवरेज ट्रीटमेन्ट प्लान्ट हेतु कमिश्नर कुमाऊँ के निर्देशानुसार आज दि० 4-09-04 को निम्न अधिकारियों/जनप्रतिनिधियों द्वारा ग्राम रुसी (केनुवाखान) की वन पंचायत भूमि का संयुक्त निरीक्षण किया गया। जिस हेतु उक्त वन पंचायत की 2.145 है० भूमि उत्तरांचल पेयजल निगम को लीज पर दिया जाना प्रस्तावित है। जिस हेतु क्रं० न०1 में 0.135 है०, एवं क्रं० न० 2 में (खेत नं० 636 मध्य 60 नाली - 1.206 है०, खेत न० 580 मध्य 20 नाली - 0.204 है० एवं खेत मध्य 733 मध्य 20 नाली - 0.204 है०) 2.01 है० कुल 2.145 है० भूमि का चयन कर प्रस्तावित किया गया। निरीक्षण के समय पाया गया कि उपरोक्त ट्रीटमेन्ट योजना हेतु प्रस्तावित वन पंचायत की भूमि के अतिरिक्त अन्य कोई भूमि उपलब्ध नहीं है।

अतः निश्चित किया जाता है कि योजना के निर्माण के लिये प्रश्नगत वन पंचायत की वनभूमि को उत्तरांचल पेयजल निगम को लीज पर दिया जाना है।

निरीक्षक	पटवारी/लेखपाल	जूनियर इंजीनियर	सहा० अभियन्ता
वन पंचायत निरीक्षक	राजस्व विभाग	पेयजल निगम नैनीताल	पेयजल निगम नैनीताल

Appendix 9: Sample Chance find Protocol

Introduction

Project town being a heritage town, there are possibility of any chance finds (artefacts) recovery during excavations. Contractors working at heritage towns must take additional care not to destroy or damage historic features during excavations. There may be many buried historic features in heritage towns such as – idols, toys, wells, ancient drains, remains of buildings, other walls, grain pits, etc. Every care must be made not to destroy these during excavations.

Excavator drivers need to be instructed to be aware of hitting buried features and that they must be investigated before continuing work. When features are encountered during mechanical excavation, work should stop and the PIU/Consultants engineers must be informed immediately so that they can be inspected at the first opportunity.

When historic features such as walls, brick constructions and other features are encountered during excavation the excavation must be stopped immediately and the PIU/Consultants must be informed immediately.

1.1 **Contractors' instruction**: As soon as contractor recovers any chance find during any excavation works for pipe laying, they should immediately inform PIU/Consultant present in town about the chance find recovery. Immediately stop the excavation activity near point of recovery. After PIU/consultants engineers come at site, contractor should follow cleaning and photography in supervision of PIU/Consultant engineers.

1.2 **Cleaning** - When a feature/chance find is discovered it must be defined by careful cleaning. Roots must be removed and dirt must be carefully cleaned away. The section or trench base should also be cleaned back for a little distance around the feature.

1.3 **Record photography** – When the feature is clean good photography should be taken – vertical and face-on shots and a few general shots of the feature, also showing its position in relation to surrounding features, buildings, etc. The photographed should be catalogued (date, location, direction of shot)

1.4 **Drawn record -** When features/chance finds are revealed a drawn record should also be made.

a. General location record – measuring its position and orientation within the protected site / in relation to surrounding structures
b. Record drawings – detail drawings made in plan and section/profile. The extent (edges) of the feature should be drawn and the level of the existing ground surface and the top and base of the feature should be recorded. These levels should be marked on the drawings. The drawings should include detail of the construction of the feature. Perspective sketches could also be made if necessary. Explanatory notes can also be put on the drawings.

1.5 **Reporting finds -** When finds are made these should be reported to PIU/Consultants. Photographs and record drawings should be sent.

1.6 **Discovery of historic objects -** When clearance and excavation takes place artefacts and historic objects are sometimes found. These should be recovered and kept in a safe place. The place of discovery should be recorded and each find given a number and tag
tied to the find with the same number on it. A list of the finds should be kept (with the find No. And place of discovery and date of discovery recorded).

1.7 **PIU/Consultants responsibility-** PIU/Consultants should inform in written to the State Archaeological Department at the earliest with photographs and request to Archaeology Department to visit the site and hand over the chance finds to them.

Appendix 10: Guidelines for Sewerage System Operations, Reuse of TreatedEffluent and Sludge from STP for Beneficial Purposes

(Source: Manual on Sewerage and Sewage Treatment Systems, CPHEEO, Ministry of Urban Development, Govt. of India)

Health Hazards during Sewage Operations

Laborers working on the sewage treatment and operations may suffer from a number of aliments directly attributed to handling of sewage. In view of this it is desirable to disinfect sewage and where feasible mechanize sewage operations.

The staff of sewage operations must be well educated in the sanitary rules on the utilization of sewage for irrigation as well as with personal hygiene. All persons working in sewage farms must undergo preventive vaccination against enteric infections and annual medical examination for helminthiases and be provided treatment if necessary.

Sewage treatment plants should be provided with adequate space for canteens with proper sanitation, wash-stands and lockers for irrigation implements and protective clothing. Safe drinking water must be provided for the workers and for population residing within the effective range of the sewage treatment plants.

All workers should be provided with gum boots and rubber gloves, which must compulsorily be worn while at work. They should be forced to observe personal hygiene such as washing after work as well as washing before taking food. The use of antiseptics in the water used for washing should be emphasized. The farm worker should be examined medically at regular intervals and necessary curative measures enforced.

Mitigation measures to avoid Health Hazards

Personal Hygiene against Pathogen

The worker should take precautions because a large number of coliform groups, various kinds of micro-organisms, and egg parasites exist in sewage. The workers should strive to maintain good health by taking care of the following points:

- Wear clean uniform, work boots, etc.
- After work and before having a meal, always wash hands and disinfect them.
- After work, take a shower if possible.
- Do not enter the offices and lounges wearing dirty clothes.
- If necessary, take vaccinations against tetanus, leptospirosis fever and so on

Maintaining Cleanliness The worker should maintain each facility in a clean and neat condition.

• The floors of workrooms, stairs and corridors should be cleaned at the appropriate frequency to maintain them in a clean condition
• Disinfection of relevant locations is to be carried out periodically.

Health Check Workers should receive health check once a year to maintain their health, and prevent illnesses or detect them at an early stage. The results of the health check should be maintained as records. Recommended items to be inspected during the health check are as given below.

• Examine medical history.
• Examine subjective symptoms and other objective symptoms.
• Check height, weight, vision and hearing ability.
• Chest X-ray examination.
• Blood pressure measurement.
• Check for anaemia.
• Check for liver functions.
• Check for lipids in blood.
• Check blood sugar level
• Urine analysis.
• Electrocardiogram analysis

Welfare Measures The Sanitation Workers (Regulation of Employment and Conditions of Service) Act 2012 proposes constitution of a Sanitation Workers State Welfare Board to exercise powers conferred on it and to perform welfare functions such as the following for sanitation workers:

• Provide immediate assistance to a beneficiary in case of an accident
• Sanction of loan and advances
• Medical expenses for treatment of major ailments
• Financial assistance for education of children
• Payment of maternity benefits
• Make provision and improvement of welfare measures and facilities as may be prescribed

Corrective Measures When a worker has symptoms of an illness listed above, the plant engineer should ensure that the worker is checked-up by a specialist doctor and receives proper treatment and care and should take the following actions considering the content of work done by the worker:

• Change the workplace if necessary
• Change the content of the work
• Shorten the working hours
• Perform relevant measurements of the working environment
• Maintain the facility or equipment

Risks in use of treated effluent and sludge in agriculture practices

Cultivation of crops that are eaten raw should be banned. Cultivation of paddy in bonded fields is likely to give rise to sanitation problems and hence is undesirable. Growing of non-edible commercial crops like cotton, jute, fodder, milling varieties of sugarcane and tobacco would be suitable. Cultivation of grasses and fodder legumes, medicinal and essential oil yielding plants like menthol and citronella may be allowed. Cultivation of cereals, pulses, potatoes and other crops that are cooked before consumption may be permitted, if sewage is treated and care is taken in handling the harvests to ensure that they are not contaminated. Cultivation of crop exclusively under seed multiplication programmes would be advantageous as these are not consumed. As an additional safeguard, sewage irrigation should be discontinued at least two months in advance of harvesting of fruits and berries, one month for all kinds of vegetables and a fortnight for all other crops. Direct grazing on sewage irrigated farms should be prohibited.

Risks of Nutrient Loading in Agriculture

Crops receiving excessive dosage of nitrogen show superfluous vegetative growth and decrease in grain or fruit yield. The phosphate deficit of sewage, therefore, should be made good by supplementing with phosphate fertilizers, the extent of phosphate fortification depending upon the nature of crop and its phosphate requirements. As the availability of phosphate is low in the Irrigation water it would be desirable to apply the required quantity of phosphatic fertilizer at the time or even (about a fortnight) before the sowing or planting of the crop. Even when sewage nutrients are balanced by fortification, irrigation with such sewage may supply excessive amount of nutrients resulting in waste or unbalanced growth of plants with adverse effects on yields. It may therefore be necessary to dilute the sewage. Dilution also helps in reducing the concentration of dissolved salts and decomposable organic matter in the sewage thus, decreasing hazards to the fertility of the soil. It is desirable to limit the BOD and total suspended solids of sewage to be disposed on land for irrigation, as per relevant standards. There is a need to take caution on describing nutrient supply capacity of sewage particularly in the case of availability of phosphorus because there is a possible conversion of available phosphorus in unavailable mode in the presence of heavy metals present in the sewerage. This happens commonly in high as well as low pH soils.

Alternative Arrangement during Non-irrigating Periods

During rainy and non-irrigating seasons, agricultural practices may not need any water for irrigation. Even during irrigating season, the water requirement fluctuates significantly. Hence, satisfactory alternative arrangements have to be made for the disposal of sewage on such occasions either by storing the excess sewage or discharging it elsewhere without creating environmental hazards. The following alternatives are generally considered: a) Provision of holding lagoons for off-season storage. They enable irrigation of a field area of land to varying rates of crop demand. They may also serve as treatment units such as aerated or stabilization lagoons, provided the minimum volume required for treatment is provided beyond the flow-balancing requirement. b) Provision of additional land where treated sewage is not required on the main plot of land c) Discharge of surplus treated sewage to river or into sea with or without additional treatment. Combining surface discharge facilities with irrigation system is quite common and often quite compatible. d) Resorting to artificial recharge in combination with an irrigation system where feasible.

Treated Sewage into Perennial Rivers

When sewage is treated and discharged into perennial flowing rivers and the blended river water is drawn downstream of the point of such blending as raw water for treatment in public water supply schemes. This is indirect potable use after blending. This is historical and ongoing all around. However, of late, the organic load due to the discharged treated, partially treated and non-point sewage becomes in excess of the self-purifying capacity of the river. Thus, the river water is not actually fresh water. The water quality of Yamuna river for Agra water supply scheme requires to be fist treated in MBBR to purify the river water to a level as raw water for the downstream WTP. When it passes through flowing surface water it has the potential disadvantages of contamination by human and animal activities adding organic matter and waterborne pathogens unless the river stretch is protected from such activities. The guiding principle in such cases for the ULBs will be to at least intercept the sewage outfalls and provide adequate STPs and follow the recommended quality criteria for the treated sewage.

Treated Sewage into Non-Perennial / Dry River Courses

There are locations where the rivers are not perennial or almost dry throughout the year except some monsoon runoff. In this case the discharged treated sewage sinks into the aquifer zone and is extracted by infiltration wells or galleries. The advantage of direct dilution from surface water is lost, but the additional purification in the soil and dilution from the aquifer water are happening. An example is the case of the Palar river course in Tamilnadu. The surface water flow in this occurs only for about a week if the monsoon is normal and if the water spills beyond the upstream impoundments. The aquifer however supports the public water supply of over 30 habitations along its dry tract of nearly 80 km before the sea. The partly treated sewage of the en-route habitations does reach this river course as intervals. So far, no epidemics have been met with. This may be due to the above said additional purification in the soil and dilution by aquifer water. However, if these are exceeded by the contamination load, there can be immediate health problems. The guiding principle in such cases for the ULBs will be (a) to keep a check on the raw water quality from the infiltration wells to detect sudden increase in contaminants and (b) at least intercept the sewage outfalls and provide adequate STPs

Appendix 11: Sample Outline Spoil Management Plan

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the ULB, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils.
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like a) The type/material, b) Potential contamination by that type, c) Expected volume (site/component specific), d) Spoil Classification etc.

II. Spoils management

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. Documentation

The volume of spoil generated (site specific, date wise), site disposed, reuse / disposal details should be documented properly.

Appendix 12: Sample Outline Traffic Management Plan

A. Principles for TMP around the Water Pipes/Sewer Construction Sites

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:

(i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
(ii) protection of work crews from hazards associated with moving traffic;
(iii) mitigation of the adverse impact on road capacity and delays to the road users;
(iv) maintenance of access to adjoining properties; and
(v) Addressing issues that may delay the project.

B. Operating Policies for TMP

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

(i) Make traffic safety and temporary traffic control an integral and high-priority element of project from planning through design, construction, and maintenance.
(ii) Inhibit traffic movement as little as possible.
(iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
(iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
(v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
(vi) Train all persons that select, place, and maintain temporary traffic control devices.
(vii) Keep the public well informed.
(viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

3. **Figure A2 to Figure A12** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure

4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

(i) approval from the ULB/Public Works Department (PWD) to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, PWD, etc.,

regarding the mitigation measures necessary at the detours where the road is diverted during the construction;

(iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;

(iv) determining if additional traffic control or temporary improvements are needed along the detour route;

(v) considering how access will be provided to the worksite;

(vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and

(vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

5. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the detour street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure A1: Policy Steps for the TMP

D. Public awareness and notifications

6. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

7. The PIU will also conduct an awareness campaign to educate the public about the following issues:

(i) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
(ii) Defensive driving behaviour along the work zones; and
(iii) Reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centres. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

(iv) explain why the brochure was prepared, along with a brief description of the project;
(v) advise the public to expect the unexpected;
(vi) educate the public about the various traffic control devices and safety measures adopted at the work zones;
(vii) educate the public about the safe road user behaviour to emulate at the work zones;
(viii) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
(ix) Indicate the office hours of relevant offices.

E. Install traffic control devices at the work zones and traffic diversion routes

10. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices

are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, and traffic speed and volumeand pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

12. **Figure A2 to Figure A12** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Lane closure on a two-line road with low volume (with yield sign)
- Lane closure on a two-line road with low volume (one flagger operation)
- Lane closure on a two lane road (two flagger operation)
- Lane closure on a four lane undivided Road
- Lane closure on divided roadway
- Half road closure on multi-lane roadway
- Street closure with detour

13. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space requiredfor delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

14. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons(preferably the LED type) for regulating the traffic during night time.

15. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. Thereshould be provision for lighting beacons and illumination for night constructions.