

# Initial Environmental Examination

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India: Himachal Pradesh Rural Drinking Water Improvement and Livelihood Project – Shimla Zone (CW:SZ 03), District: Solan

Prepared by Jal Shakti Viibhag Government of Himachal Pradesh for the Asian Development Bank.



## **CURRENCY EQUIVALENTS**

(as of 5 December 2021)

Currency unit – Indian rupee (₹)

₹1.00 = \$0.0133

\$1.00 = ₹75.234

## **ABBREVIATIONS**

ADB	- Asian Development Bank
AESEO	- Assistant Engineer (Safeguard/Environment) Officer
CFE	- Consent for Establishment
CFO	- Consent for Operation
CPCB	- Central Pollution Control Board
DBO	- Design-Build-Operate
DMS	- Detailed Measurement Survey
EAC	- Expert Appraisal Committee
EHS	- Environmental Health & Safety
EIA	- Environmental Impact Assessment
EMP	- Environmental Management Plan
ESR	- Elevated Service Reservoir
ESS	- Environment Safeguard Specialist
GOI	- Government of India
GOHP	- Government of Himachal Pradesh
GWSS	- Gravity Water Supply Scheme
FGD	- Focus Group Discussions
GoHP	- Government Of Himachal Pradesh
GRC	- Grievance Redressal Committee
GRM	- Grievance Redress Mechanism
HPPCB	- Himachal Pradesh Pollution Control Board
IEE	- Initial Environmental Examination
JSV	- Jal Shakti Vibhag
LARRA	- Land Acquisition, Rehabilitation and Resettlement Authority
LPCD	- liters per capita per day
LWSS	- Lift Water Supply Scheme
MOEF& CC	- Ministry of Environment and Forest & Climate Change
NGO	- Non-Government Organization
NOC	- No Objection Certificates
PDMSC	- Project Design Management and Supervision Consultant
PMU	- Project Management Unit
PWD	- Public Works Department
RFCTLARR	- Right To Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013
RORWSSHP	- Remodeling / Renovation of Old Rural Water Supply Schemes of Himachal Pradesh
REA	- Rapid Environmental Assessment Checklist
ROW	- rights-of-way
HPRDWILP	- Himachal Pradesh Rural Drinking Water Improvement and Livelihood Project

SEC	-	State-Level Empowered Committee
SEIAA	-	State Environmental Impact Assessment Authority
SEP	-	Site Environmental Plan
SPS	-	Safeguard Policy Statement 2009
TOR	-	Terms Of Reference
ULB	-	Urban Local Body
WSS	-	Water Supply Scheme
WTP	-	Water Treatment Plant

## **WEIGHTS AND MEASURES**

cm	-	centimeter
dB	-	decibels
ha	-	hectare
kg	-	kilogram
km	-	kilometer
l	-	liter
m	-	meter
m <sup>2</sup>	-	square meter
m <sup>3</sup>	-	cubic meter
mg/l	-	milligrams per liter
ml	-	milliliter
MLD	-	million liters per day
mm	-	millimeter
km <sup>2</sup>	-	square kilometers
µg/m <sup>3</sup>	-	micrograms per cubic meter

## **NOTE**

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

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## EXECUTIVE SUMMARY

The government of “Himachal Pradesh” has accorded top priority to the provision of safe drinking water to the rural areas of the state. The focus in the water supply sector is to cover every household with piped water supply. The existing old rural water supply schemes (commenced before year 2000) were designed to tap water from available local sources and many of them are small water supply schemes which cater few habitations or villages. With passage of time water demand increased due to increase in population and as a result, existing water supply schemes could not match the increased demand. The constant wear and tear, limited maintenance funds and unreliability of various small sources, made these systems more vulnerable. The Jal Shakti Vibhag (JSV) is the key sector line department, responsible for planning, infrastructure development, and regulation in the state. Prior to 2020, JSV was known as the Department of Irrigation and Public Health (IPH). IPH was established in 1986 with the mandate to provide safe drinking water supply across the state. Therefore, Jal Shakti Vibhag (JSV), wants these schemes to be re-modelled/renovated.

In line with the national Jal Jeevan Mission (JJM), Government of Himachal Pradesh's (GoHP) rural water supply goal is to have 100% universal household water coverage by the end of the fiscal year (FY) 2022–2023. To do so the GoHP prepares annual action plans. Prior to the JJM, the state had launched the Himachal Pradesh Water Policy, 2013. The policy goal was to ensure equitable and adequate water supply in rural areas and to support the key stakeholders. Therefore, Government of Himachal Pradesh with loan funding from Asian Development Bank (ADB) has proposed to implement “Himachal Pradesh Rural Drinking Water Improvement and Livelihood Project (HPRDWILP), herein after referred as ‘the Project’. Jal Shakti Vibhag (JSV) shall be the Executing and Implementing Agency for the Project. The project cost for Rural Drinking Water Improvement will be funded by the Asian Development Bank (ADB) and Government of Himachal Pradesh (GoHP) in 80:20 proportion.

The project area comprises the rural regions of Himachal Pradesh. JSV has identified 187 water supply schemes commissioned before 2000 which are included in the ADB supported HPRDWILP project scope for renovation and remodelling schemes in 10 districts<sup>1</sup> in Himachal Pradesh. The entire rural water supply schemes of Himachal Pradesh are divided into four zones, namely Shimla, Hamirpur, Mandi and Dharamshala. The zones are divided into circles which get further divided into divisions and sub-divisions. The grids are then formed by integrating various small water supply schemes in these sub-divisions according to the geographical continuity of the schemes.

At present the schemes are being operated at 40 LPCD with intermittent water supply to the consumers. The water flow largely remains unaccounted due to absence of any water flow monitoring and automation system. This has led to unequal water supply in different areas and inefficiency in the system. The key objectives of the assignment to strengthen the existing network system and provide 100% rural house with piped water supply are (i) to identify reliable & sustainable drinking water source for preparation of schemes; ; (ii) automate the operation and telemetry system from source to reservoirs including water quality monitoring; (iii) ensure that all project household beneficiaries have a metered water connection; (iv) construct water treatment plants at all new source; (v) to reduce water borne diseases, water stress & non-revenue water (NRW),(vi) prepare works contract to include operation and maintenance for up

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<sup>1</sup> The targeted districts comprise Bilaspur, Chamba, Hamirpur, Kangra, Kullu, Mandi, Shimla, Sirmaur, Solan, and Una.

to 5 years of the service period; (vii) introduce energy-efficient mechanisms to reduce operating costs and (viii) ensure positive impact on social status and economic standard of the people of rural areas.

The proposed SZ03 IEE focuses on providing 24x7 water supply system with the automation of pumps and real-time monitoring of water quality at water treatment plants and quantity from the water supply source and at the household level @70lpcd. The sub-project area of Package - SZ03 belongs to Shimla zone and covering mostly rural areas of Solan district, Himachal Pradesh. SZ03 falls in district Solan comes under Solan Circle and comprises three (3) divisions viz. Solan, Baddi & Nallagadh. These divisions are further divided into subdivisions. This package is an integration of two (2) grids, comprising of Fifteen (15) small rural water supply schemes. The project area of CW-SZ03 comprises of 16 village panchayats covering 80 villages and 132 habitations.

The project will be implemented under Design, Build including Civil works and Operation and Maintenance for 5 years of Rural Water Supply Scheme at District Solan (Package- SZ 03). The construction period is 24 months.

The existing rural water supply schemes sources from local sources such as Tube wells, springs, khads and nallahs located near the villages. Due to hilly topography, water is being supplied through lift and gravity mechanisms. Over time water demand has increased due to increased population and in some cases existing water supply schemes do not match the increased demand for water. The lack of maintenance has also resulted in repair and rehabilitation being deferred. Most of the transmission and distribution lines were laid over 20 years ago and have now past their design life. The pipes were initially designed with a peak factor of 1 and do not have sufficient capacity as per 70 lpcd requirement at household level. Most of the pipes are in extremely poor condition with leakages. At present water supply @ 40 LPCD is being catered by small rural water supply schemes dependent on local sources such as percolation well, infiltration gallery and nallah. The lean period discharge of existing sources is not enough to meet the current water demand i.e., 70 LPCD at consumer end, therefore schemes should be shifted to the reliable alternative water supply sources.

Hence, it is proposed to adopt conjunctive use approach, utilizing both surface and groundwater sources to meet the demand. Therefore, project will mostly design surface water-based water supply systems – drawing water from new/existing rivers/springs/khads/nallahs. Creation of new infrastructure to extract groundwater will be limited to areas where there are no surface water sources.

The proposed water supply system for the Package SZ-03 (District Solan) of Shimla zone has been designed for 20 years i.e., ultimate design year 2042 considering water demand 95 LPCD. (70 lpcd plus losses) The estimate of future population has been carried out on the decadal growth rate of @12.5%, based on the 2011 census data. The total estimated population of entire project area for 2022 and 2042 is 27,004 and 32,928 respectively. Considering water demand 95 LPCD total water demand for the year 2022 and 2042 will be approximately 2.56 MLD and 3.13 MLD respectively.

**Screening and assessment of potential impacts.** 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). As per the Government of India environmental impact assessment (EIA) Notification, 2006, this subproject does not require EIA study or Environmental Clearance. The potential environmental impacts of the subproject have

been assessed using ADB rapid environmental assessment (REA) checklist for water supply system. The potential negative impacts were identified in relation to preconstruction, construction and operation phases. This Initial Environmental Examination (IEE) addresses the infrastructure components proposed under water supply subproject.

**Categorization.** Environmental assessment has been conducted for the subprojects based on (i) preliminary design. The environmental assessment used ADB's rapid environmental assessment (REA) checklists for water supply. The environmental assessments of the subprojects are not likely to have any significant adverse environmental impacts that are irreversible, diverse, or unprecedented. Potential impacts are mostly site-specific and few of them are irreversible. In most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

Development of water supply, system with 5-year O&M under Shimla zone Package SZ 03 located in Solan district, is classified as Environmental Category B as per the SPS as no significant impacts are envisaged. Accordingly, this Initial Environmental Examination (IEE) assesses the environmental impacts and provides mitigation and monitoring measures to ensure that there are no significant impacts as a result of the project.

**The main components of this subproject include:** (i) construction of one RCC open frame intake structure on Giri river and four tubewells (i) construction of six (6) Water treatment Plants of various capacities from 63 KLD to 2300 KLD; (ii) eleven (11) Pump houses; (iii) nine (9) Main Balance Reservoirs (MBR) of various capacities ranging from 20 KL to 215 KL; (iv) twenty one (21) Service Reservoirs (SR) of various capacities from 20 KL to 245 KL; (v) house service connections (5,403 units); (vi) electrical and mechanical works; (vii) operation and maintenance of water supply system (for 5 years); (viii) Rising mains of about 68.5km. of Mild Steel Electric Resistance Welding (MS ERW ) with diameter ranges from 50 mm to 125 mm; (v) Gravity Mains of about 49 Km of Galvanised Iron (GI) with diameter ranges from 50 to 150 mm; (vi) Distribution network of about 186 km. of Galvanised Iron (GI) with diameter ranges from 25 mm to 150 mm; (vii) and (ix) Automation is proposed at WTP, Pump House, MBR and SRs to bring efficiency in operation and maintenance.

**Description of the Environment.** All the project components fall in Solan district of Himachal Pradesh. This district Solan came into existence on 1 September 1972. The district was carved out by amalgamating Solan and Arki tehsils of the erstwhile Mahasu district and Kandaghat and Nalagarh tehsils of the erstwhile PEPSU. The name of the district as well as its headquarters comes from Mata Shoolini Devi. It's said that she saved Solan from being destroyed.

Project area is situated in the basin of the Yamuna River and the river is the boundary between the states of Himachal Pradesh and Uttarakhand, Solan lies on high altitude of 1523m above sea level. The summers have much more rainfall. According to Köppen and Geiger, this climate is classified as Cwa.<sup>2</sup> In Solan, the average annual temperature is 17.4 °C | 63.4 °F. The annual rainfall is around 1413 mm. The project area is well connected with two national highways – NH 3 (Leh – Attari Highway or Shimla- Road) and NH 303 (Nagrauta – Nadaun Highway), which connects the project area to Hamirpur City and Nagrauta City respectively.

As per the seismic zoning map of India, Solan districts, lie in Zone IV (High damage risk zone) where the maximum intensity expected

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<sup>2</sup> Dry-winter humid subtropical climate

**Water Source Sustainability:** The proposed water sources for project area comprises of tube wells and Giri river. There is a total of six (6) locations where water sources will be tapped out of which one source will be existing tubewell source. Source selection criteria are based on its ability to meet the ultimate year (2042) water demand of its respective command area. The lean period discharge (measured in November/December for snow fed sources and for rain fed sources in May/June) of a particular source in the past few years were considered and picked the driest season value (lps) for design. No major source of pollution should be present in the upstream of the source. The water demand per capita per day is taken as 95 LPCD (70 lpcd plus loss). The population of 2042 of respective command areas has been computed by decadal growth method.

Under HPRDWILP, water availability is assessed based on lean season water flow of rivers/streams etc., to account for further fluctuations, as thumb of rule, 70% of the lean period discharge is calculated and considered as “available discharge” for water supply. This is done to avoid over exploitation and to keep the environmental water flow in the source intact. Then, “Available discharge” is compared against the water demand for the area. If “available discharge” is greater than water demand, then the source is deemed sustainable and considered as project source.

In case of ground water sources, the decision for providing number of tube wells/ percolation well/ infiltration gallery shall be considered based on availability of 3 phase electricity (in hours per day). To ensure the sustainability of ground water source, long term summer yield test are conducted to access specific yield. Considering summer draw down and accordingly cone of interference spacing between two tube-wells shall invariably preferably be 500 meters. For the selection of proposed ground water sources advance geophysical /resistivity survey technique shall be adopted for estimation of the yield. If there is presence of percolation well or tubewell in the vicinity of the proposed site, then it is a good indication that the surrounding soil has enough porosity and is feasible for tubewell. Water quality of the proposed site is judged by the water quality of the nearby source (tubewell or percolation well). No major source of pollution should be present in the upstream of the source, as applicable.

This criterion is ensured for both existing and proposed sources used in this project. In terms of water availability and quality of water, selected sources are adequate and suitable to meet the project water demand, and there are unlikely to be any issues related source sustainability during the project life cycle.

All sources are duly selected keeping in mind the downstream conditions and water requirement. Upto two kilometres downstream of the sources, it was observed that there will not be any significant water reduction that will impact the users in the downstream. Sources like Giri River have huge water discharge, and in this package, less than 1% of that discharge will be extracted to serve a particular command area or scheme.

Considering water demand at 95 LPCD (70 lpcd will be available at consumer-end, after loss of 20 lpcd) total water demand for the year 2022 and 2042 will be approximately 2.56 MLD and 3.13 MLD (36.23 lps). The present water discharge available from all the proposed sources and one existing source is 205.76 MLD (2,381.5 lps), Hence it can be concluded that the proposed sources are capable to meet projected demand and sustainable for this water supply scheme and can provide water to till ultimate design year (2042). Giri River has huge water discharge (2340 lps) even during the lean season, while the water demand of Grid SS-1 based on Giri River is 17.51 lps (2042 demand), which is just 0.75%. Water quality test reports indicate that the available water is suitable for the human consumption and fulfil the standards mentioned in BIS 10500.



**Potential Environmental Impacts and Mitigation Measures.** In this draft IEE, negative impacts were identified in relation to location, design, construction and operation of the improved infrastructure. Environmental impacts as being due to the project design or location were not significant as various measures are included in site planning and preliminary design. There are no environmentally or archeologically sensitive areas within the project area.

The project area is located in Western Himalayan broadleaf forests with hilly terrain of mainly agriculture and forest landuse. Subproject components are located in immediate surroundings of small towns/villages which are mainly rural in set up. Proposed Intake, WTP, MBR, SR will be constructed on vacant government revenue land mostly under possession of JSV and in some private lands. None of the project components, except some water pipelines, are proposed in forest lands. At some locations, water supply pipelines will pass through forest areas, but mostly along forest trails / earthen roads, where there are no notable trees. Forest department has exempted from clearance procedure for laying of drinking water pipelines requiring excavation/trench of less than 1m width and 2 m depth along the roads in forest land. In case of sample subproject IEEs, the proposed trench width is 0.6m; hence permission from local forest department will be adequate for pipeline laying (Appendix 7). The water pipelines will be laid along the roads and within the existing right of way with no notable tree felling anticipated as per preliminary design. However, it will be finalised during detailed design period and if any tree felling is required, compensatory tree plantation will be carried out in 1:10 ratio. No Protected Forest land needs to be diverted for this subproject.

In Solan district two Wildlife Sanctuaries namely Chail and Majathal are located. Chail Wildlife Sanctuary in Solan district has also been notified as an Eco Sensitive zone. The proposed intake on Giri River at Grid SS-1 is at about 6 km from Chail Wildlife Sanctuary. Proposed SR Bawasni is at an aerial distance of ~31km from Majathal wildlife, Proposed intake structure on Giri river in Grid SS-1 is about 17 KM from Churdhar WLS in Sirmaur district and is about 23 KM from Shimla water cantonment WLS in Shimla District. The construction of these small components will not have any impact on the protected areas. There are no endangered terrestrial, avifauna or migratory species. Aquatic life is observed in Giri river which also act as the breeding and spawning area of Tor (Mahasheer) and other aquatic life.

Nearest proposed component from designated Ramsar site Renukaji lake in Shimla zone, of Package SZ-03(Solan district) is proposed Intake structure on Giri River in Grid SS 1 which is about 37 km (areal distance) from Renukaji lake.

Based on biodiversity assessment and site visits it can be noted that the areas where vegetation clearing for the subproject component required is mostly degraded land with shrubs and trees with no protected wildlife species. Most disturbances from construction and operations will take place in areas of already modified habitat. Impacts of vegetation loss and habitat fragmentation are thus assessed to be of Low significance. Therefore, the project will pose no risk or impact on biodiversity and natural resources. Screening via Integrated Biodiversity Assessment Tool (IBAT) indicates presence of various protected areas and key biodiversity areas within 50 km radial distance; however, none are located close to the subproject area. Total 22 species of threatened category and 4 restricted range species are found in 50km radius in subproject components area as result of IBAT analysis (Appendix 6B).

From an aquatic perspective, the project area falls within the Ganges-Himalayan Foothill freshwater eco-region. As with terrestrial species, it is an area of very high aquatic species richness and was believed to be an area of only moderate aquatic species endemism. It is with

11 fish species endemic to the region though the distribution of species in the region remains too poorly understood to have high confidence in this.

The Giri River is the primary river in the catchment where the subproject infrastructure will be located. It originates at Khada Pathar (100km upstream) of proposed intake and merges with the Jamuna river at Ponta Sahib (60 km downstream). Ashwani khad in upstream and Khwal Khad in the downstream merges in Giri river near the proposed source. Many small nallahs/springs also join the Giri river. A dam at Renuka Ji was built on Giri river, at 40km downstream of proposed intake location, for hydropower generation.

In Himachal Pradesh 61 species of fish observed, belongs into 13 families<sup>3</sup> in general waters and trout waters, with estimated length of 600 and 2400 kms; respectively. The major fishes available in these streams are Trout, Golden Mahseer (*Tor putitora*), *Nemacheilus* spp, *Barilus* sp, *Schizothoracids* *Crossocheilus* sp. *Glyptothorax* spp. etc. Rainbow trout and Mahaseer are the important fishes in Himachal Pradesh.

As per the information obtained from the Himachal Pradesh Fisheries Department (Appendix 6A) and consultations with the local people during site visits fish species found in the proposed water are mainly, *Schizothorax* sp (Gugli), Minnows, Chal, Rainbow and Brown Trouts, *Cyprinus Carpio* (Common carp) and Mahseer (*Tor tor*). In subproject area, endangered Golden Mahseer is reported in Giri river. The field assessment as part of IEE report preparation, as per the consultation with fishery department and local community, Giri Pul a location on 2km upstream of subproject component is a recognized breeding ground for the fish species and Mahseer is found during monsoon (May to September months).

Based on Integrated Biodiversity Assessment Tools (IBAT) and biodiversity assessment report prepared for SZ 03 subproject (Appendix 6B), the potential impacts arise because the presence of protected fish species Golden Mahseer (*Tor putitora*) in Giri river section. In the process of avoidance of potential impacts on the aquatic habitat, a small RCC Open frame intake structure has been designed near the riverbank water where water is available even during lean seasons. Construction in riverbed will be minimal to 2-4 RCC columns to support the structures which will be primarily located on the bank outside the water course. The water will be drawn via a intake pipe and submersible pump suspended to the open frame. The water requirement for rural water supply subproject is just about 0.75% of total volume of water during lean period. Thus, the extraction of water will not change hydrological flow of the Giri river.

The Director, Fisheries department, Solan has issued a certificate (Appendix 6C) stating that the nearby recognized breeding ground for the fish species is Giri Pul a location on 2km upstream of proposed intake location. Since the water requirement of the proposed scheme of Grid SS1 is negligible compared to available quantum of water (demand of only 11.5 lps and the flow of the Giri river during the lean period is 2320 lps). There will be no hindrance due to construction of above scheme as far as fish breeding is concerned and Fisheries department has no objection in this regard. No loss of aquatic habitat is anticipated due to extraction of water from river as per the hydrological studies the volume of available water is very high comparing the water intake. A number of additional/specific mitigation and management measures necessary to reduce residual impacts on Critical Habitat-qualifying biodiversity are mentioned in the biodiversity report. Nonetheless, without mitigation, the subproject might possibly have

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<sup>3</sup> Fish Fauna of Himachal Pradesh: A Case Study, Department of Zoology, (Aquaculture Laboratory), Shri Shivaji College, Parbhani, July 2013.

adverse impacts on fish species. Works near the river may degrade of aquatic habitat quality during construction from water pollution, noise, disturbance and damage due to presence of works and operation of equipment and machinery. Appropriate measures are suggested and included in the EMP, implementation of these measures would reduce the impacts to negligible levels

**Potential impacts during construction** are considered significant but temporary and are common impacts of construction, and there are well developed methods to mitigate the same. Except laying of water supply lines all other construction activities will be confined to the selected sites and the interference with the general public and community around is minimal. In these works, the temporary negative impacts arise mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupational health and safety (OH and S) aspects These are all general impacts of construction in areas and there are well developed methods of mitigation that are suggested in the EMP. Water pipes will be laid at a depth of 1m as per topography. It may be noted that due to hilly terrain, some sites are not accessible by motorable roads, and in such cases, material will be transported manually, and work will be conducted with minimal tools and mostly manually. During the construction phase of pipeline, impacts arise from the invasive nature of excavation and trenching work mostly along the roads. However as most of the individual elements are relatively small and involve straightforward construction, the potential environmental impacts (i) will be mainly localized, temporary and not greatly significant; (ii) will not cause direct impact on biodiversity values and (iii) are common impacts of construction, and there are well-developed methods for their mitigation that are suggested in the EMP. Given the hilly terrain, cuts and fills can promote instability and erosion although proposed excavation will not be significant, necessary measures will be put in place to avoid construction during rains, and cuts, fills and sloped surfaces in construction sites will be properly stabilized to avoid erosion. Site clearance will be strictly confined to actual work area, no clearance of topsoil or vegetation will be done outside the site. Temporary containment drains, silt fences will be used to contain silt laden run off from sites. Various measures will be put in place for work in forest lands to avoid any impacts or damage / disturbance to flora and fauna.

**Anticipated impacts of water supply during operation and maintenance** will be related to operation of WTP, handling and application of chlorine, operation of pump houses, and repair and maintenance activities. Various provisions are already made in the design: to recirculate wastewater from WTP; collect, thicken and dispose sludge; chlorine safety; use energy efficiency equipment, etc., Water supply system will be operated using the standard operating procedures. It is unlikely that there will be any significant negative impacts. Application and handling of chlorine gas will involve certain risks, and appropriate measures are included in EMP.

Once the new water supply 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.

**Environmental Management.** 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 design. During construction, the EMP includes mitigation measures such as (i) proper planning of sewer and drain construction 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; and (v) 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 contractor will be required to submit to PIU, for review and approval, a site 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; and (iii) monitoring program as per EMP. 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.

The EMP will also ensure efficient lines of communication between PIU/ULB, PMU, consultants and contractor. The draft IEE and 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 quality of supplied water, in order to ensure that it is functioning well along with the project agency responsible for such actions, form part of the Environmental Management Plan. The total estimated cost for implementing the EMP is approximately 75,50,000.00/= (Seventy-five lakhs fifty thousand only).

**Implementation Arrangements.** Jal Shakti Vibhag (JSV) of Government of Himachal Pradesh will be the Executing Agency & Implementing Agency for the Project, responsible for management, coordination and execution of all activities funded under the loan. Jal Shakti Vibhag (JSV) will establish a central Project Management Unit (PMU) headed by a Director (PD) and will be supported by three Deputy Project Directors (DPD I, II and III). DPD-I and II will be responsible for procurement and contract management in two zones each (DPD-I - Hamirpur and Dharamshala, and DPD-II - Shimla and Mandi). DPD-III will be responsible for finance management of the project. PMU will be staffed with technical, administrative, finance, procurement, safeguards, gender, etc., Under the PMU, four Project Implementation Units (PIUs) will be established at zonal level (Hamirpur, Dharamshala, Shimla and Mandi), and each PIU will be headed by a Project Manager. PMU and PIUs will be supported by Project Design, Management and Supervision Consultant (PDMSC) team.

**Safeguard Implementation Arrangement.** PMU will be staffed with three safeguard officers: (i) Environment Safeguard Officer (ESO) (ii) Social Safeguard and Gender Officer (SSGO), and (iii) Community Development Officer (CDO) who will be responsible for compliance with the environmental, social safeguards and community related issues in program implementation respectively. Environment Safeguard Officer and Social Safeguard and Gender Officer will have overall responsibility of safeguard implementation in compliance with ADB SPS 2009. At individual subproject level, Environment Safeguard Officer and Social Safeguard and Gender Officer will ensure that environmental assessment and social impact assessment is conducted, and IEE reports and corresponding EMPs and Social Management Plan (SMP) and Resettlement Plans (RP), due diligence reports (DDRs) are prepared and implemented, and the compliance, and corrective actions, are undertaken. Environmental Safeguard Specialist and Social Safeguards and Gender Specialist of the PDMSC will have primary responsibility of preparing the safeguard documents and supervising the EMP and resettlement plan implementation, while the Safeguards Officers at PMU will review, approve and oversee the

compliance. At each PIU, a Safeguard/Environment Officer of Assistant Engineer rank, AE (SEO), will be responsible for safeguard implementation. AE(SEO) will oversee the safeguards implementation at PIU level and will be responsible for reporting to Environment Safeguard Officer and Social Safeguard and Gender Officer at PMU. The AE(SEO) will coordinate public consultation, information disclosure, regulatory clearances and approvals, EMP and resettlement plan implementation and grievance redress. Contractor will appoint an Environment, Health and Safety (EHS) supervisor to implement EMP; EHS supervisor of DBO Contractor will have responsibilities related to environmental and social safeguards compliance and grievance redress and management at field level.

**Consultation, Disclosure and Grievance Redress.** The stakeholders were involved in developing the IEE through discussions on-site/off-site and a public consultation workshop at village 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 stakeholders committee has appreciated and approved the subproject. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB and JSV/PMU websites. The consultation process will be 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 quickly.

**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 PDMSC, 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 JSV/PMU websites.

**Conclusions and Recommendations.** The sub-project will benefit the citizens of Package SZ03 project area in Solan district by contributing to the long-term improvement of water supply system. The subproject is primarily designed to improve environmental quality and living conditions of service area through provision of water supply. The subproject aims to achieve safe and sustainable water services both in terms of services to customers and conservation of precious water resources. The benefits arising from this subproject include: (i) increased availability of potable water at appropriate pressure to all households including rural poor; population (ii) reduced time and costs in accessing alternative sources of water. (iii) 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. The successful implementation of the water supply project will result in better control over the NRW management, improved monitoring system and overall demand management along with energy reduction.

The subproject is therefore unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category "B" is confirmed. The subproject is not covered by the GoI EIA Notification (2006). However, to conform with

government guidelines all necessary permissions and NOCs are to be obtained from the concerned departments prior to start of construction.

This IEE shall be updated by PMU during the implementation phase to reflect any changes, amendments and will be reviewed and approved by ADB. The revised IEE shall supersede the earlier version of IEE and shall be contractually applicable to the contractor.

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

- Include this draft IEE, prepared based on the preliminary designs, in DBO bid and contract documents, and specify that this draft will be superseded by the updated/final IEE based on detailed design after contract award
- Update this IEE during the detailed design, and submit to ADB for approval
- Engage an aquatic fauna/fishery expert during the detailed design phase to design the intake screen in Giri river in SS1 Grid to avoid entry of fish into pipe
  - To confirm that there is no breeding/spawning ground within 1 km (upstream and downstream) of the proposed intake location
  - the intake screen in Giri river in SS 1 Grid to avoid entry of fish into pipe
  - design pumping equipment near Giri river in with minimal noise levels
- A detailed audit of existing facilities to be conducted as part of the updated IEE
- Provide updated IEE and EMP to the contractor for implementation
- Obtain necessary permissions, and consents prior award of contract or start of construction as applicable, and include conditions, if any, in the updated IEE and EMP
- Do not commence works until all the preconstruction requirements are met, including: (i) this IEE is updated and approved by ADB and disclosed, (ii) contractor appointed EHS supervisor, and prepared SEMP and health and safety plan including COVID-19 health & safety plan, and approved by PIU/PMU, (iii) contractor complied with government regulations, and (iv) GRM is established and operationalized.
- During implementation, ensure that EMP / SEMP is implemented as envisaged via regular supervision, monitoring, and timely reporting as indicated in the IEE
- Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2016) and solid waste disposal should have a designated site (dumping on vacant lot is not allowed).
- Ensure COVID-19 appropriate behavior and compliance with protocols in project implementation as per the applicable government regulations and relevant guidelines published by WHO, ILO, ADB etc.,
- Continue consultations with stakeholders, and redress grievances effectively and timely.

## **I. INTRODUCTION**

### **A. Project Background**

1. The state of Himachal Pradesh is located in northern part of India with a total land area of 55,673 square kilometers across 12 districts, which is about 1.69% of India's total area. The state is home to about 6.86 million people, of which 90% of the total population reside in rural areas, while the remaining 10% are urban based. In the previous decade, from 2001 to 2011, the population of Himachal Pradesh increased from 6,077,900 (2001) to 6,864, 602 (2011), at a growth rate of 12.9%. Moreover, population density has doubled from 62 in 1971 to 123 in 2011.

2. The rural water supply schemes are sourced from local sources such as springs, khads, nallahs and tube wells located near the villages. Due to hilly topography, water is being supplied through lift and gravity mechanisms. Over time water demand has increased due to increased population and in some cases existing water supply schemes do not match the increased demand for water. The lack of maintenance has also resulted in repair and rehabilitation being deferred. The risks of increased drought and reduced dry season flows have also made these systems less efficient. In rural areas, house connections are available for about 54% of households while the remaining are dependent on standpipes. It is expected to achieve 100 % coverage through this project.

3. Currently, 40 liters per capita per day (lpcd) of water is being supplied at household level. Most of the existing sources are not having sufficient discharge to cater the continuous water supply with desired rate of 70 lpcd at the household level.

4. Most of the transmission and distribution lines were laid over 20 years ago and have now past their design life. The pipes were initially designed with a peak factor of 1 and do not have sufficient capacity as per 70 lpcd requirement at household level. Most of the pipes are in extremely poor condition with leakages. Approximately 5,100 km of existing pipe network is being used to supply water from source to households.

5. The Jal Shakti Vibhag (JSV) is the key sector line department, responsible for planning, infrastructure development, and regulation in the state. Prior to 2020, JSV was known as the Department of Irrigation and Public Health (IPH). IPH was established in 1986 with the mandate to provide safe drinking water supply across the state. JSV has four administrative zones, namely Dharamshala, Mandi, Shimla, and Hamirpur. The zones are divided into 'circles,' and further divided into 'divisions' and 'sub-divisions.'

6. Government of Himachal Pradesh (GoHP) intends to seek a fund from Asian Development Bank (ADB) towards Himachal Pradesh Rural Water Supply Improvement Project (HPRWSIP) (formerly, "Remodelling/Renovation of Old Rural Water Supply Systems of Himachal Pradesh)" under which approximately 468,693 people will directly benefit from water infrastructure improvements. The HPRWSIP project will cover 10 districts out of 12 districts. Jal Shakti Vibhag (JSV) of Government of Himachal Pradesh shall be the Implementing and Executing Agency for the Project.

7. Currently, the small water supply schemes supply 40 lpcd to 371,616 (2020) people in rural areas of Himachal Pradesh. This account to approximately 15,025 cubic meters per day water supply. The current water supply is insufficient to meet the daily needs of the people and on an average 70 lpcd is required to meet daily needs. At 70 lpcd, the water demand will be approximate 26,294 cubic meters per day, thus creating a water supply deficit of about 11,269

cubic meters per day. Apart from the existing water supply schemes there are no other domestic water supply sources used by the people

8. The objectives of the HPRDWILP project include the following: (i) identify reliable and sustainable drinking water sources for rural water supply schemes; (ii) automate the operation and telemetry system from source to reservoirs including water quality monitoring; (iii) ensure that all project household beneficiaries have a metered water connection; (iv) construct water treatment plants at all new source; (v) prepare works contract to include operation and maintenance for up to 5 years of the service period; and (vi) introduce energy-efficient mechanisms to reduce operating costs

9. JSV has identified 187 water supply schemes commissioned before 2000 which are included in the ADB supported HPRDWILP project scope for renovation and remodeling schemes in 10 districts in Himachal Pradesh. The renovation and remodelling of 187 schemes will provide 24 hours and seven days a week water supply system with the automation of pumps and real-time monitoring of water quality at water treatment plants and quantity from the water supply source and at the household level.

10. The entire rural water supply schemes of Himachal Pradesh is divided into four administrative zones, namely Dharamshala, Mandi, Shimla, and Hamirpur. The zones are divided into circles which gets further divided into divisions and sub-divisions. The zone wise bifurcation of schemes as under:

- (i) **Dharamshala Zone:** 10 schemes which are clustered into 8 Grids and 2 packages
- (ii) **Mandi Zone:** 89 schemes which are clustered into 21 Grids and 3 packages
- (iii) **Shimla Zone:** 38 schemes which are clustered into 12 Grids and 3 packages
- (iv) **Hamirpur Zone:** 50 schemes which are clustered into 18 Grids and 2 packages

11. Grids are formed by the integration of various small water supply schemes based on their geographical continuity. Similarly, package is an integration of grids falling under the respective circle of each zone.

12. This IEE focuses on renovation and remodelling of 15 Schemes under 2 Grids of Package SZ 03, Shimla Zone (District: Solan) which will provide 24 hours and seven days a week water supply system with the automation of pumps and real-time monitoring of water quality at water treatment plants and quantity from the water supply source and at the household level @70lpcd.

13. The project will be implemented under Design, Build including Civil works and Operation and Maintenance for 5 years of Rural Water Supply Scheme at District Solan (Package- SZ-03). The construction period is 24 months.

## **B. Purpose of this IEE Report**

14. 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.



15. The potential environmental impacts of the subprojects have been assessed using ADB Rapid Environmental Assessment (REA) Checklist for water supply system (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 subproject is 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.

16. This IEE is prepared for selected project area designated as Package SZ 03 (District Solan) under the Shimla zone. The project includes civil works, project implementation and management, and non-physical investments and 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 IEE is based on the preliminary project report prepared by the Jal Shakti Vibhag (JSV). The IEE is based mainly on field reconnaissance surveys and secondary sources of information. No field monitoring (environmental) survey was conducted; however, the environmental monitoring program developed as part of the environmental management plan (EMP) will require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation is an integral part of the IEE.

17. This IEE will be updated and finalized during detailed design stage to reflect change in scope of works, change in location of component and change in cost due to addition or subtraction of components which can change the environmental impacts. The revised IEE shall supersede the earlier version of IEE and shall be contractually applicable to the contractor after approval from PMU and ADB.

18. The implementation of the subprojects will be governed by Government of India (GoI) and the state of Himachal Pradesh 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 ADB SPS, 2009 and international good practice, as reflected in internationally recognized standards.

### **C. Report Structure**

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

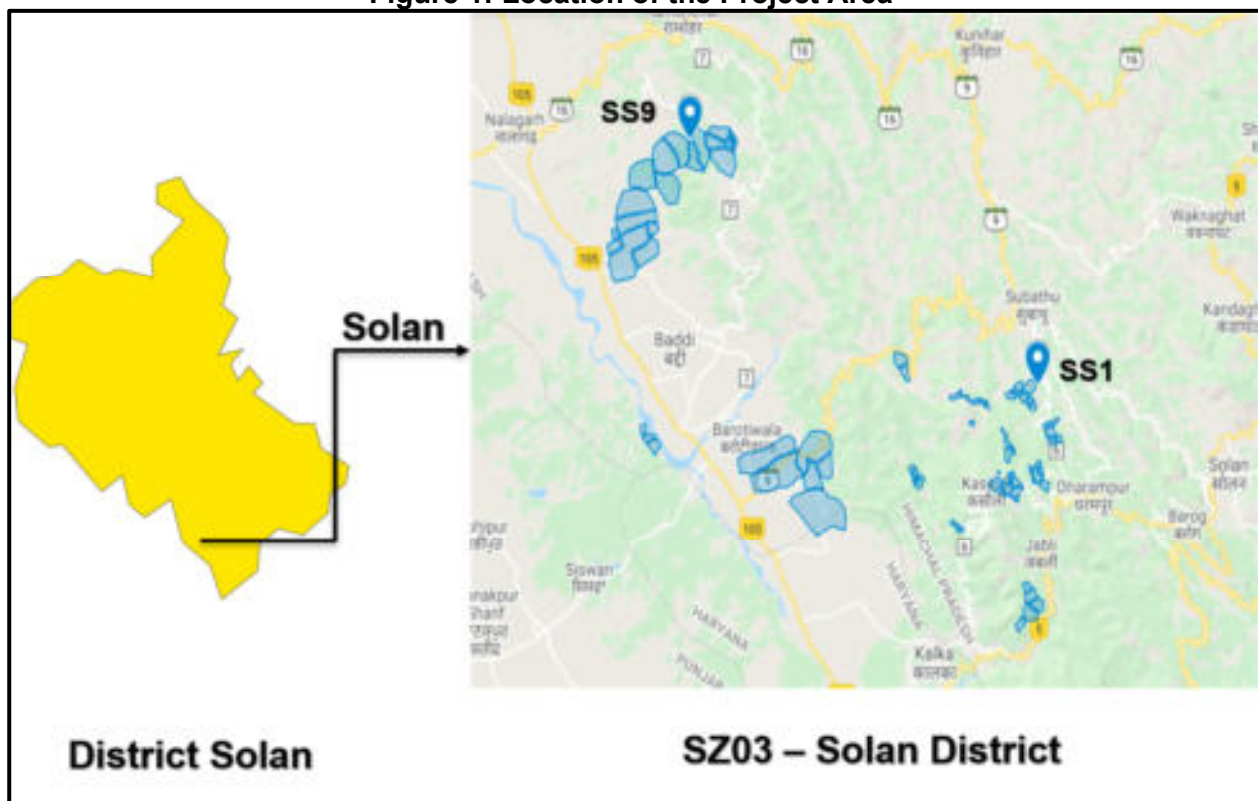
- Executive Summary
- (i) Introduction
- (ii) Description of the Project.
- (iii) Analysis of Alternative.
- (iv) Policy, Legal, and Administrative Framework
- (v) Description of the Environment
- (vi) Anticipated Environmental Impacts and Mitigation Measures
- (vii) Public Consultation and Information Disclosure
- (viii) Grievance Redress Mechanism
- (ix) Environmental Management Plan
- (x) Conclusion and Recommendations



Package	Scheme	Grid ID	District	Circle	Division	Villages (Nos.)	Habitation (Nos.)
	GWSS Jhanger						
	LWSS Hurang Kotla						
	LWSS Bhaguri						
	LWSS Dumanwala	SS-9	Solan	Doon	Solan	Baddi/Nalagarh	47
	LWSS Barotiwala						
	LWSS Kotian Mandhala						
	LWSS Landeywal						
	LWSS Amroo Bawasni and their adjoining villages						

Population Source: Detailed Project Report (2020).

### Figure 1: Location of the Project Area



## **B. Existing Water Supply Situation**

23. The existing rural water supply schemes are sourced from local sources such as springs, khads, nallahs and tube wells located near the villages. Due to hilly topography, water is being supplied through lift and gravity mechanisms. Over time water demand has increased due to increased population and in some cases existing water supply schemes do not match the increased demand for water. The lack of maintenance has also resulted in repair and rehabilitation being deferred. The risk of increased drought and reduced dry season flows has also made these systems less efficient. In rural areas, house connections are available for about 54% of households while the remaining are dependent on standpipes. It is expected to achieve 100 % coverage through this project.

24. Most of the transmission and distribution lines were laid over 20 years ago and have now past their design life. The pipes were initially designed with a peak factor of 1 and do not have sufficient capacity as per 70 lpcd requirement at household level. Most of the pipes are in extremely poor condition with leakages. Currently, the small water supply schemes supply 40 lpcd to 371,616 (2020) people in rural areas of Himachal Pradesh. This account to approximately 15,025 cubic meters per day water supply. The current water supply is insufficient to meet the daily needs of the people and on an average 70 lpcd is required to meet daily needs.

25. At present water supply @ 40 LPCD is being catered by small rural water supply schemes as mentioned above. The schemes are dependent on local sources such as percolation well, infiltration gallery and nallah. The lean period discharge of existing sources is not enough to meet the current water demand i.e., 70 LPCD at consumer end, therefore schemes should be shifted to the reliable alternative water supply sources.

26. Conventional treatment system – Filter beds are used to treat the water before supply and manual dosing of bleaching powder is being done for disinfection at MBR stage. Due to absence of necessary equipment's and skilled manpower filter beds are not maintained properly and the quality of supplied water is not reliable.

27. Existing civil structures such as existing intake, water treatment plant, pump house, storage reservoirs and other ancillary structures are not in good condition and they need repair and maintenance. Capacity of existing Service reservoirs is not adequate to meet the ultimate water demand. The command area of few service level reservoirs is exceeding the radius two Kms which is also a reason for unequitable supply of water to the consumer end. Few ground level reservoirs are required to be replaced with overhead tank (OHT) to maintain the minimum terminal head of 7 meters at nearby habitations.

28. The present distribution network is laid on need basis which makes the network very complex. Multiple distribution pipes are serving the same land settlement patch directly from service level reservoirs and tail end consumers are not getting the enough terminal pressure and discharge.

29. Existing pumps are working on low efficiency and already served their design period. Boundary wall, chowkidar rooms and lighting facilities are not available at source, main balancing reservoirs and service reservoirs. None of the pump houses have an operator room that is meant to provide working space to the pump operators, except a chowkidar room at some places. Many of the pump houses lack basic facilities such as toilets.

30. The schemes are manually operated and lack monitoring of real time quality and quantity of water supplied. A conditional assessment carried out based on physical appearance, hydraulic capacity in case of treatment plant & reservoirs and inputs provided by JSV officials Inventory of existing water supply arrangement based on this assessment is summarised below grid wise:

**Table 2: Existing Water Supply Arrangements**

Grid	Description
<b>SS-1</b>	<p>Grid SS 1 has only ten water supply schemes viz., LWSS Satyana Shiva, LWSS Garkhal Larih, LWSS Gorthi, LWSS Sunaradi Anji, LWSS Kasuali, LWSS Bhaguri, LWSS Jhanger, LWSS Jangeshu, LWSS Hurang Kotla and LWSS Seri Thana. The existing water supply schemes are dependent on 4 springs 3 khads and 3 Nallahs. The combined discharge observed in all the sources is 4.28 lps. The discharge observed in the existing sources is adequate to cater the ultimate water demand of year 2042. At present water supply at 40 LPCD is being catered by five small rural water supply schemes. Total length of distribution network is 53.3 Km and consists of GI pipes.</p> <p>The lean period discharge of existing sources is enough to meet the current water demand i.e 70 LPCD at consumer end, therefore existing sources is proposed to cater the demand for these schemes.</p> <p>These schemes were constructed long back in between year 1985 to 1988 as per that time water requirement. Now, the existing components like main balancing reservoirs, service reservoirs, distribution etc. are not able to cater the water demand of next 20 years.</p>
<b>SS-9</b>	<p>SS 9 is an integration of 5 nos. water supply schemes viz. LWSS Dumanwala, LWSS Barotiwala, LWSS Kotian Mandhala, LWSS Landeywal, LWSS Amroo Bawasni, Distt. Solan HP. At present water supply @ 40 LPCD is being catered by five small rural water supply schemes as mentioned above. The schemes are dependent on local sources such as springs and nallahs. The lean period discharge of respective sources is 37.11lps, which is not sustainable enough to meet the current water demand as well as future water demand i.e 70 LPCD at consumer end, therefore, in addition to one existing tube well source four new bore wells are proposed as reliable additional water supply source. The total length of distribution network is 33.26 kms and consist of GI pipes.</p> <p>These schemes were constructed long back in between year 1979 to 1981 as per the water requirement during that period. The existing components of the scheme such as main balancing reservoirs, service reservoirs, distribution network etc. will not able to cater the water demand of next 20 years and thus requires the need of renovation of existing structures or proposal of new structures as per the requirement of ultimate design year water demand.</p>

### **C. Proposed Project**

31. The water supply schemes are clubbed into grids based on their geographical continuity. Thus, two grids are proposed under – SZ03. The proposed water sources comprise of Intake and Tube wells. There is a total of six (6) locations where water sources will be tapped including one existing source. Few of the sources proposed are located at new locations.

32. **Source selection criteria** are based on its ability to meet the ultimate year (2042) water demand of its respective command area. The proposed water sources for project area

comprises of Tube wells and river. There is a total of six (6) locations where water sources will be tapped including one existing source. Source selection criteria are based on its ability to meet the ultimate year (2042) water demand of its respective command area. The lean period discharge (measured in November/December for snow fed sources and for rain fed sources in May/June) of a particular source in the past few years were considered and picked the driest season value (lps) for design. No major source of pollution should be present in the upstream of the source. The water demand per capita per day is taken as 95 LPCD (70 lpcd with losses). The population of 2042 of respective command areas has been computed by decadal growth method.

33. About 70% of the source's lean period discharge is required to meet the ultimate year (2042) water demand of its respective command areas. As thumb of rule, not more than 70% of the discharge available at the source is considered for extraction. This is done to avoid over exploitation and to keep the environmental water flow in the source intact. Hence, 70% of the lean period discharge is calculated and considered as "available discharge" for water supply. Then, "Available discharge" is compared against the water demand for the area. If "available discharge" is greater than water demand, then the source is deemed sustainable, otherwise it is deemed un-sustainable.

34. The proposed surface water supply source in this project is Gritri river and JSV has also measured the discharge at proposed water supply source location during the feasibility stage of this project. Based on the analysis of recorded data JSV has issued the discharge certificate and are enclosed as Appendix 8.

35. In case of ground water sources, the decision for providing of tube wells/ percolation well/ infiltration gallery shall be considered based on availability of 3 phase electricity (in hours per day). To ensure the sustainability of ground water source, long term summer yield test are conducted to access specific yield. Considering summer draw down and accordingly cone of interference spacing between two tube-wells shall invariably preferably be 500 meters. For the selection of proposed ground water sources advance geophysical /resistivity survey technique shall be adopted for estimation of the yield. If there is presence of percolation well or tubewell in the vicinity of the proposed site, then it is a good indication that the surrounding soil has enough porosity and is feasible for tubewell. Water quality of the proposed site is judged by the water quality of the nearby source (tubewell or percolation well). No major source of pollution should be present in the upstream of the source, as applicable.

36. This criterion is ensured for both existing and proposed sources used in this project. The JSV has also conducted water testing at sources to determine the suitability of water for potable use. In terms of water availability and quality of water, selected sources are adequate and suitable to meet the project water demand, and there are unlikely to be any issues related source sustainability during the project life cycle.

37. **Water Demand and Supply.** The proposed water supply system has been designed for 20 years i.e., ultimate design year 2042. Considering water demand at 95 LPCD (70 lpcd plus loss), the estimated future population has been carried out on the decadal growth rate of at 12.5%, based on the 2011 census data. The total estimated population of entire project area for 2022 and 2042 is 27,004 and 32,928 respectively. Considering water demand 95 LPCD total water demand for the year 2022 and 2042 will be approximately 2.56 MLD and 3.13 MLD (36.23 lps) respectively. Gridwise projected population and water demand is given in Table 3.

**Table 3: Grid-wise Projected Population and Water Demand**

Package	Scheme	Grid ID	Population			Water Demand (KLD)		
			2011	2022	2042	2011	2022	2042
SZ03	LWSS Sunaradi Anji	SS1	596	684	833	57	65	79
	LWSS Garkhal Larah		3128	3565	4346	297	339	413
	LWSS Satyana Shiva		2292	2616	3191	218	249	303
	WSS Kasauli		600	683	833	57	65	79
	LWSS Gorthi		1190	1357	1656	113	129	157
	LWSS Seri Thana		532	608	741	51	58	70
	WSS Jhanger		1081	1232	1503	103	117	143
	LWSS Jangeshu		543	619	755	52	59	72
	LWSS Hurang Kotla		629	719	876	60	68	83
	LWSS Bhaguri		852	970	1183	81	92	112
	LWSS Dumanwala	SS9	2691	3069	3740	256	292	355
	LWSS Landeywall		479	547	667	46	52	63
	LWSS Amroo Bawasni		1572	1797	2190	149	171	208
	LWSS Barotiwala		5077	5776	7046	482	549	669
	LWSS Mandhala		2425	2762	3368	230	262	320
Total			23687	27004	32928	2250	2565	3128

Source: Census 2011, and Detailed Project Report



Figure 2: Map Showing Proposed Grids of SZ 03



38. **Proposed Water Supply Sources and Arrangements.** Details of proposed subproject components are shown in the Table below:

**Table 4: Proposed Subproject Components**

Grid No	Infrastructure	Description
SS-1	Proposed Water Source	Proposed one (1) intake structure at Giri River
	WTPs	WTP of 2.3 MLD at Giri River
	Pump houses	3 Pump houses 1. At Giri River 2. At Bigad 3. At Dharampur
	MBR	7 nos. MBR (65 KL, 65 KL, 65 KL, 215 KL, 20 KL, 40 KL, and 20 KL)
	SR	7 nos. SRs (40 KL, 40 KL, 40 KL, 130 KL, 25 KL, 40 KL, 45 KL, 60 KL, 40 KL, 60 KL)
	Rising Main	34.4 KMs (Día 200 mm)
	Gravity Main	42 KM (Día 50-150 mm)
	Distribution Main	68.4 KM (Día 25 mm to 125 mm)
SS-9	Proposed Water Source	Proposed four 4 Borewells sources at <ul style="list-style-type: none"> <li>Proposed Tube Well Amroo Bawasni (6 LPS)</li> <li>Proposed Tube Well Dumanwala (8 LPS)</li> <li>Proposed Tube Well Landeywall (3 LPS)</li> <li>Proposed Tube Well Mandhala (7 LPS)</li> </ul>
	WTPs	Construction of five WTPS : <ul style="list-style-type: none"> <li>Proposed Slow Sand Filter Amroo Bawasni (208 KLD)</li> <li>Proposed Slow Sand Filter Dumanwala (355 KLD)</li> <li>Proposed Slow Sand Filter Barotiwala (669 KLD)</li> <li>Proposed Slow Sand Filter Mandhala (320 KLD)</li> <li>Proposed Slow Sand Filter Landeywall (63.37 KLD)</li> </ul>
	Pump houses	Construction of eight PHs: <ul style="list-style-type: none"> <li>Pump House near Proposed WTP AmrooBawasni</li> <li>Pump House near Proposed WTP Dumanwala</li> <li>Pump House near Proposed Sumpwell Stage-1</li> <li>Pump House near Proposed Sumpwell Stage-2</li> <li>Pump House near Proposed Slow Sand Filter Landeywall</li> <li>Pump House near Existing Sumpwell in Village Landeywall</li> <li>Pump House near Proposed WTP Mandhala</li> </ul>

Grid No	Infrastructure	Description
		<ul style="list-style-type: none"> <li>Pump House in Mandhala village</li> </ul>
	MBR	2 Nos. MBRs (20 KL, 20 KL)
	SR	11 Nos. SRs (245 KL, 65 KL, 30 KL, 100 KL, 40 KL, 25 KL, 40 KL, 50 KL, 70 KL, 80 KL and 35 KL)
	Rising Main	38.14 KM (Dia 50 mm to 125 mm)
	Gravity Main	7.13 KM (Dia 50 and 80 mm)
	Distribution Main	117.6 KM (Dia 25 mm to 125 mm)

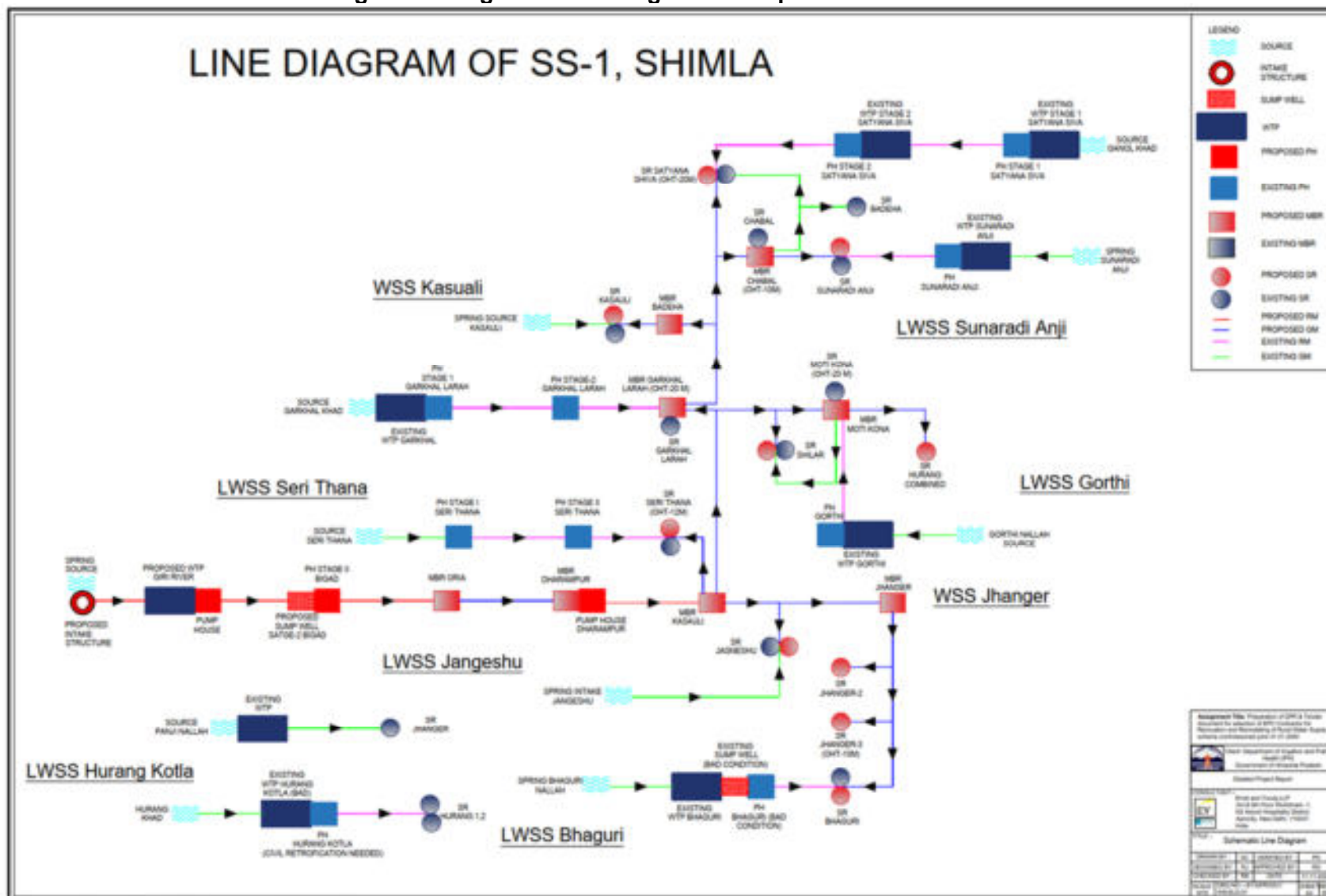
Source: Preliminary Detailed Project Report, 2020-2021

39. As discussed, the existing rural water supply schemes are under major stress, hence renovation and remodelling of existing infrastructure is required. The lean period discharge of few existing sources is not enough to meet the current water demand i.e., 70 LPCD at consumer end, therefore, schemes should be shifted to the reliable alternative water supply sources. Under renovation and remodelling the system will be designed for 20 years' horizon in phase wise manner. The ultimate or design year is 2042. The gridwise details of proposed infrastructures are furnished as under. The flow measurement certificates of proposed sources and raw water quality reports are enclosed as Appendix 8 and Appendix 9 respectively.

40. **Grid SS 1** The existing twelve sources in grid SS1 are catering the water demand of the grid SS-1 viz. Ganol Khad, Garkhal Khad, Hurang Khad, Sunardi spring, Gorthi Nallah, Giri Water source, Seri Spring, Kasauli Spring, Jangeshu Spring, Panji Nallah, Hurang Khad and Bhaguri Nallah. Spring sources of the existing scheme are not sustainable enough to meet the future water demand specially during dry season. Also, the water from existing spring sources is being directly supplied to consumers without any treatment as the water quality of springs are potable as per BIS standards.

41. The projected water demand for the year 2042 is 1511 KLD i.e., 17.51 lps. The water discharge available at Giri river during lean period from is 2340 lps. Therefore, the source is Giri river is capable to meet projected demand and sustainable for this water supply scheme and can provide water upto the ultimate design year. Abstraction of water from Giri river is less than 1% of the lean period discharge in the river, therefore, no downstream water usage conflicts will arise. Water quality test reports recommend that the water is potable as per BIS 10500 (2012). The flow diagram (Figure 3) depicts the integrated line diagram of the scheme.

Figure 3: Integrated Line Diagram of Proposed Scheme of SS- 1



42. **Grid SS 9.** At present 4 Tubewells and one spring source that is Bawasni spring are being used as source of water for grid SS9. The lean period discharge of respective sources is 37.11 lps, few of the sources are not sustainable to cater the water demand of these command area as well as future project water demand considering 70 LPCD at consumer end.

43. The projected water demand for the year 2042 is 1616 KLD i.e., 18.72 lps. As per design calculations four groundwater sources (bore wells) are proposed as water sources in addition to one existing tube well source (total yield 41.5 lps) to cater the ultimate water demand, which is sustainable for these water supply schemes. Feasibility reports were obtained from the Senior Hydrologist, JSV measuring the potential yield of borewells by electrical resistivity method and the same is attached in Appendix 8. As ground water will be utilised as primary sources, no conflicts will arise with any community.

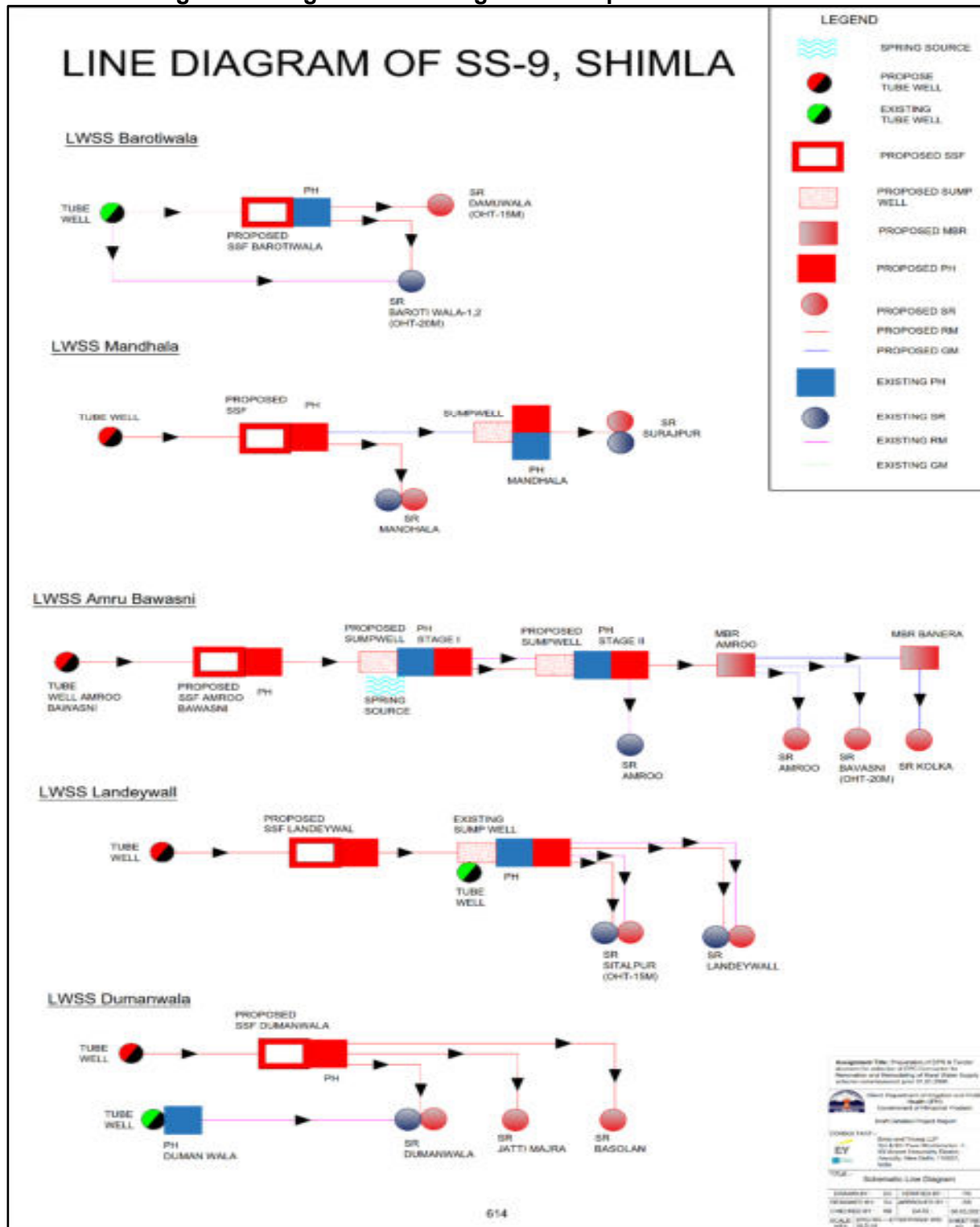
44. Water quality test reports recommend that the water is suitable for consumption after treatment as per BIS 10500 (2012). Six new water treatment plants are proposed near sources. Thereafter proposed clear water pumping transmission mains will convey the treated water from pump house to respective proposed MBRs. The proposed SR's under this scheme will be fed from these MBRs. The flow diagram depicts the integrated scheme of this Grid (Figure 4).

**Table 5: Details of Sources, Yield and Water Demand for Grid SS 9**

Source Type	Yield (LPS)	Water Demand (lps) (Year 2042)
Tubewell Dumanwala	8	6.1
Tubewell Landeywala	3	1.1
Existing Tubewell Barotiwala	17.5	2.42
Tubewell at Amroo Bawasni	6	3.6
Tube well at Mandhala	7	5.5
<b>Total</b>	<b>41.5</b>	<b>18.72</b>



Figure 4: Integrated Line Diagram of Proposed Scheme of SS-9



45. Intakes, WTPs, Pump houses, MBRs and SRs are the major civil structures proposed in this package. The summary of the grid wise components proposed in the package is summarized below in Table 6.

**Table 6: Proposed Civil Structures in SZ03**

Number of Civil structures						
Package	Grid no.	Intake	WTPs	Pump House	MBRs	SRs
SZ03	SS1	1	1	3	7	10
	SS9	4	5	8	2	11
<b>Total</b>		<b>5</b>	<b>6</b>	<b>11</b>	<b>9</b>	<b>21</b>

46. Total 5 intakes, 6 WTPs, 11 pump houses, 9 MBRs and 21 SRs have been proposed under this package (Table 6). Google earth images depicting the gridwise WTP locations, pipelines traversing through SH/NH and rising mains and distribution mains proposed through major roads are appended in Appendix 23. The detailed description of these civil structures is mentioned in Table 4.

47. In all new proposed sources, provision of water treatment plant is considered. In existing sources water is found to be of good potable quality and is directly supplied. The water testing is regularly conducted by testing laboratory of Jal Shakti Vibhag and the water quality reports suggest that the water is fit for potable purpose as per BIS standards (Appendix 9.) In such scenario, where the water quality is potable the water is directly supplied to the MBRs after the provision of disinfection through vacuum gaseous chlorination.

48. **Water Treatment Plant.** The aim of water treatment is to produce and maintain water that is hygienically safe, aesthetically attractive and palatable, in an economical manner. The method of treatment to be employed depends on the nature of raw water constituents and the desired standards of water quality. The Choice of any sequence of treatment units will depend not only the qualities of the raw water available and treated water desired but also on the comparative economics as alternative treatment steps applicable. Two techniques for water treatment are proposed in the proposal, (i) Rapid Sand filter (RSF) and (ii) Slow sand filter (SSF). SSF are proposed only in case where proposed source is either Percolation wells or Spring else, in all other proposed sources RSF is proposed.

49. **Rapid sand filter:** Components of the rapid sand filter i.e., Pre settling tank, connecting channel cum venturi flume, flash mix, flocculator, channel connecting flocculator to rapid gravity filter, rapid sand gravity filter and clear water reservoir are cast in-situ. It shall be ensured that WTP (RSF) components shall be designed to permit a 50% overload.

50. **Slow sand filter:** Components of the slow sand filter i.e., inlet chamber, filter beds (2 nos.) and collection tank are cast in-situ.

51. **Provision of recirculation system for backwash water** - Backwash water from filter beds will be re circulated to WTP inlet and mixed with raw water; this arrangement will minimize wastage of water, which otherwise would have disposed to open drains, and pollute the receiving water body. Since back water is recovered and recirculate in the WTP, no wastewater will be generated from water treatment process. Backwash water from filter beds will be sent to

a storage tank, and after allowing adequate time for settlement of solids, clarified water will be pumped to WTP inlet (Figure 2). This arrangement will avoid pollution and minimize wastage of water.

52. **Accumulated sludge** will be disposed-off at sludge drying beds for natural drying. Dried sludge will be used as soil conditioner if it is suitable. The water quality in the sources is quite better as being snow fed. The sludge generated will be dried in the sludge drying bed for use as manure in green area within the WTP complex. Therefore, no additional land will be required for sludge disposal. During detailed design phase an inventory of requirement for use of sludge in agriculture will be carried out. 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 will 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 Municipal Solid Waste Management & Handling Rules, 2016 have been adopted here.

53. **Automation** is proposed at WTP, Pump House, MBR and SRs to bring efficiency in operation and maintenance. The real time quality and quantity of water supplied will be monitored through automation. The provision for solar panels has been considered to support the automation at remote location.

54. The Grid wise details of the water pipeline networks proposed in this package with diameter which will be laid in the sub project area are as follows-

55. **Rising Mains.** The proposed rising mains or raw water transmission mains are used to either lift the water from source / intakes to WTPs / sump wells or transport the water from source to WTPs. The length of the proposed rising mains is about 68 km. The material of the pipe is MS ERW (Mild Steel Electric Resistance Welding) with diameter ranges from 50 mm to 200 mm.

**Table 7: Details of Proposed Rising Main Network under SZ 03**

Grid	Length of Rising Main in meter					
	50 mm	65 mm	80 mm	100 mm	125 mm	200 mm
<b>SS-1</b>	0	0	0	0	0	30422
<b>SS-9</b>	5640	11017	17277	674	3538	0
<b>Total</b>	<b>5640</b>	<b>11017</b>	<b>17277</b>	<b>674</b>	<b>3538</b>	<b>30422</b>

Source: Preliminary Detailed Project Report, 2020-2021

56. **Gravity Mains.** The gravity mains or clear water transmission mains usually convey water from higher elevation to lower elevation and used either to lift water from WTP o MBR/ SR or to supply water from WTP/ MBR to SR through gravity. The proposed length of the pipe is about 49 Km. The material of the pipe is Galvanised Iron (GI) with diameter ranges from 65 to 80 mm.



**Table 8: Details of Proposed Gravity Main under SZ 03**

Grid	Length of Galvanised Iron Pipe - Gravity Mains in meters					
	50 mm	65 mm	80 mm	100 mm	125 mm	150 mm
SS1	18	19938	1226	13165	1367	6292
SS9	0	4265	2867	0	0	0
Total Length	18	24203	4093	13165	1367	6292

Source: Preliminary Detailed Project Report, 2020-2021

57. **Distribution Main.** The proposed distribution network to convey water from service reservoirs to habitations is about 186 km. The material of the pipe is Galvanised Iron (GI) and the diameter ranges from 25 mm to 125 mm.

**Table 9: Details of Proposed Distribution Network under SZ 03**

Grid	Length of Galvanised Iron Pipe – Distribution networks in meters							
	25 mm	32 mm	40 mm	50 mm	65mm	80 mm	100 mm	125 mm
SS1	9499	10434	12463	11656	20212	1732	1945	501
SS9	17875	8561	19041	15418	46770	7106	1335	1501
Total Length	27374	18995	31504	27074	66982	8838	3280	2002

Source: Preliminary Detailed Project Report, 2020-21

58. Transmission and distribution lines will be laid along the roads and streets in the subproject area. If the existing water pipes are in the same route of new water supply pipes, the contractor through a detailed survey will establish the requirement of old pipes removal for giving way to new pipelines. Per the JSV, the requirement for removal of old pipes will be minimal. The existing pipes are of galvanized iron (GI) and mild steel (MS). There are no asbestos cement (AC) pipes. Old steel pipes will be disposed along with scrap material via recyclers.

59. **Household connections** will be provided to each house from the bulk water distribution mains. The details of the household connections proposed in the sub project area are shown below:

**Table 10: Details of Household Connections**

Grid No.	Number of Gram Panchayat	Number of Villages	Total No. of Habitations	Household connections
				2022
SS1	10	58	85	2612
SS9	6	22	47	2791
<b>All Grids Combined for SZ03</b>	<b>16</b>	<b>80</b>	<b>132</b>	<b>5403</b>

60. As above table shows that the overall household connections for the sub project commencing year (2022) is about 5403. The main bulk water distribution lines will reach the habitations. Thereafter, each house will be connected by a house service connection pipeline. The pipeline material is GI. with diameters of 15 and 20 mm and length of 30 m on average. These connections will be proposed along with a smart water meter to monitor the quantity of water delivered at user end.

61. **The land parcels** are identified based on the field visits to each of the water supply component locations and transect walk along the raw and clear water transmission mains pipeline alignment proposed under the subproject. A social and resettlement due diligence has been carried out simultaneously. Status of land requirement and availability are provided in Table 11 and Appendix 6. No compulsory acquisition of private land is anticipated, as procurement of land for public purpose mainly involving infrastructure projects from private owners will be through consent by the private owners. The people of the subproject area have shown willingness to contribute/donate land towards the well-being of the community for development of water supply infrastructure. None of the project components like intake, WTP, and reservoirs are falling within Protected Forest areas, however, the pipeline networks traverses through the forests at many locations. The entire civil works under the subproject for the transmission line are proposed along the existing pipelines and along the roads within RoW. It is assessed that few shop owners at some locations along the road will temporarily have some impact during laying of the water pipeline. Efforts will be made to minimize impact to the extent possible through provisions made in design.

**Table 11: Required Land Area for SZ 03**

Grid Number	Area Required to be Obtained (m <sup>2</sup> )	Ownership
SS1	7508.45	Revenue Department
	81	Cantonment Board
	121	Private Land
SS 9	4108.15	Revenue Department

Source: Detailed Project Report

62. **Road networks** in the subproject area are classified as National highways, State Highways, Major district roads, other district roads, village roads and katchha path in case

habitations. National highways are generally of 14m of width bituminous road, State highways are generally 8m, major district road is generally 6 m in width bituminous road, other district road are of 5m width bituminous road and village roads are generally 3.5m bituminous road or brick roads. As per Detailed Project Report, maximum dia pipes are less than 200mm which can be easily laid within the ROW of the roads.

63. As per the indicative alignment, pipelines will primarily traverse one State highway, SH 16 and one national highway NH 205, at various locations which will be further assessed during the time of DMS. Google earth images depicting the pipelines traversing through major roads are appended in Appendix 23.

64. Pipelines will be laid in the vacant right of way of roads which belong to the government. Since the density of housing is low and the houses are spread out, the possibility of access disruptions to houses during pipe laying and house connections are unlikely. Hence, no temporary economic impacts are anticipated due to laying of water supply network.

65. Details of proposed water supply network, available ROW for roads, dia. and length of pipes are presented in Table 12.

**Table 12: Summary of Proposed Water Supply Network**

S. No.	Details of Network	Length (in meter)	Road Width (in meter)	Dia of Pipe
1	Total Water Supply Network in Villages	3,03,755	1 m to 12 m	25 mm to 200 mm
2	Total Water Supply Network in Major road – SH22 and SH5	12,150	6 m to 14 m	
3	Total Water Supply Network in village roads, transect walks, Kuccha paths, forest trail paths etc	2,91,605	1 m to 4 m	

Source: Preliminary Detailed Project Report, 2020-2021.

#### **D. Proposed Subproject Components**

66. Subprojects are proposed for implementation under Design-Build-Operate (DBO) modality, wherein which the successful bidder will design the water supply system and components (based on the feasibility / preliminary design / standards / guidelines provided in the bid document), construct, commission, and operate for 5 years, after which it will be transferred to JSV. Therefore, at this stage, subproject is designed only in outline, and the details of components of the subproject provided in the table 13 below are as finalized at this stage based on the preliminary designs and as included in the bid documents. This IEE is based on the subprojects and components detailed in below and the IEE will be further updated during the detailed design phase. Table 13 shows the nature and size of the various components of the Water supply, system. Typical Layout Plan and Schematic Diagram of various components are shown in Figure 10 at the end of this Chapter.

**Table 13: Proposed Water Supply Subproject Components of SZ 03**

Sr. No.	Infrastructure	Function	Description	Location
<b>Grid SS-1</b>				
1	One intake structure near river Giri	Abstract water from river Giri and pump to WTP	Construction of RCC open frame intake structure at river Giri.	Tapping point of water is located at Giri river at coordinates Lat 30.874956°N and Long 77.217756E. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.
2	One set of Raw water pump at Giri river is proposed in Grid SS-1	Raw water pumps are proposed to lift water from respective source structure to the water treatment plant.	1. Pumps of capacity 20 HP with configuration of 2 working and 2 standbys (2W+2S) are proposed at Giri river, Pumps are designed for 11.95 LPS discharge and 35m Head.	The pumps are located at the bank of the river at coordinates 30°52'28.02"N 77°13'7.01"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.
3	Construction of One Water Treatment Plant are proposed in Grid SS-1 at Dharol-Sunaradi Anji	Treatment of raw water to meet the drinking water standards.  Conventional water treatment is proposed to treat the raw water from the River Beas.	MLD capacity WTP is proposed at Dharol - Sunaradi Anji covering total area of 6300 sqmt having following process: <ul style="list-style-type: none"> <li>• Raw water tank (dia 16m and depth 4.45m)</li> <li>• Pre-settling tank (14*5.6*2.8) m</li> <li>• Flocculator</li> <li>• Settling tank 15.6*5.2*2.8) m</li> <li>• Clarifier</li> <li>• Clear water tank (13*3.3) m</li> <li>• Chlorination tank.</li> </ul>	Water Treatment Plant Dharol is located in the bank of the River Giri at Coordinate 30°52'28.02"N 77°13'7.01"E having an area of 6300 sqmt. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.

Sr. No.	Infrastructure	Function	Description	Location
4	Three Sets. of Clear water pump are proposed in Grid SS-1.	Clear water pumps are proposed to lift water from water treatment plants to the corresponding main balancing reservoirs.	<p>Clear water pumps at 3 location are proposed with following specification:</p> <p>1: Pumps at pump house Stage-1 near Proposed WTP at Giri River, for 11.95 LPS with 581 M Head and 180 HP capacity with configuration of 2W+2S</p> <p>2: Pumps at pump house Stage-2 near Proposed Sumpwell Stage-2 Bigad, for 150 LPS with 433 M Head and 30 HP capacity with configuration of 2W+2S</p> <p>3: Pumps at pump house Dharampur near Proposed MBR Dharampur, for 11.95 LPS with 335 M Head and 100 HP capacity with configuration of 2W+2S</p>	<p>Proposed pump house is located at bank of Giri river at coordinates 30°52'28.04"N 77°13'5.46"E.'</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is located at bank of Bigad river at coordinates 30°51'38.03"N 77°4'53.09"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is located at Dharampur at coordinates 30°54'7.79"N 77°1'40.40"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p>
5	Three Pumping Station are proposed in grid SS-1 1. Proposed Pumping station near Proposed MBR Dharampu. 2. Proposed pumping station Stage-2 near Proposed Sumpwell Stage-2 Bigad 3. Proposed pumping station Stage-1 near Proposed WTP at Giri River	Pumping station will house clear water pumps to lift the water from Water Treatment Plant to Main Balancing Reservoirs or at MBR to lift water to SRs	Three Pumping stations are proposed in grid SS-1, all the Pump houses have an area of 63.15 sqmt each and it will house 8 pumps at each location.	<p>Proposed pump house is located at Dharampur at coordinates 30°54'7.79"N 77°1'40.40"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is located at bank of Bigad river at coordinates 30°51'38.03"N 77°4'53.09"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is located at bank of Giri river at coordinates 30°52'28.04"N 77°13'5.46"E.'</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p>

Sr. No.	Infrastructure	Function	Description	Location
6	Seven Nos. Main Balancing Reservoir are proposed in Grid SS-1.	Main balancing Reservoir will be supply water to different service reservoirs and in some cases will serve a part of command area.	<p>Seven no. of MBR is proposed in this Grid i.e.</p> <ol style="list-style-type: none"> <li>1. MBR Oria with capacity of 65 KL.</li> <li>2. MBR Dharampur with capacity of 65 KL</li> <li>3. MBR Kasauli with capacity of 65 KL</li> <li>4. MBR Garkhal Larih (Staging - 20 m) with capacity of 215 KL</li> <li>5. MBR Badeha with capacity of 20 KL.</li> <li>6. MBR Chabal (Staging - 10 m) with capacity of 40KL</li> <li>7. MBR Moti Kona (staging-20m) with capacity of 60 KL.</li> <li>8. MBR Jhanger with capacity of 20 KL.</li> </ol>	<p>Proposed seven MBRs are located at:</p> <ol style="list-style-type: none"> <li>1. MBR Oria with area 81 sqm at coordinates 30°55'25.31"N 76°58'35.79"E</li> <li>2 MBR Dharampur with area 81 sqm at coordinates 30°54'7.74"N 77° 1'40.19"E</li> <li>3. MBR Kasauli with area 81 sqm at coordinates 30°53'52.99"N 76°58'8.16"E</li> <li>4. MBR Garkhal Larih with area 169 sqm at coordinates 30°54'17.83"N 76°58'59.33"E</li> <li>5. MBR Badeha with area 64 sqm at coordinates 30°54'49.63"N 76°58'47.95"E</li> <li>6. MBR Chabal with area 81 sqm at coordinates 30°55'25.31"N 76°58'35.79"E</li> <li>8. MBR Jhanger with area 64 sqm at coordinates 30°54'10.68"N 76°55'38.79"E</li> </ol> <p>MBR Kasauli is on Cantonment land for which request for consent/NOC from Cantonment Board has been initiated by the JSV.</p> <p>All other proposed sites are located on government land (revenue) and transfer of land to JSV has been initiated.</p>

Sr. No.	Infrastructure	Function	Description	Location
7	10 Nos. of Service Level Reservoirs are proposed in Grid SS-1.	Service Reservoirs will be supplying water to the command area through distribution mains.	<p>10 no. of SR are proposed in this Grid i.e.</p> <p>1.SR Seri Thana with capacity of 40 KL</p> <p>2.SR Kasauli with capacity of 40 KL</p> <p>3.SR Surnadi Anji with capacity of 60KL</p> <p>4.SR Satyna Shiva with capacity of 130KL</p> <p>5.SR Shilar with capacity of 25KL</p> <p>6.SR Hurang Combined with capacity of 45KL</p> <p>7.SR Jangeshu with capacity of 40KL</p> <p>8.SR Jhanger-2 with capacity of 60KL</p> <p>9.SR Jhanger-3 with capacity of 40KL</p> <p>10.SR Bhaguri with capacity of 60KL</p>	<p>Proposed 7 Nos. of SRs, i.e. Seri Thana, Jagneshu, Bhaguri, Shilar, Kasauli, Sunaradi Anji, Satyana Shiva will be constructed at the same location of existing SR by dismantling of the existing SR However, new proposed SRs. will be located at coordinates:</p> <p>1.SR Jangeshu-2 is located at 30°54'18.80"N 76°55'27.33"E</p> <p>2.SR Jangeshu-3 is located at 30°54'28.77"N 76°55'24.66"E</p> <p>3.SR Hurang Combined is located at 30°55'24.72"N 76°59'53.99"E</p> <p>8 no. of SR having an area of 81 sqmt. and one SR Satyna Shiva having an area of 121 sqmt and SR Shilar having area 64 sqm.</p> <p>SR Satyna Shiva is located on private land. Consent has been obtained for voluntary land donation to JSV.</p> <p>All other proposed sites are located on government land (revenue) and transfer of land to JSV has been initiated.</p>
8	Distribution Mains	Distribution Lines are proposed to distribute water from MBR & SR to the command area through gravity.	Distribution lines with a total length 68.4 KM with diameter varying from 25 mm to 125 mm is proposed in Grid SS-1. About 16 KM of length is lying on forest land.	Distribution Lines will be laid from Service Reservoirs to the Land settlement patches. Pipes will be laid at most the locations along the existing distribution lines and at some places along the katcha path and village roads.
9	Gravity Mains	Gravity Mains are proposed to distribute water from MBR to SR through gravity.	Gravity main with a total length 42 KM with diameter varying from 50 mm to 150 mm is proposed in Grid Grid SS-1. About 33 KM of length of pipe is lying on forest land.	Gravity main will be laid form Main Balancing Reservoirs to Service Reservoirs. Pipe will be laid at most the locations along the existing gravity mains and along the roads.
10	Rising mains	Rising mains are proposed to lift the water WTP to MBRs through pumping	Rising mains with a total length of 30.4 KM out of which ~ 16 KM of pipeline is proposed to pass through forest land and proposed 200 mm in Grid SS-1.	Rising main will be laid form Water treatment Plants to Main Balancing Reservoirs. Pipe will be laid at most the locations along the existing rising mains and along the roads.

Sr. No.	Infrastructure	Function	Description	Location
11	House Service Connections	House Service Connection are proposed with water meter and tap water connections.	Total of 2612 House service connections are proposed in Grid SS-1.	House Service Connection will be located at every house connection.
<b>Grid SS-9</b>				
1	Four sources are proposed in Grid SS-9 1. Tube well at Ambroo Bawasni 2. Tube well at Dumanwala 3. Tube well at Landeywell 4. Tube well at Mandhala	Abstract underground water and pump it to proposed WTP	Construction of tube well of 125 m depth and 200 mm diameter.	Proposed Tubewell at Ambroo Bawasni is Located at coordinates 30°59'16.62"N 76°46'12.09"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.
		Abstract underground water and pump it to proposed WTP	Construction of tube well of 125 m depth and 200 mm diameter	Proposed Tubewell at Dumanwala is Located at coordinates 30°55'18.70"N 76°47'19.00"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.
		Abstract underground water and pump it to proposed WTP	Construction of tube well of 90 m depth and 200 mm diameter	Proposed Tubewell at Landeywell is Located at coordinates 31° 00' 11.8"N 76°44' 08.07"E. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.
		Abstract underground water and pump it to proposed WTP	Construction of tube well of 125 m depth and 200 mm diameter	Proposed Tubewell at Mandhala is Located at coordinates 30°53'54.53"N 76°52'14.64"E. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.



Sr. No.	Infrastructure	Function	Description	Location
	<p>Five sets of Raw water pump are proposed in Grid SS-9; ie,</p> <ol style="list-style-type: none"> <li>1. Pump at proposed Tube well Ambroo Bawasni</li> <li>2. Pump at proposed Tube well Dumanwala</li> <li>3. Pump at proposed Tube well Landeywell</li> <li>4. Pump at proposed Existing Tube Well Barotiwala</li> <li>5. Pump at proposed Tube well Mandhala</li> </ol>	<p>Raw water pumps are proposed to lift water from underground source to the water treatment plant.</p>	<p>Raw water pumps at 5 location are proposed with following specification:</p> <ol style="list-style-type: none"> <li>1. Pumps of capacity 15 HP with configuration of 1 working and 1 standbys (1W+1S) are proposed at proposed Tube well Ambroo Bawasni, Pumps are designed for 3.29 LPS discharge and 137m head.</li> <li>2. Pumps of capacity 20 HP with configuration of 1 working and 1 standbys (1W+1S) are proposed at proposed Tube well Dumanwala, Pumps are designed for 5.61 LPS discharge and 137m head.</li> <li>3. Pumps of capacity 5 HP with configuration of 1 working and 1 standbys (1W+1S) are proposed at proposed Tube well Landeywell Pumps are designed for 1.33 LPS discharge and 102m head.</li> <li>4. Pumps of capacity 30 HP with configuration of 1 working and 1 standbys (1W+1S) are proposed at existing Tube well Barotiwala, Pumps are designed for 10.57 LPS discharge and 136m head.</li> <li>5. Pumps of capacity 20 HP with configuration of 1 working and 1 standbys (1W+1S) are proposed at proposed Tube well Mandhala Pumps are designed for 5.06 LPS discharge and 154m head.</li> </ol>	<p>The pumps are located at proposed Tube well Ambroo Bawasni at coordinates 31° 00' 11.8"N 76°44' 08.07E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>The pumps are located at proposed Tube well Dumanwala at coordinates 30°59'16.62"N 76°46'12.09"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>The pumps are located at proposed Tube well Landeywell at coordinates 30°55'18.70"N 76°47'19.00"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>The pumps are located at existing Tube well Barotiwala at coordinates 30°54'14.19"N 76°50'27.03"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>The pumps are located at proposed Tube well Mandhala at coordinates 30°53'54.53"N 76°52'14.64"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p>

Sr. No.	Infrastructure	Function	Description	Location
2	Construction of Five Water Treatment Plant are proposed in Grid SS-9	<p>Treatment of raw water to meet the drinking water standards.</p> <p>Slow sand filter based water treatment is proposed to treat the raw water from the ground</p>	<p>Slow Sand filters are proposed at 5 locations with given specifications:</p> <p>1. A 0.355 MLD capacity slow sand filter is proposed at Dumanwala covering total area of 675 sqmt having following process:</p> <ul style="list-style-type: none"> <li>• Inlet Chamber (18.5 m * 2 m)</li> <li>• Filter bed (3 * (9 m * 6 m))</li> <li>• Collection tank (18.5 m * 2 m)</li> <li>• Chlorination tank (0.6m * 0.6m * 1.8m)</li> </ul> <p>2. A 0.669 MLD capacity slow sand filter is proposed at Barotiwala covering total area of 885 sqmt having following process:</p> <ul style="list-style-type: none"> <li>• Inlet Chamber (28.75 m * 2 m)</li> <li>• Filter bed (4 * (11 m * 7 m))</li> <li>• Collection tank (28.75 m * 2 m)</li> <li>• Chlorination tank (0.6m * 0.6m * 1.8m)</li> </ul> <p>3. A 0.208 MLD capacity slow sand filter is proposed at Amroo Bawasni covering total area of 445 sqmt having following process:</p> <ul style="list-style-type: none"> <li>• Inlet Chamber (15.5 m * 2 m)</li> <li>• Filter bed (3 * (7 m * 5 m))</li> <li>• Collection tank (15.5 m * 2 m)</li> <li>• Chlorination tank (0.6m * 0.6m * 1.8m)</li> </ul> <p>4. A 0.320 MLD capacity slow sand filter is proposed at Mandhala covering total area of 485 sqmt having following process:</p> <ul style="list-style-type: none"> <li>• Inlet Chamber (15.5 m * 2 m)</li> <li>• Filter bed (3 * (9 m * 5 m))</li> <li>• Collection tank (15.5 m * 2 m)</li> </ul>	<p>The slow sand filter Dumanwala is located at Coordinate 30°59'18.00"N 76°46'12.70"E having an area of 675 sqmt. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>The slow sand filter Barotiwala is located at Coordinate 30°54'14.38"N 76°50'26.95"E having an area of 885 sqmt. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>The slow sand filter Amroo Bawasni is located at Coordinate 30°59'59.23"N 76°44'23.94"E having an area of 445 sqmt. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>The slow sand filter Mandhala is located at Coordinate 30°53'50.13"N 76°52'23.09"E having an area of 485 sqmt. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p>

Sr. No.	Infrastructure	Function	Description	Location
			<p>m) •Chlorination tank (0.6m * 0.6m * 1.8m)</p> <p>5.A 0.063 MLD capacity slow sand filter is proposed at Landeywal covering total area of 325 sqmt having following process:</p> <ul style="list-style-type: none"> <li>• Inlet Chamber (9.5 m * 2 m)</li> <li>• Filter bed (3 * (4 m * 3 m))</li> <li>•Collection tank (9.5 m * 2 m)</li> <li>•Chlorination tank (0.6m * 0.6m * 1.8m)</li> </ul>	<p>The slow sand filter Landeywal is located at Coordinate 30°55'18.64"N 76°47'18.77"E having an area of 325 sqmt. The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p>
	<p>Thirteen Sets of Clear water pump are proposed in Grid SS-9.</p>	<p>Clear water pumps are proposed to lift water from water treatment plants to the corresponding main balancing reservoirs.</p>	<p>Clear water pumps at 15 location are proposed with following specification:</p> <p>1: Pumps At Proposed PH near Proposed WTP Amroo Bawasni, for 1.65 LPS with 372 M Head and 20 HP capacity with configuration of 2W+2S</p> <p>2: Pumps At Proposed PH near Proposed Sumpwell Stage-1, for 1.65 LPS with 293 M Head and 15 HP capacity with configuration of 2W+2S</p> <p>3: Pumps At Proposed PH near Proposed Sumpwell Stage-2, for 1.65 LPS with 318 M Head and 15 HP capacity with configuration of 2W+2S</p> <p>4: Pumps At Proposed PH near Proposed WTP Dumanwala, for 0.69 LPS with 178 M Head and 4 HP capacity with configuration of 2W+2S</p> <p>5: Pumps At Proposed PH near Proposed WTP Dumanwala, for 1.24 LPS with 175 M Head and 7.5 HP capacity with configuration of 2W+2S</p> <p>6: Pumps At Proposed PH near Proposed WTP Dumanwala. for 1.06 LPS with 212 M Head and 7.5 HP capacity with configuration of</p>	<p>Proposed pump house is located at Proposed PH near Proposed WTP Amroo Bawasni 30°59'59.23"N 76°44'23.94"E.' The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated</p> <p>Proposed pump house is located at Proposed PH near Proposed Sumpwell Stage-1 31° 2'26.73"N 76°47'26.40"E' The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated</p> <p>Proposed pump house is located at Proposed PH near Proposed Sumpwell Stage-2 31° 2'24.47"N 76°48'2.48"E' The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated</p> <p>Proposed pump house is located at Proposed PH near Proposed WTP Dumanwala 30°59'18.00"N 76°46'12.70"E' The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated</p> <p>Proposed pump house is located at Proposed PH near Proposed WTP Landeywall 30°55'18.64"N 76°47'18.77"E' The proposed site is located on government land (revenue) and</p>

Sr. No.	Infrastructure	Function	Description	Location
			<p>2W+2S</p> <p>7: Pumps At Proposed PH near Proposed WTP Landeywall, for 0.67 LPS with 39 M Head and 1 HP capacity with configuration of 2W+2S</p> <p>8: Pumps At Proposed PH near Existing Sumpwell in Village Landeywall, for 0.68 LPS with 62 M Head and 2 HP capacity with configuration of 2W+2S</p> <p>9: Pumps At Proposed PH near Existing Sumpwell in Village Landeywall, for 0.62 LPS with 83 M Head and 2 HP capacity with configuration of 2W+2S</p> <p>10: Pumps At Proposed PH near Proposed SSF Barotiwala, for 3.84 LPS with 117 M Head and 10 HP capacity with configuration of 2W+2S</p> <p>11: Pumps At Proposed PH near Proposed SSF Barotiwala, for 1.45 LPS with 62 M Head and 4 HP capacity with configuration of 2W+2S</p> <p>12: Pumps At Existing PH near Proposed SSF Mandhala for 1.53 LPS with 165 M Head and 10 HP capacity with configuration of 2W+2S</p> <p>13. Pumps At existing PH near Proposed PH Mandhala, for 1.00 LPS with 195 M Head and 5 HP capacity with configuration of 2W+2S</p>	<p>transfer of land to JSV has been initiated</p> <p>Proposed pump house is located at Proposed PH near Existing Sumpwell in Village Landeywall 30°55'27.99"N 76°46'40.09"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated</p> <p>Proposed pump house is located at Proposed PH near Proposed SSF Barotiwala 30°53'50.13"N 76°52'23.09"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated</p> <p>Proposed PH near Proposed SSF Mandhala is located at 30°53'50.13"N 76°52'23.09"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Existing PH near Proposed PH Mandhala-2 is located at 30°54'40.76"N 76°51'28.97"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p>
	<p>Eight Pumping Station are proposed in grid SS-9</p> <p>1. Proposed Pump House near Proposed WTP Amroo</p>	<p>Pumping station will house clear water pumps to lift the water from Water Treatment Plant to Main Balancing Reservoirs or at MBR to lift water</p>	<p>Six Pumping stations are proposed in grid SS-9, the Pump houses at Proposed WTP Dumanwala has an area of 111.15 sqm and houses 12 pumps, pump house at PH near existing sumpwell at Landeywall have an area of 63.15 sqmt and it</p>	<p>Proposed pump house is located near Proposed WTP Amroo Bawasni at coordinates 30°59'59.23"N 76°44'23.94"E.</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is</p>

Sr. No.	Infrastructure	Function	Description	Location
	<p>Bawasni</p> <p>2. Proposed Pump House near Proposed WTP Dumanwala</p> <p>3. Proposed Pump House near Proposed Sumpwell Stage-1</p> <p>4. Proposed Pump House near Proposed Sumpwell Stage-2</p> <p>5. Proposed Pump House near Proposed Slow Sand Filter Landeywall</p> <p>6. Proposed Pump House near Existing Sumpwell in Village Landeywall</p> <p>7. Proposed Pump House near Proposed Sumpwell Mandhala</p> <p>8. Proposed Pump House in Village Mandhala</p>	to SRs	will house 8 pumps, all remaining pump houses have an area of 48 Sqm and houses 4 pumps.	<p>located near Proposed WTP Dumanwala at coordinates 30°59'18.00"N 76°46'12.70"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is located near Proposed Sumpwell Stage-1 at coordinates 31° 2'26.73"N 76°47'26.40"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is located near Proposed Sumpwell Stage-2 at coordinates 31° 2'24.47"N 76°48'2.48"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is located at Proposed Slow Sand Filter Landeywall at coordinates 30°55'18.64"N 76°47'18.77"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed pump house is located near Existing Sumpwell in Village Landeywall at coordinates 30°55'27.99"N 76°46'40.09"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p> <p>Proposed PH near Proposed SSF Mandhala is located at 30°53'50.13"N 76°52'23.09"E</p> <p>The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.</p>

Sr. No.	Infrastructure	Function	Description	Location
				Existing PH near Proposed PH Mandhala-2 is located at 30°54'40.76"N 76°51'28.97"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.
3	Two nos. of Main Balancing Reservoir are proposed in grid SS-9.	Main balancing Reservoir will be supply water to different service reservoirs and in some cases will serve a part of command area.	3 Nos. of MBR is proposed in this Grid i.e.. 1. Proposed MBR Amroo with capacity of 20 KL 2. Proposed MBR Banera with capacity of 20 KL.	Proposed 2 Nos. MBR:  MBR Amroo with area 64 sqm will be constructed at coordinates 31° 2'12.56"N 76°48'38.74"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.  MBR Banera with area 64 sqm is located at coordinates 31° 1'42.23"N 76°48'23.86"E The proposed site is located on government land (revenue) and transfer of land to JSV has been initiated.
4	Eleven Service Level Reservoirs are proposed in Grid SS-9.	Service Reservoirs will be supplying water to the command area through distribution mains.	11 Nos. of SRs are proposed in this Grid i.e.  1. Proposed SR Damuwala with capacity of 245KL 2. Proposed SR Surajpur with capacity of 65KL 3 Proposed SR Mandhala - with capacity of 100KL. 4. Proposed SR Landeywall with capacity of 30KL 5. Proposed SR Sitalpur with capacity of 40KL 6. Proposed SR Kolka with capacity of 25KL 7. Proposed SR Bavasni with capacity of 40KL 8. Proposed SR Amroo with capacity of 50KL 9. Proposed SR Basolan with	Proposed SR Dumanwala, SR Sitalpur, SR Landeywall SR Surajpur and SR Mandhala will be constructed at the same location as of existing SRs. The proposed new SRs, SR Damuwala is located at 30°55'13.67"N 76°51'34.36"E SR Kolka is located at 31° 1'39.18"N 76°47'6.79"E Proposed SR Bavasni located at 31° 2'13.03"N 76°48'49.19"E Proposed SR Amroo is located at 31° 2'17.21"N 76°48'33.56"E SR Basolan is located at 31° 0'57.87"N 76°46'50.43"E SR Damuwala is located at 30°55'13.67"N 76°51'34.36"E Proposed SR Jatti Majra located at 31° 0'25.43"N 76°46'58.80"E Proposed sumpwell stage-1 is located at 31°46'15.78"N

Sr. No.	Infrastructure	Function	Description	Location
			capacity of 70KL 10. Proposed SR Dumanwala with capacity of 35KL 11. Proposed SR Jatti Majra with capacity of 80KL	76°31'48.22"E. Proposed sumpwell stage-2 is located at 31°46'15.78"N 76°31'48.22"E. Proposed Sumpwell at proposed PH Mandhala is located at 31°46'15.78"N 76°31'48.22"E.  All the proposed sites are located on government land (revenue) and transfer of land to JSV has been initiated.
5	Gravity mains	Gravity Mains are proposed to distribute water from MBR to SR through gravity.	Gravity main with a total length 7.13 KM with diameter varying from 50 mm to 80 mm is proposed in Grid SS-9.	Gravity main will be laid from MBR to SR pipes will be laid at most the locations along the existing gravity mains. About 3 KM of length of pipe is lying on forest land. New pipelines will be mostly laid along the existing mains in forest areas or along the forest trails / roads. No tree cutting will be required for laying pipelines.
6	Rising mains	Rising mains are proposed to lift the water from Pump house to MBRs and SRs	Rising mains with a total length of 38.14 KM out of which ~ 13 KM of pipeline is proposed to pass through forest land and proposed diameter varying from 50 mm to 125 mm in Grid SS-9.	Rising main will be laid from Water treatment Plants to Main Balancing Reservoirs. Pipe will be laid at most the locations along the existing rising mains and along the roads. About 13 KM of length is lying on forest land. New pipelines will be mostly laid along the existing mains in forest areas or along the forest trails / roads. No tree cutting will be required for laying pipelines.
7	Distribution Mains	Distribution Lines are proposed to distribute water from MBR & SR to the command area through gravity.	Distribution lines with a total length 117.6 KM with diameter varying from 25 mm to 125 mm is proposed in Grid SS-9.	Distribution Lines will be laid from Service Reservoirs to the Land settlement patches. Pipes will be laid at most the locations along the existing distribution lines and at some places along the katcha path and village roads. About 36 KM of length is lying on forest land. New pipelines will be mostly laid along the existing mains in forest areas or along the forest trails / roads. No tree cutting will be required for laying pipelines.



Sr. No.	Infrastructure	Function	Description	Location
8	House Service Connection	House Service Connection are proposed with water meter and tap water connections.	Total of 2791 House service connections are proposed in Grid SS-9.	House Service Connection will be located at every house connection.

### E. Project Benefits

67. The citizens of SZ 03 coverage area will be the major beneficiaries of the improved water supply system. The subproject is primarily designed to improve environmental quality and living conditions of service area through provision of water supply. The subproject aims to achieve safe and sustainable water services both in terms of services to customers and conservation of precious water resources. The benefits arising from this subproject include: (i) increased availability of potable water at appropriate pressure to all households including rural poor; population (ii) reduced time and costs in accessing alternative sources of water. (iii) 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. The successful implementation of the water supply project will result in better control over the NRW management, improved monitoring system and overall demand management along with energy reduction.

### F. Energy Efficiency Measures included in the subproject

68. The water supply project is designed with utmost consideration to energy efficiency. Gravity flow systems adopted, wherever feasible. In water supply system, water losses (UFW) are usually very high, reducing the losses and improving the efficiency of the system is identified as the most important component under HPRWSP.

69. 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 measures are 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.

70. 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 for pump 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.

71. **Instrumentation** To bring the efficiency in system, automation is proposed at Source, WTP, Pump House, MBR and SRs. The automation will be monitoring the real time quality and quantity of water supplied and will reduce the manual intervention in the operation of the supply schemes. The details of proposed component at each stage are furnished as under:



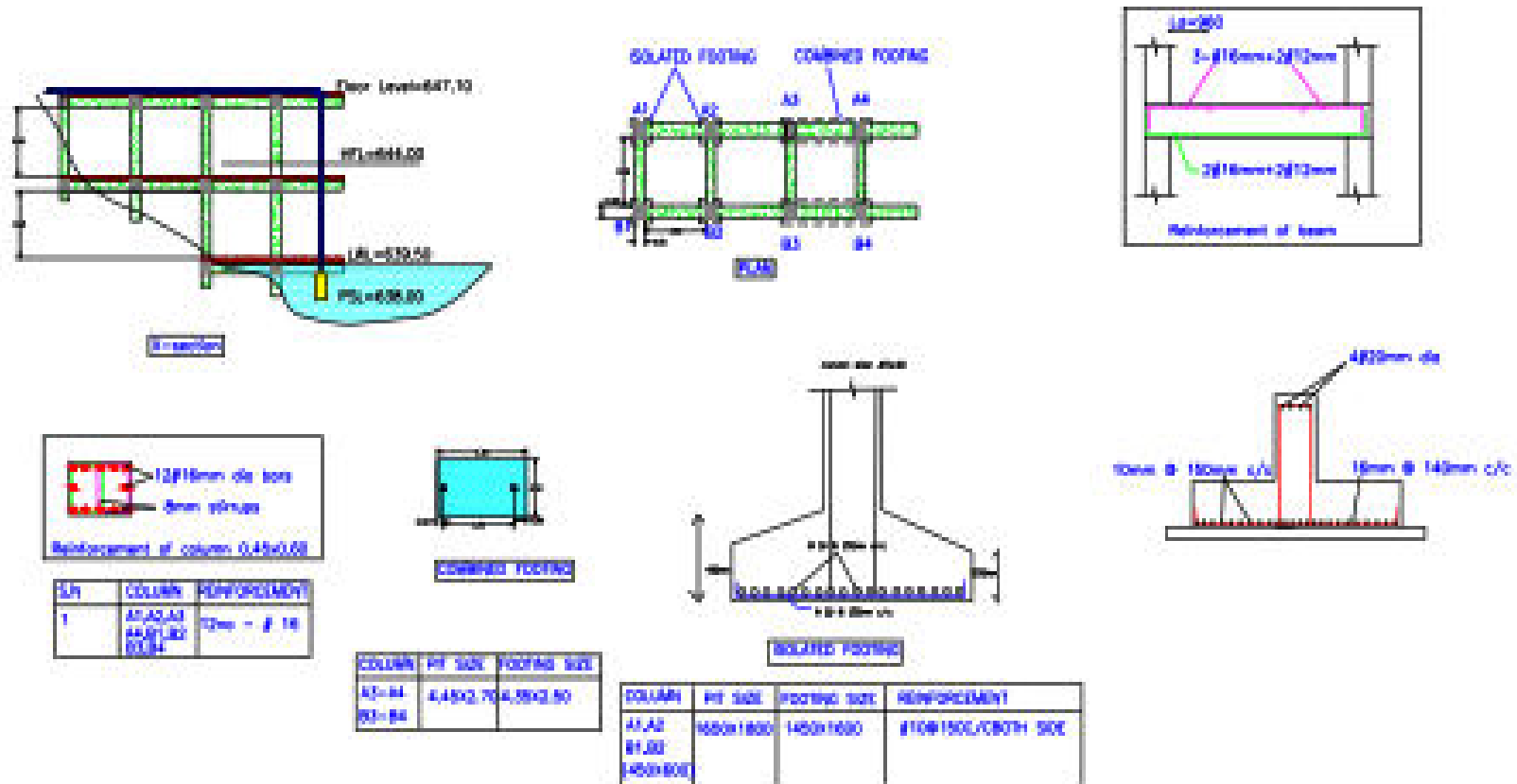
- (i) **At Source**
  - Pressure Transmitter to link the automatic start and stop of pumps with respect to pressure built in the rising main on the closing of actuator valves at the inlet of Raw water tank.
  - Electronic flow meter to measure the discharge.
  - Ultrasonic Level Transmitter to measure the water level.
- (ii) **Water Treatment Plant**
  - Level sensor, actuator valve and Electronic flow meter to measure the real time discharge and control the out flow in Raw Water Collection tank / Sump well.
  - Online Water Analyser.
  - Vacuum Gaseous Chlorination System for disinfection.
  - Loss of Head/Differential Pressure Transmitter (DPT) at Filter bed
- (iii) **At Pump House**
  - Pressure Transmitter to link the automatic start and stop of pumps with respect to pressure built in the rising main on the closing of actuator valves at the inlet of MBRs.
  - Desktop with operating system for supervision and collation of data.
  - Electrical Panel.
  - Motor actuated sluice valves.
- (iv) **At Main Balancing Reservoirs**
  - Level sensor, actuator valve and electronic flow meter to measure the real time discharge and control the out flow in respective Main Balancing Reservoirs.
  - Solar panels for campus lightning and automation components.
- (v) **At Service Level Reservoirs**
  - Level sensor, actuator valve and electronic flow meter to measure the real time discharge and control the inflow.
  - Solar panels for campus lightning and automation components.

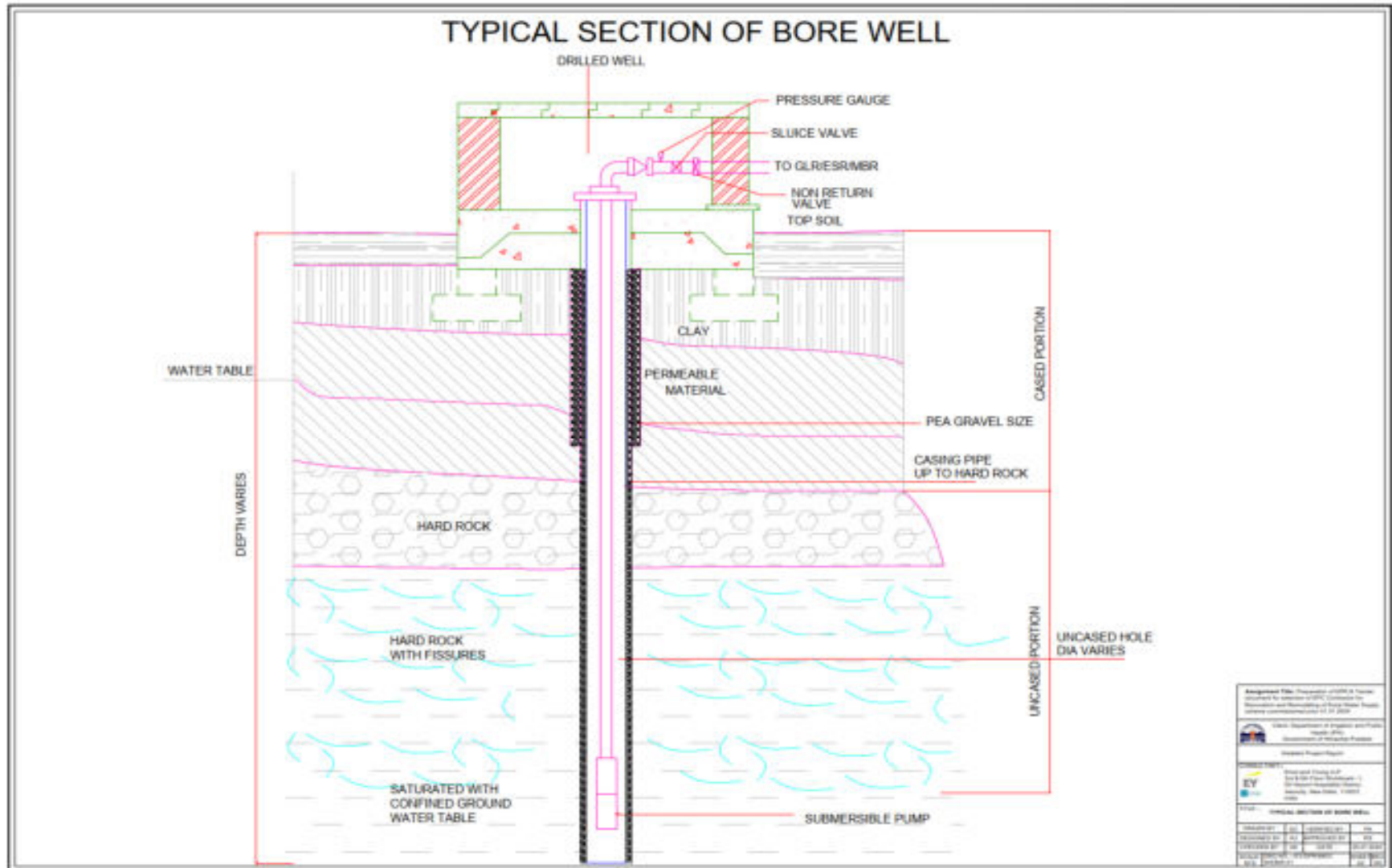
72. Supply of power at the WTP and Pump house campus will be provided by the Himachal Pradesh State Electricity board and further correspondence on this will be taken ahead by IPH.

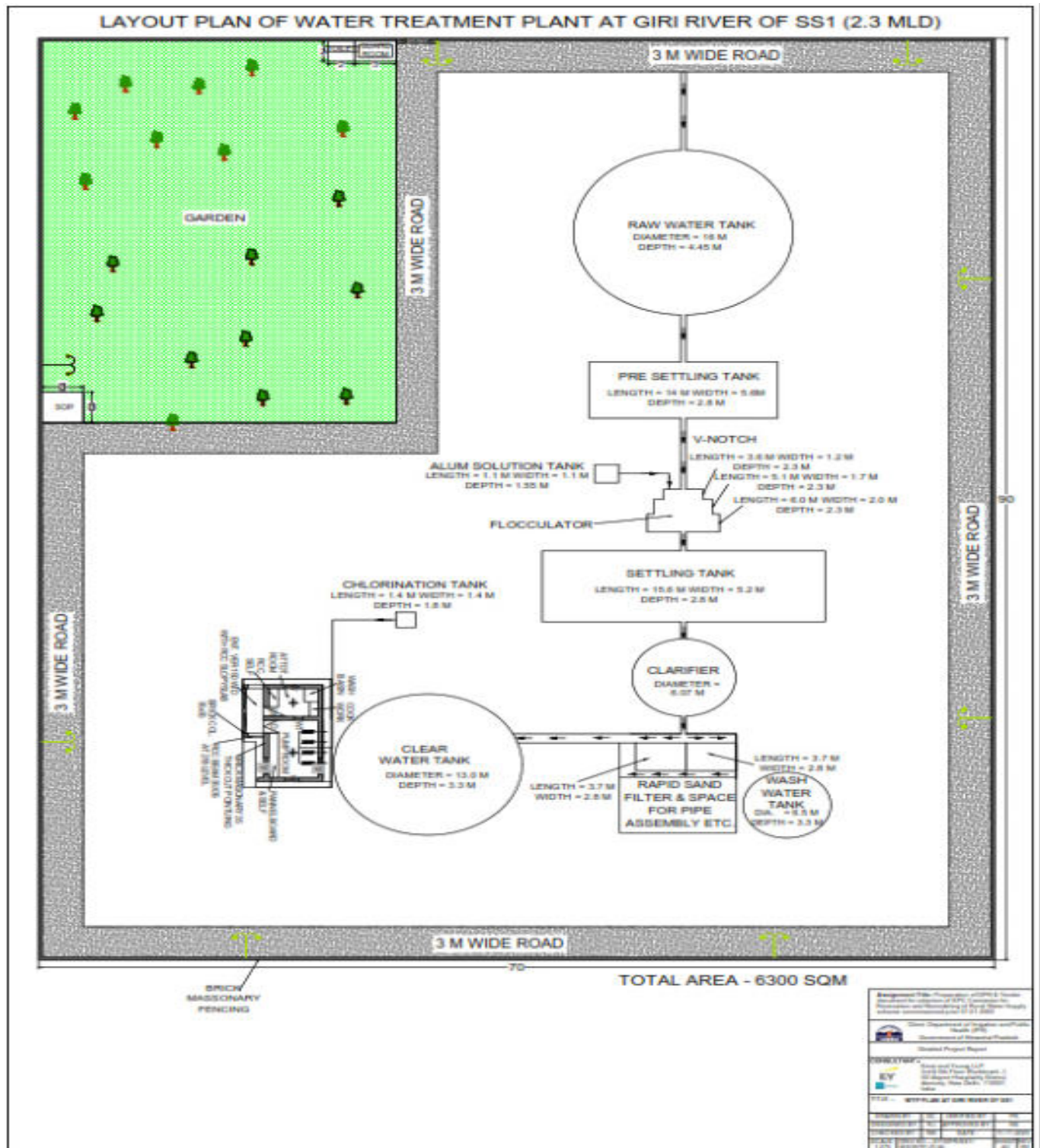
## **G. Implementation Schedule**

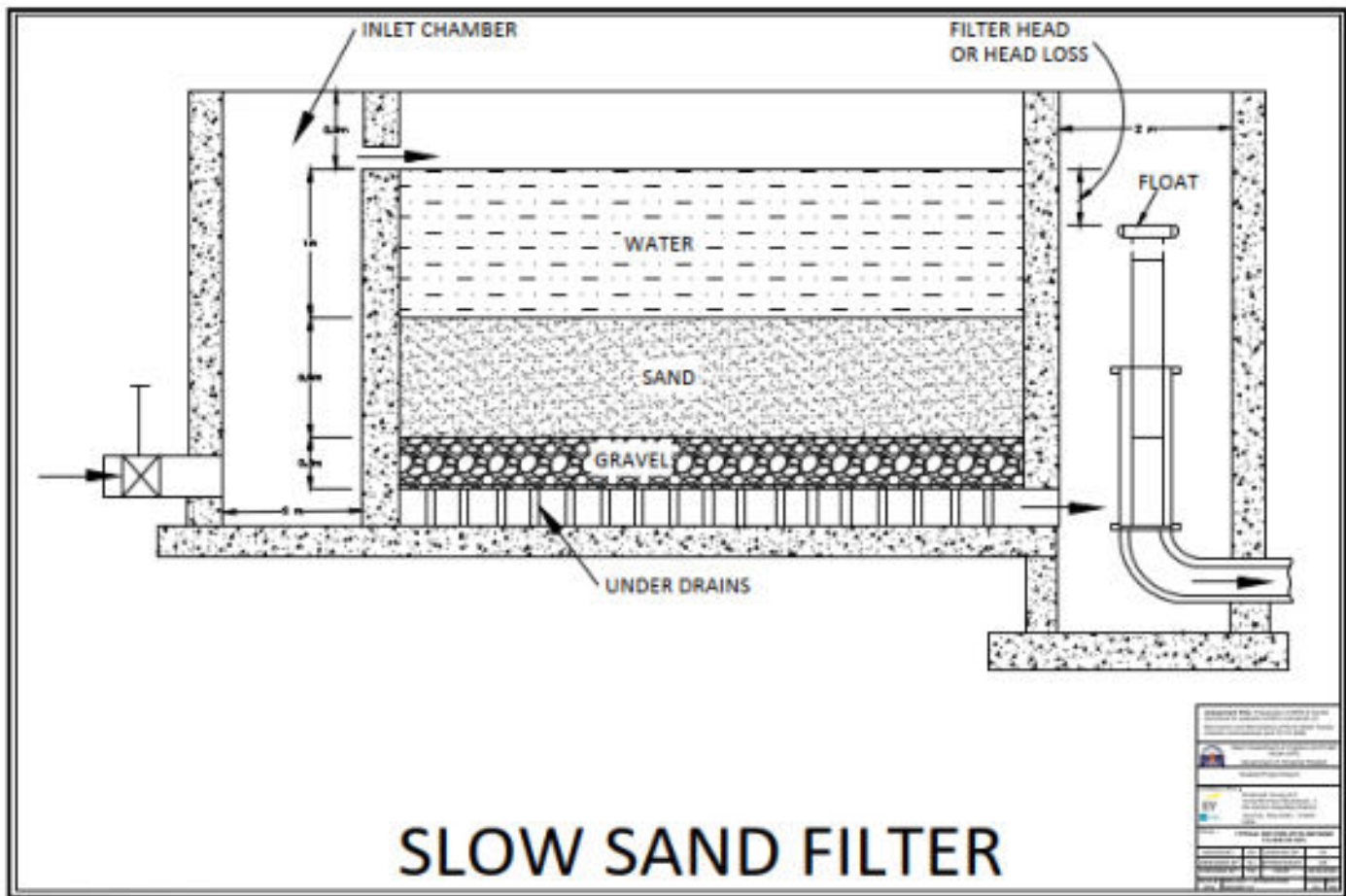
73. After the completion feasibility study /preliminary designs, bids will be invited in December 2021 for the subprojects to be implemented under the DBO (design-build-operate) modality. Bids will be awarded in March 2022. Successful bidder then will carry out detailed designs and construction is will take about 24 months after the award of works. After completion of construction and commissioning, scheme will be operated by DBO contractor for 5 years, and after which the operation and maintenance will be carried out by JSV.

Figure 5: Typical Layout Plan and Schematic Diagram of Various Components  
**PLAN OF RECTANGULAR RCC OPEN FRAME INTAKE STRUCTURE**

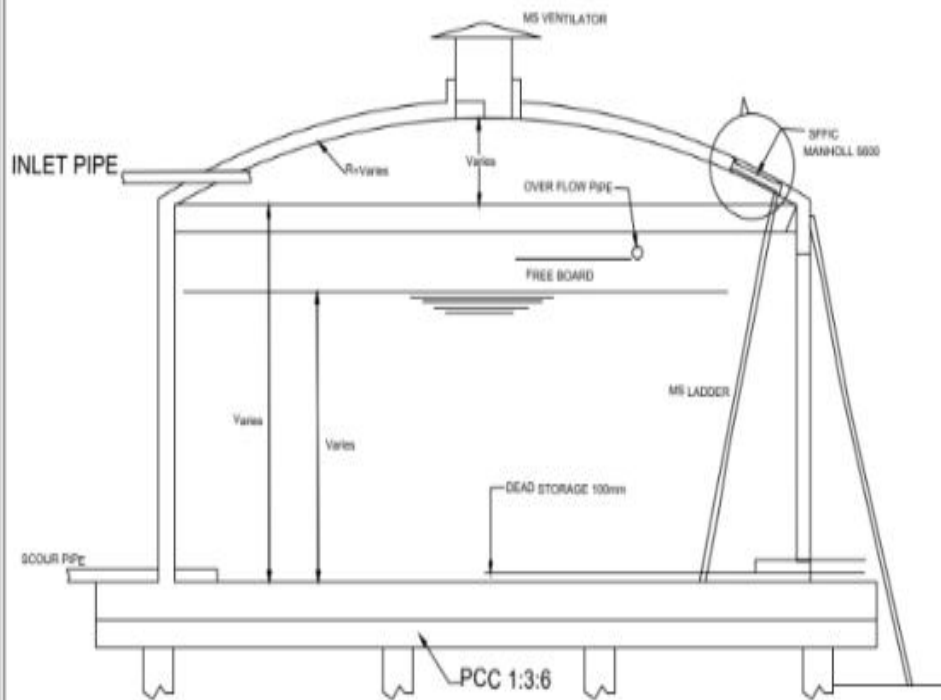








# TYPICAL SECTION OF SR / MBR



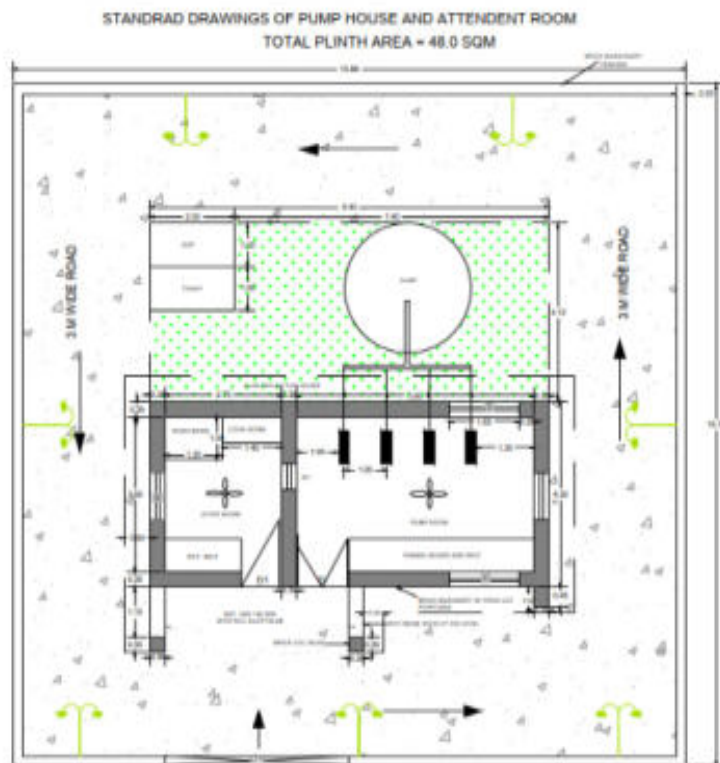
NOTE:  
1. All dimensions are in Meter unless stated

**SCHEMATIC SECTION OF STORAGE TANK**

<p>Approved By: <i>[Signature]</i> Date: 10/10/2017          Checked By: <i>[Signature]</i> Date: 10/10/2017          Drawn By: <i>[Signature]</i> Date: 10/10/2017</p>			
<p>Project Name: <b>Water Treatment Plant</b>          Project Location: <b>Water Treatment Plant</b>          Project No: <b>WT-2017-01</b></p>			
<p>Revision No: <b>01</b>          Revision Description: <b>Initial Design</b>          Revision Date: <b>10/10/2017</b></p>			
<p>Scale: <b>1:100</b>          Drawing No: <b>WT-2017-01-01</b>          Drawing Date: <b>10/10/2017</b></p>			



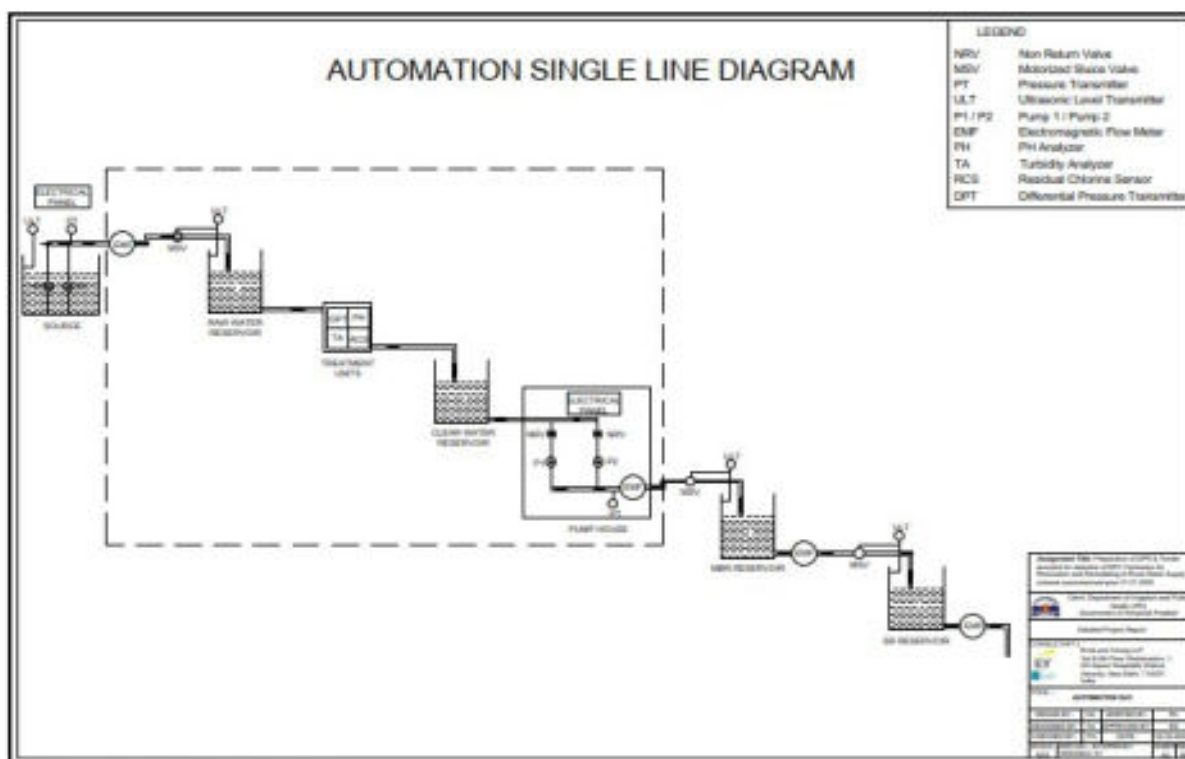




Notes:  
1. All dimensions are in Metric unless stated

<p>PROJECT: <b>STANDRAD DRAWINGS OF PUMP HOUSE AND ATTENDANT ROOM</b></p> <p>DATE: <b>10/10/2023</b></p> <p>SCALE: <b>1:100</b></p> <p>PROJECT NO: <b>10/10/2023</b></p> <p>DESIGNER: <b>STANDRAD</b></p> <p>CHECKED: <b>STANDRAD</b></p> <p>APPROVED: <b>STANDRAD</b></p>	
<p>PROJECT NO: <b>10/10/2023</b></p> <p>DATE: <b>10/10/2023</b></p> <p>SCALE: <b>1:100</b></p> <p>PROJECT NO: <b>10/10/2023</b></p> <p>DATE: <b>10/10/2023</b></p> <p>SCALE: <b>1:100</b></p>	<p>PROJECT NO: <b>10/10/2023</b></p> <p>DATE: <b>10/10/2023</b></p> <p>SCALE: <b>1:100</b></p> <p>PROJECT NO: <b>10/10/2023</b></p> <p>DATE: <b>10/10/2023</b></p> <p>SCALE: <b>1:100</b></p>





### III. ANALYSIS OF ALTERNATIVES

74. 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.

75. GoHP intends to seek a fund from Asian Development Bank (ADB) towards “Remodelling/ Renovation of Old Rural Water Supply Systems of Himachal Pradesh, (HPRWSP)” which will cover 10 districts out of 12 districts. The renovation and remodelling of 187 schemes will provide 24 hours and seven days a week water supply system with the automation of pumps and real-time monitoring of water quality at water treatment plants and quantity from the water supply source and at the household level.

76. The existing rural water supply schemes were designed to tap water from local available sources and many of them are small water supply schemes to caters few habitation or village. With passage of time water demand increased due to increase in population and existing water supply schemes could not match the increased demand. The constant wear and tear, limited maintenance funds and unreliability of various small sources, made these systems more vulnerable.

77. Therefore, JSV, wants these schemes to be re-modelled/renovated. The proposed water supply subproject components in SZ03 located in Solan district include source augmentation to provide adequate water, water conveyance, treatment, storage and distribution. Descriptions of various alternatives considered for critical components such as water source, water treatment and distribution etc. are presented in the following Table 14.

**Table 14: Analysis of Alternatives**

<b>1.</b>	<b>Project Need – No Project Alternative</b>
<b>Type of alternative</b>	<b>‘No project’ / ‘with project’ alternative</b>
<b>Description of alternatives</b>	<p><b><u>No project alternative</u></b></p> <p>At present water supply is being served @ 40 LPCD, which is less than latest norms of rural water supply i.e., 70 LPCD. These schemes are dependent on Spring, Khad and Bore well.</p> <p>Some of existing civil structures such as storage reservoirs and other ancillary structures are not in good condition. Few reservoirs are not adequate to meet the ultimate water demand and those are meeting need repairing of civil structures. The command area of few service level reservoirs is exceeding the radius two Kms which is also a reason for unequitable supply of water to the consumer end.</p> <p>The present distribution network is laid on need basis which makes the network very complex and inadequate. Multiples distribution pipes are serving the same land settlement patch directly from service level reservoirs and tail end consumers are not getting the enough terminal pressure and discharge. The existing water supply schemes covered under this grid are both gravity and pumping-based schemes.</p> <p>The schemes are manually operated and lacking in monitoring of real time quality and quantity of water supplied. Therefore, it could be stated that unaccountable flow water in the system is very high.</p>

Living conditions due to absence of proper water supply, are unhealthy and unhygienic. Lack of infrastructure is also causing environmental pollution, overall poor quality of life. Poor environmental quality affects the rural poor more.

The project intends to provide following benefits to the people residing in the subproject area, and the “no project” alternative will deprive people of these benefits:

- increased availability of potable water at appropriate pressure to all households including urban poor;
- reduced time and costs in accessing alternative sources of water.
- better public health particularly reduction in waterborne and infectious diseases;
- Supply 70 LPCD water supply to user end as per defined KPIs in Bidding Document
- To ensure positive impact on social status and economic standard of the people of rural areas.
- To automate the operation from source to sector tank with use of SCADA and water quality monitoring
- Ensure that 100% households have a metered water connection,
- Provide Solar enabled system in the value chain as far as possible.

#### ***With No Forest Option***

As it has already been mentioned in Chapter II that None of the project components like intake, WTP, and reservoirs are falling within forest areas, however, the pipeline networks traverses through the protected forests at many locations. Forest department has exempted from clearance procedure for laying of drinking water pipelines requiring excavation/trench of less than 1m width and 2 m depth along the roads in forest land. In case of sample subproject IEEs, the proposed trench width is 0.6m, hence permission from local forest department will be adequate for pipeline laying

. During alternative analysis, ‘With No Forest’ option has also been considered so that occupying of forest area could be avoided for the construction of these proposed components. But the technical studies show that there are no other feasible options for the proposed project. Forest areas cannot be avoided for pipelaying since large areas around habitation are under forest category. Hence, this ‘With No Forest’ option seems inappropriate for the proposed project.

#### **With project alternative**

The proposed subprojects will support the ongoing efforts of the Government of Himachal Pradesh under Himachal Pradesh Water Policy, 2013 towards improving water supply systems.

Since the existing water supply sources/systems are insufficient to accommodate growing population in the area, the proposed water supply subproject include source augmentation to provide adequate water, water conveyance, treatment, storage and distribution. Construction of new source, WTP, MBR, SR and water supply pipeline networks have been included in the scope of this water supply sub-project. 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.

	<p>Similarly, the proposed water supply subproject 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 area. The successful implementation of the water supply project will result in better control over the NRW management, improved monitoring system and overall demand management along with energy reduction.</p> <p>Overall, the <b>‘with project alternative’</b> will bring about improved public health and living environment that will contribute to improved quality of life in the rural areas/villages. Improved water supply system will create an enabling environment for local economic development.</p>
<b>Selected Alternative</b>	<p>“Without” subprojects would yield the project area to be continuously under-served that puts the health 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 and the defer commitments to improve the proportion of the population with sustainable access to clean water.</p> <p>Given the large-scale benefits to the population and environment, <b>‘With Project’</b> alternative is considered appropriate</p>
<b>2</b>	<b>Alternative source of water</b>
<b>Type of alternative</b>	<b>‘Water source’</b>
<b>Description of alternatives</b>	<p>The existing rural water supply schemes are sourced from local sources such as bore wells and rivers located near the villages. This Package SZ 03, Shimla Zone (District: Solan) focuses on renovation and remodelling of 15 such schemes under 2 Grids of which will provide 24 hours and seven days a week water supply system</p> <p>The proposed water sources mostly comprises of intake and bore wells. There are a total of five (6) locations where water sources will be tapped. Amongst them, One (1) location is the existing tube well source which will be retained in the proposal. The project area of CW-SZ03 comprises of 16 village panchayats covering 80 villages and 132 habitations.</p> <p>Source selection criteria is based on its ability to meet the ultimate year (2042) water demand of its respective command area. Considering water demand 95 LPCD total water demand for the year 2022 and 2042 will be approximately 2.56MLD and 3.13 MLD (36.23 lps). The lean period water discharge available from all the proposed sources and one existing source is 205.76 MLD (2381.5 lps), Hence it can be concluded that the proposed sources are capable to meet projected water demand and sustainable for this proposed water supply project till ultimate design year (2042). Water quality test reports recommends that the available water is suitable for the human consumption after treatment and fulfil the standards mentioned in BIS 10500 (2012).</p> <p>All sources are duly selected keeping in mind the downstream conditions and water requirement. Upto two kilometres downstream of the sources, it was observed that there will not be any significant water reduction that will impact the users downstream.</p> <p>One existing and four groundwater sources (tube wells) along with and one surface water source (Giri river) are proposed as water sources in SZ03 to cater the ultimate water demand, Feasibility reports obtained from the Senior Hydrologist, JSV measuring the potential yield of proposed four tube wells (24 lps) by electrical resistivity method confirms that bore wells are sufficient to meet the water demand of 16.3 lps for the respective command areas till the design year 2042.. As ground water will be utilised as primary sources here in Grid SS9. no conflicts will arise with any community. No area or block has</p>

	been notified from groundwater development point of view by the Central Groundwater Board (CGWB)
<b>Selected Alternative</b>	<b>Selected source:</b> Surface water sources comprises of Giri river for Grid SS1 along with Groundwater sources for Grid SS9
<b>3</b>	<b>Project Locations</b>
<b>Description of alternatives</b>	<p><b>Location of water intake:</b> One RCC open frame intake structure is proposed under this package on Giri river. Location selection is guided by technical feasibility and availability of year-round availability of water. It has been found that the proposed sources are capable to meet projected demand and sustainable for the water supply schemes and can provide water to till ultimate design year, 2042. Intakes are proposed at unused vacant government revenue land for which JSV will obtain necessary permission from revenue department.</p> <p><b>Location of Tube well:</b> Four proposed bore well with combined discharge of 24 lps will be installed in Amroo Bawasni, Dumanwala, Landeywall, Mandhala. on revenue lands for which JSV will obtain necessary permissions from Revenue department. The lands are vacant away from human settlements and free from of any encumbrances. Proposed bore well locations are away from houses, shops or any other premises used by people, thus establishing a buffer to reduce the effects of noise, dust and the visual appearance of the site. Only shrubs and bushes are present at sites and therefore no tree cutting will be required during construction of tube well as per preliminary design. No wildlife is reported at from the sites. A feasibility study has been conducted</p> <p><b>WTP Location.</b> The aim of water treatment is to produce and maintain water that is hygienically safe, aesthetically attractive and palatable, in an economical manner. The method of treatment to be employed depends on the nature of raw water constituents and the desired standards of water quality.</p> <p>Considering the small rural water supply systems, slow sand filter (SSF) technology is adopted. Six WTP sites are selected for this package. These are proposed at unused vacant land some of which are located on Revenue Land for which JSV will obtain necessary permission from Revenue department. Considering the technical feasibility of proximity to the service area, and easy access, the sites are selected for WTP.</p> <p><b>Location of, Pump Houses, Main Balancing Reservoirs and Service Reservoirs :</b> All together 5 intakes, 6 WTPs, 11 pump houses, 9 MBRs and 21 SRs of various capacities are proposed within the existing water supply facilities in SZ03. These are located in vacant land some of which are located on Cantonment Board for which JSV will obtain necessary permission from Cantonment Board.</p> <p><b>Water Pipeline Network.</b> (1) <b>Rising mains.</b> The proposed rising mains to lift the water from lower elevation to higher elevation is about 68 km. The material of the pipe is MSERW with diameter ranges from 50 mm to 200 mm.; (2) <b>Gravity mains.</b> The proposed gravity mains to convey water from higher elevation to lower elevation is about 49 km. The material of the pipe is galvanised iron (GI) with diameter ranges from 65 to 80 mm and (3) <b>Distribution mains.</b> The proposed distribution network to convey water to habitations is about 270 km. The material of the pipe is GI and the diameter ranges from 25 mm to 125 mm .</p> <p>Clear water pipes will be laid at most the locations along the existing pipelines and along the the vacant right of way (ROW) of government roads. Distribution lines will be laid from Service Reservoirs to the Land settlement patches. Pipes will be laid at most the locations along the existing distribution lines and at some places along the katcha path and village roads within RoW. The pipeline networks traverses through the protected forests at many</p>

	<p>locations.</p> <p>Road network in the subproject area are classified as National highways, State Highways, Major district roads, other district roads, village roads and katcha path in case habitations. As per the indicative alignment, pipelines will primarily traverse one National highway, NH-205 and one State highway, SH 22, at various locations which will be further assessed during the time of DMS.</p> <p>Water supply pipes will be laid underground (1m depth) and are/will be located on one or either side of the roads. There are no eco-sensitive or protected areas within the proposed project activity areas. No wildlife is also reported in the project area. During water supply pipe laying works tree cutting is not envisaged as per preliminary design.</p> <p>Existing pipelines are of MS ERW and GI pipes, which shall be left buried as it is. If the existing water pipes are in the same route of new water supply pipes, the contractor through a detailed survey will establish the requirement of old pipes removal for giving way to new pipelines. Those pipes shall be removed and disposed along with other scrap material to recyclers.</p>
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#### IV. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

##### A. ADB Safeguard Policy Statement, 2009

78. 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.

79. 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, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project 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:

- (i) **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 facilities subject to physical works. An environmental impact assessment (EIA) is required.
- (ii) **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. These impacts 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.
- (iii) **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.
- (iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

80. The environmental impacts of Package SZ 03 subproject of water supply, system has been identified and assessed as part of the planning and design process. An environmental assessment using ADB's Rapid Environmental Assessment Checklists for Water supply system (Appendix 1) were conducted, and results of the assessments shows 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.

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

82. **Environmental Audit of Existing Facilities.** ADB SPS requires that relevant external experts perform an environmental audit, if a subproject involves facilities and/or business

activities that already exist or are under construction, it is to determine the existence of any areas where such project may cause or is causing environmental risks or impacts and identify and plan appropriate measures 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 to identify and plan appropriate measures to address outstanding compliance issues.

83. **Public Disclosure.** The IEE will be put 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 will be put up in ADB's website so that the affected people, other stakeholders, and the public can provide meaningful inputs into the project design and implementation:

- (i) Final or updated IEE upon receipt; and
- (ii) Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

84. **Consultation and Participation.** ADB SPS requires borrower to conduct meaningful consultation<sup>4</sup> with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

85. **Grievance Redress Mechanism.** ADB SPS requires borrowers to establish a mechanism to 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.

86. **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 submit to 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 during operation until ADB issues a project completion report.

87. **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 EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

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<sup>4</sup> Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;<sup>1</sup> (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



88. **Occupational Health and Safety.** ADB SPS requires the borrower<sup>5</sup> to ensure that workers<sup>6</sup> 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 workers and 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.

89. PMU shall ensure to apply preventive and protective measures consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines.

90. **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.

91. **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.

92. **Pollution Prevention and Control Technologies.** During the design, construction, and operation of the project, PMU, shall apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines.<sup>7</sup> These standards contain performance levels and measures that are normally acceptable and

<sup>5</sup> In case where responsibility is delegated to subproject contractors during construction phase, borrower shall ensure that the responsibilities on occupational health and safety are included in the contract documents

<sup>6</sup> Including non-employee workers engaged by the borrower/client through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

<sup>7</sup> World Bank Group. 2007. Environmental, Health, and Safety General Guidelines. Washington, D.C.; <https://www.ifc.org-ehs-guidelines>.

applicable to the project infrastructures. When the government's regulations differ from these levels and measures, the project shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, PMU, will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

93. **Bidding and Contract Documents.** This IEE report, which contains the EMP, shall be included in bidding and contract documents and verified by PMU. The PMU shall also ensure that bidding and contract documents include specific provisions requiring contractors to (i) comply with all 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 solid and 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 may be 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.

94. **Conditions for Award of Contract and Commencement of Work.** PMU shall not award any 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 disclosed; and (iii) other necessary permits from relevant government agencies have been obtained. For "design, build, and operate" type contracts, PMU shall ensure no works for a subproject which involves environmental impacts shall commence until (i) relevant provisions from the EMP are incorporated into 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.

## **B. National and State Laws**

95. The implementation of the subprojects will be governed by Government of India and State of Himachal Pradesh 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.

96. **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.

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

the subproject.

98. **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 15.

**Table 15: Applicable Environmental Regulations**

<b>Law</b>	<b>Description</b>	<b>Requirement</b>	<b>Relevance to Project Phase</b>
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.	JSV 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 Himachal Pradesh State Pollution Control Board (HPSPCB) before starting implementation and Consent to Operate (CTO) before commissioning.	Proposed STP will require CTE (prior to start of construction works) and CTO (prior to start of operation) from Himachal Pradesh State Pollution Control Board (HPSPCB)  All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the HPSPCB website. ( <a href="http://hppcb.nic.in">http://hppcb.nic.in</a> )	Construction and operation
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments (1987)	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 CTE and CTO under Section 21 of the Act from HPSPCB. The occupier of the project/facility has the	The following will require CTE and CTO from HPSPCB: (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 HPSPCB website ( <a href="http://hppcb.nic.in">http://hppcb.nic.in</a> ). 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	
Ground Water (Regulation, Development and Management) Act 2005	An act to regulate and control the development and management of ground water and matters connected therewith or incidental thereto.	Construction of Tube wells will require permission (prior to start of construction works) from Member Secretary Himachal Pradesh Ground Water Authority-Cum-Superintending Engineer, P&I-II Unit, Shimla-9	Construction and operation
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 within the boundaries of protected areas.	Construction
The Forest (Conservation) Act, 1980 and its subsequent amendments necessitate obtaining	<p>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 (MoE&amp;CC), Government of India.</p> <p>This act also provides guidelines for conservation of forests and diversion of forest land for non-forest use. It describes the penalties for contravention of the provisions of the Act.</p>	<p>Not applicable – None of the components of this subproject are proposed in Forest land.</p> <p>Forest department has exempted laying of drinking water pipelines requiring excavation/trench of 1m</p>	-

Law	Description	Requirement	Relevance to Project Phase
clearance from the MoEF&CC for diversion of forest land for non-forest purposes.		width and 2 m depth. In case of this current subproject the trench width is 0.6m, hence no permission required for pipeline laying (Appendix 7 )	
Environmental (Protection) Act, 1986 amended in 1991 and the following rules/notifications:	<p>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.</p> <p>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.,</p>	<p>There are rules / notifications that have been brought out under this Act, which are relevant to JSV, and are provided in Appendix 2</p> <p>Appendix 2 provides applicable standards for ambient air quality, emission limits and emission stack height requirements for diesel generators</p>	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	<p>Responsibility of Solid Waste Generator:</p> <p>(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;</p> <p>(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 bury the solid waste</p>	Contractor to follow all the rules during construction works	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.		
Construction and Demolition Waste Management Rules 2016	<p>Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities</p> <p>Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains</p> <p>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,</p> <p>Large generators shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C and D Waste.</p> <p>Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar,</p> <p>Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;</p>	<p>Construction waste shall be collected at stockpile area for 8-10 days and will be sent to disposal site. Disposal site shall be identified and allotted by Municipal Council after mobilization of contractor (during SIP period) and can't be mentioned at this time.</p> <p>Contractor to follow all the rules during construction works.</p> <p>Sludge or any material if classified as hazardous waste / material is to be handled and disposed according to this Rules Excerpts from C and D Rules are provided in Appendix 4</p>	Construction
Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016,	<p>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 shall give to the operator of that facility, such specific information as may</p>	<p>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.</p>	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	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 necessary to ensure their safety.		
e-waste (Management) Rules, 2016	Rules apply to manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment listed in Schedule I, including their components, consumables, parts and spares which make the product operational but shall not apply to batteries, radio active waste. Schedule 1 specifies electrical and electronic equipment in the following categories: Information technology and telecommunication equipment, consumer electrical and electronics	This does not cover solar panels, proposed in the project. However, as there are no rules at present regulating PV panel waste, e-waste rules are presented here:  Responsibilities of the consumers/bulk consumers (like JSV) include: ensuring that e-waste generated is channelised through collection centre or dealer of authorised producer or dismantler or recycler or through the designated take back service provider of the producer to authorised dismantler or recycler, and maintain e-waste records	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.	Construction and operation
Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Ancient	The Act designates areas within 100 meters (m) of the "protected monument/area" as "prohibited area" and beyond 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).	Not applicable - there are no protected monuments / places of archeological / historical places in or near the project sites of Solan In case of chance finds, the	Construction



Law	Description	Requirement	Relevance to Project Phase
Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010.		contractor/ PIU will be required to follow a protocol as defined in the Environmental Management Plan (EMP)	
The Himachal Pradesh Ancient and Historical Monuments and Archaeological Sites and Remains Act, 1976	An Act to provide for the preservation of ancient and historical monuments, archaeological sites and remains other than those of national importance, for the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects. State government notifies monuments, objects, and excavation sites as state protected under this -Construction activities within the notified areas of each monument are regulated	Any project activities located in such notified area will require prior permission	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 (JSV) 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 amenities and facilities shall be provided to workers including housing, medical aid, traveling expenses from home and back, etc.,  Appendix 5 provides applicable labor laws including amendments issued from time to time	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
		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 in certain occupations and processes Employment of child labor is prohibited in building and construction 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 should be 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.	Applicable; some 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.  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.	Construction
<b>International Conventions and Treaties</b>			

Law	Description	Requirement	Relevance to Project Phase
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 three Ramsar sites in Himachal Pradesh but no Ramsar sites are located in or 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 to this project	-
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 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 recognizes that states must be the protectors of migratory species that live within 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 8 of the Convention. CMS Parties strive towards strictly protecting these species, conserving or restoring the places where	Not applicable to this project as no migratory species of wild animals are reported in the project areas.	-

Law	Description	Requirement	Relevance to Project Phase
	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 8, and CMS encourages the Range States to conclude global or regional agreements.		

99. Clearances / permissions to be obtained prior to start of construction. Table 16 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 16: Clearances and Permissions required for Construction Activities**

Sr. No	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
1	Construction and Operation of new WTP including disposal of sludge	Consent to establish (CTE) and consent to operate (CTO) under Water Act, 1974 from Himachal Pradesh State Pollution Control Board (HPSPCB)	PIU and DBO Contractor	PMU
2	Permission for extraction of ground water	Permission from Member Secretary Himachal Pradesh Ground Water Authority-Cum-Superintending Engineer, P&I-II Unit, Shimla-9 under Ground Water (Regulation, Development and Management) Act 2005	PIU and DBO Contractor	PMU
3	Diversion of Forest land for non-forest purposes	The Forest (Conservation) Act, 1980 and its subsequent amendments necessitate obtaining clearance from the MoEF&CC for diversion of forest land for non-forest purposes.	PIU	PIU and PMU
4	Tree Cutting	State forest department	PIU	PIU and PMU
5	Hot mix plants, Crushers and Batching plants	Consent to establish and consent to operate under Air Act, 1981 from HPSPCB	DBO Contractor	PIU
6	Storage, handling and transport of hazardous materials	Hazardous Wastes (Management and Handling) Rules, 2016; Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 from HPSPCB	DBO Contractor	PIU
7	Material Sourcing-Approval for sourcing stones and sand from quarries and sand mining and borrow areas	Permission from District Collector/ State Department of Mining	DBO Contractor	PIU
8	New quarries and borrow areas	Environmental clearance under EIA Notification 2006	DBO Contractor	PIU
9	Temporary traffic diversion measures	District traffic police	DBO Contractor	PIU
11	Road cutting for water pipe laying works	NH, PWD and Panchayat	PIU	PMU
12	Construction Waste and Demolition Debris Management	Approval from Nagar Nigam for disposal site is required per Construction and Demolition Waste Management Rules 2016	DBO Contractor	PIU

<b>Sr. No</b>	<b>Construction Activity</b>	<b>Statute under which Clearance is Required</b>	<b>Implementation</b>	<b>Supervision</b>
13	Labour License	Labour Commissioner, Government of Himachal Pradesh	DBO Contractor	PIU
14	Use of Vehicles and Equipment- Pollution Under Control (PUC) Certificate	Motor Vehicle Rules, 1989	DBO Contractor	PIU

100. JSV/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 as part of the regular progress reporting.

## V. DESCRIPTION OF THE ENVIRONMENT

### A. Physical Resources

#### 1. Location, Area & Connectivity

101. The project area falls in Solan district of Himachal Pradesh. This district Solan came into existence on 1 September 1972. The district was carved out by amalgamating Solan and Arki tehsils of the erstwhile Mahasu district and Kandaghat and Nalagarh tehsils of the erstwhile PEPSU. The name of the district as well as its headquarters comes from Mata Shoolini Devi. It's said that she saved Solan from being destroyed.

102. Project area in Solan district is situated in the basin of the Yamuna River and the river is the boundary between the states of Himachal Pradesh and Uttarakhand, Solan lies on high altitude of 1523 m above sea level. The summers have much more rainfall. According to Köppen and Geiger, this climate is classified as Cwa (Dry-winter humid subtropical climate). In Solan, the average annual temperature is 17.4 °C | 63.4 °F. The annual rainfall is around 1413 mm.

103. The project area is situated in the basin of the Yamuna River and the river is the boundary between the states of Himachal Pradesh and Uttarakhand. The villages of respective grids are well connected with road network from district headquarter of Shimla and division Kasauli. Locals mostly commute with buses and own vehicles.

- (i) The nearest airport is Shimla Airport within range of 50 kms. Chandigarh airport is within a range of 70 kms.
- (ii) The nearest railway stations are Shimla ISBT and Chandigarh ISBT within a range of 60 kms and 75 kms respectively

104. The project area is well connected with two national highways – NH 5 (Kufri to Shimla) and NH 105 from Swarghat to Kalka, NH 205 and SH-16 from Shimla to Nalagarh. Due to the proper rail and road connectivity the materials needed for the execution of the project can be delivered to the project location with ease.

105. The district is divided into five sub-divisions of Arki, Kandaghat, Nalagarh, Solan and Kasauli and 13 Tehsil/Sub-Tehsils. Further district is divided into five Community Development Blocks for the developmental purposes. There are 240-gram panchayats in the district. District Solan has often been victim to natural calamities causing severe damage to life and property. About 90% of its population lives in remote villages situated in far-flung and inaccessible areas making it more vulnerable to disasters.

106. For the execution of subproject, the project area has been divided into two grids viz Grid SS-1 and Grid SS-9. The projected area partially comprises 17 village panchayats and 63 villages. The village panchayats are namely – Chamian, Jagjit nagar, Ganol, Kotbeja, Garkhal Sanavar, Hurang, Jangeshu, Bhaguri, Garkhal Kasauli, Kati namb, Kot, Lodi Majra, Nandpur, Barotiwala, Mandhala, Baswani, and Sandholi.

**Figure 6: Location of the Project Area Showing all Grids**



\*Source: DPR

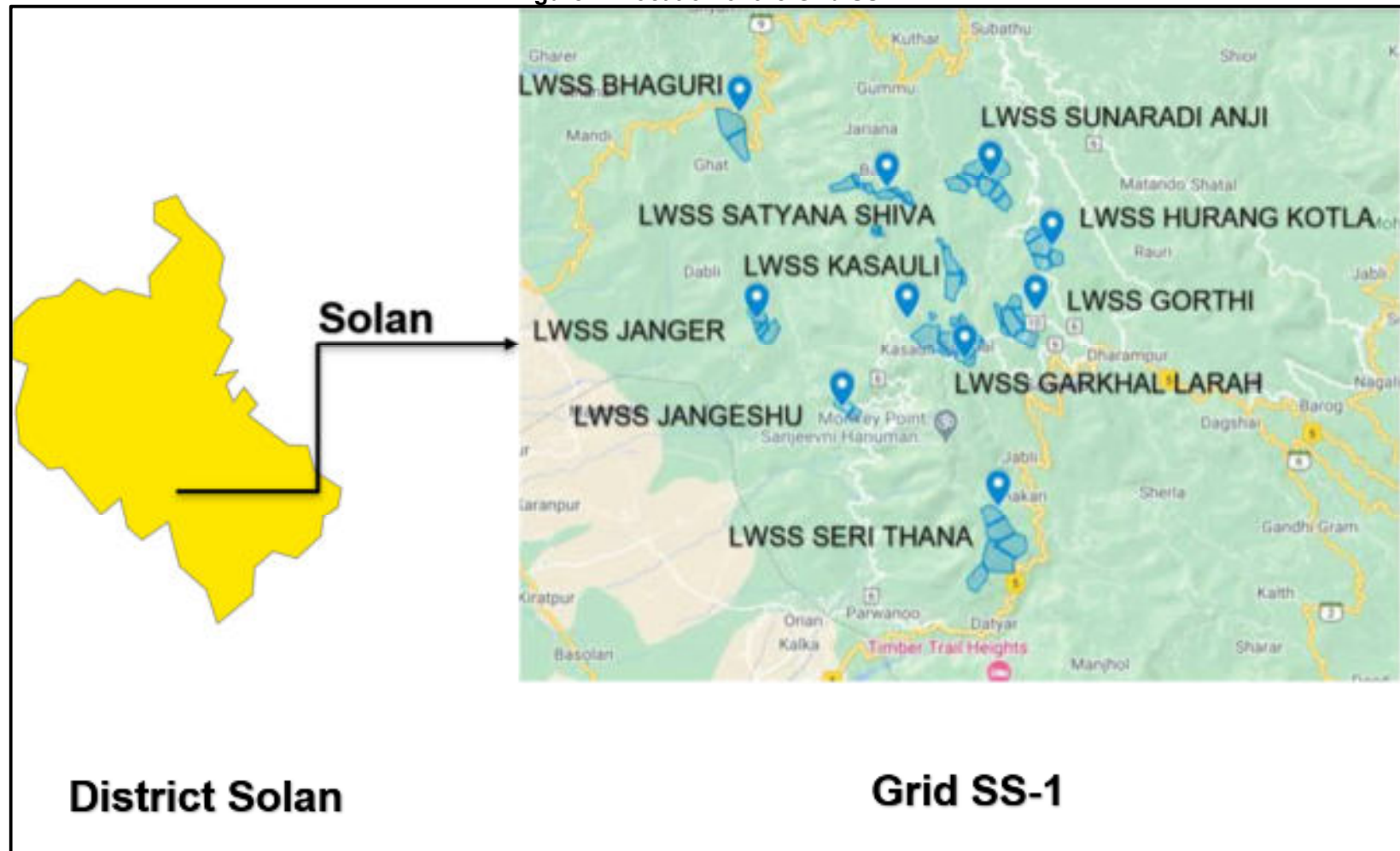
107. Project area in Solan district is situated in the basin of the Yamuna River and the river is the boundary between the states of Himachal Pradesh and Uttarakhand, Solan lies on high altitude of 1523m above sea level. The summers have much more rainfall. According to Köppen and Geiger, this climate is classified as Cwa. In Solan, the average annual temperature is 17.4 °C | 63.4 °F. The annual rainfall is around 1413 mm.

108. **Grid SS1:** The villages covered under this grid lies in Dharampur block, of Solan district Himachal Pradesh. The command area covered under this grid comprises of 10 village panchayats viz: Chamian, Jagjit Nagar, Ganol, Kotbeja, Garkhal Sanavar, Garkhal Kasauli, Hurang, Jangeshu, Bhaguri, Jabli, Kot, and 58 villages namely Kot Khass, Dadol Kalan, Dadhol Khurd, Sunarari, Anji, Kamthan Khurd, Kamthan Kalan, Sanavar, Pathia, Shilar Chhaharr, Ghanol, Kharog, Tiket Hatti, Devari, Kasauli Gaon, Dewari, Diwari, Garkhal, Garkhal gaon, Chabal, shiwa, chamiya, baniyan, mundru, Badyar, Khajret, Nichlu Gangudi Upper Gangudi, Dhala, jaul, khatech, lohari. Banti. Sadiyana. Khadoli. Badha, Harli. Kutaghat. Namb Chaola, Seri, Thana, Kasauli Gaon, Anji Chanala, Hurang, Kanda, Kathiaru, Kotla, Jangeshu, Shalaura Khurd, Shalu Kalan, Baldiyan, Banoi, Gunai. Panji. Thandu., Basdala, and Bhaguri. Location of Grid SS-1 is shown in Figure 7.

109. The nearest airport is Shimla Airport within range of 50 Kms. Chandigarh airport is within range of 70 kms. The nearest railway stations are Shimla ISBT and Chandigarh ISBT within a range of 60 kms and 75 kms respectively.



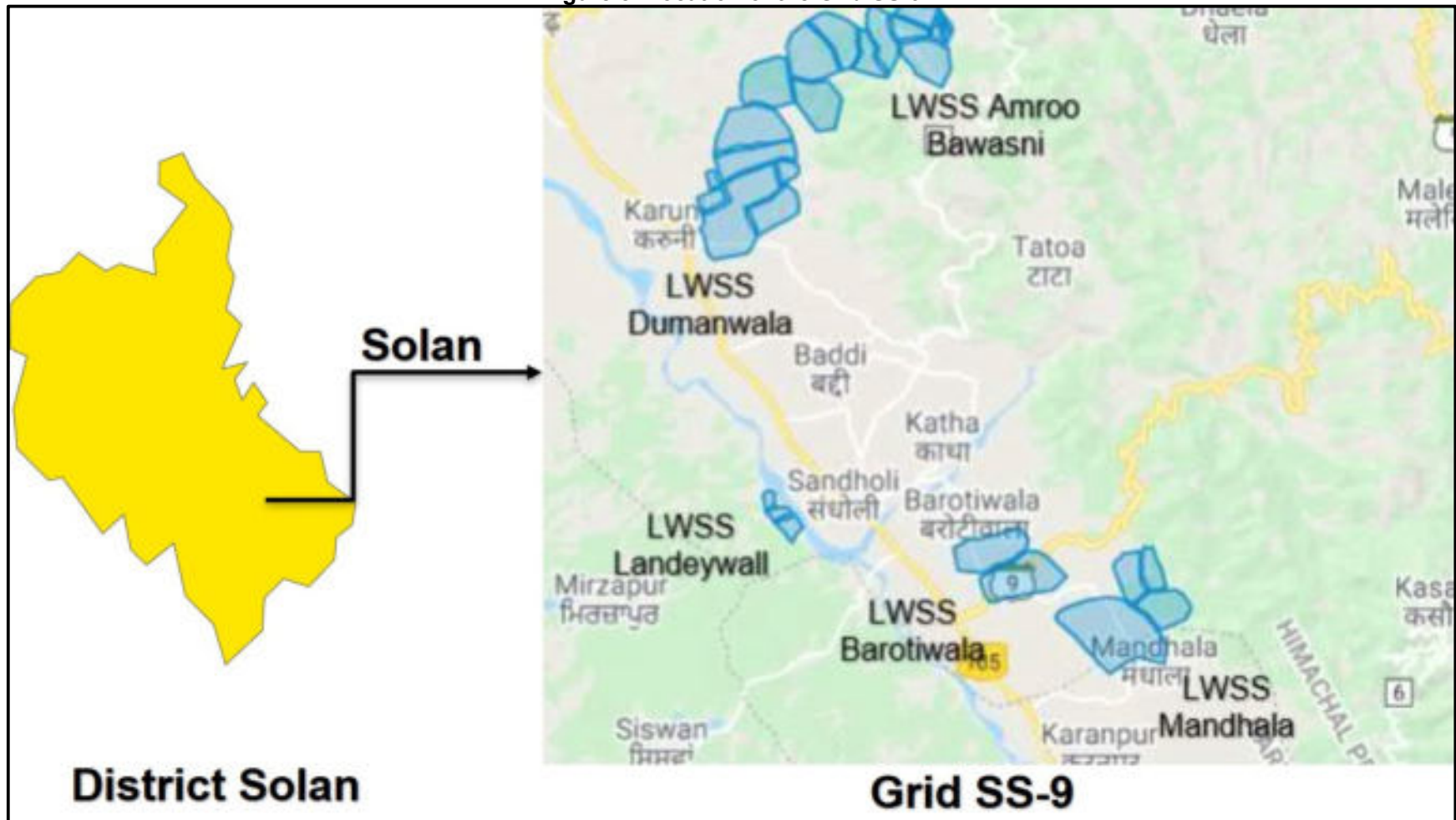
Figure 7: Location of the Grid SS-1



110. **Grid SS-9:** The villages covered under this grid lies in Solan and Nalagarh block, Solan District, Himachal Pradesh. The command area covered under this grid comprises of six village panchayats namely, Lodi Majra, Nandpur, Barotiwala, Mandhala, Baswani, Sandholi which comprise of 22 villages as; Landeywall, Chakjangi, Kalyanpur Bated, Barotiwala, Mandhala, Tippra Upper, Surajpur, Dhawlar, Bavasni, Dano da ghat, Gharmandal Kurad, Gharmandal Kalan, Amru, Banera, Kolka, Jaman da Dohra, Bukhari da ghat, Kotha Kanon, Jamrari,, Jabal, Chikni, Berson, Nandpur, Panga, Raipur, Routanwala, Shahpur, Jatti Majra Location of Grid SS-9 is shown in Figure 8.

111. The villages of respective grid are well connected with road network from Shimla, Chnadigarh, Bilaspur and Nawashahr. Locals mostly commute with buses and own vehicles. The nearest airport is Shimla and Chandigarh while the nearest train station is Kalka. The project area is well connected with state and national highways – NH 205 (Bilaspur-Amru-Project site-88 kms), NH 5 (Shimla to Mandhala-98 kms), NH-105 (Chandigarh to Kalyanpur-52 kms) and NH-103A (Nawashahr to Amru-Project site-88 kms). Due to the proper road connectivity the materials needed for the execution of the project can be delivered to the project location with ease.

Figure 8: Location of the Grid SS-9



## 2. Topography, Drainage, Soils and Geology

112. In Himachal Pradesh, geological history goes back to the Archaean Proterozoic transition although the actual Himalayan Mountain building took place only during Cenozoic era. The Himalayas are a classic example of continent and continent collision due to convergent movement of the Indian plate toward the Eurasian plate. It comprises two contrasting tectogens with their own distinctive geological history. The dividing lines between these two tectogens represent a major tectonic discontinuity and are designated by several local names. However, it can be collectively referred to as a main central thrust and on either side of this thrust the tectogens display contrasting stratigraphic and tectonics features indicating convergence of two alien blocks. These are the lesser Himalayan tectogens and the Tethys Himalayan tectogens.

113. **Drainage.** Solan district presents an intricate mosaic of high mountain ranges, hills and valleys with altitude ranging from 300 to 3000 m above msl. The district lies between north latitude 30°44'53" to 31°22'01" and east longitude 76°36'10" to 77°15'14". The altitude of the hill ranges is higher in northern parts, whereas south-western part of the district is represented by low denuded hill ranges of Siwalik. In the areas underlain by high hill ranges of Himalayas, the valleys are narrow and deep with steep slopes trending in NW-SE direction. The terrain is moderate to highly dissected with steep slopes. Solan district is drained by streams/rivers forming part of the drainage basins of the Sutlej, the Yamuna and the Ghaggar rivers. However, major part of the district is drained by tributaries of Sutlej River viz., Ghambar River and Sirsa nadi. Ghambar River flows almost from the central part of the district towards north-east to join the Sutlej River in Gobind Sagar Lake. Another important-tributary of the Sutlej River is the Sirsa Nadi, flowing towards north-west in the Nalagarh valley. The Giri River and its tributary, Assan flows towards south in the eastern part over a small area and are part of Yamuna river basin. Ghaggar River flows towards south-west and marks the south-eastern boundary of the district. Most of the rivers/streams/khads maintain base flow for major part of the year. In hilly terrain, the drainage density is high and fine, but it become coarse in foothills, kandi areas and valleys.

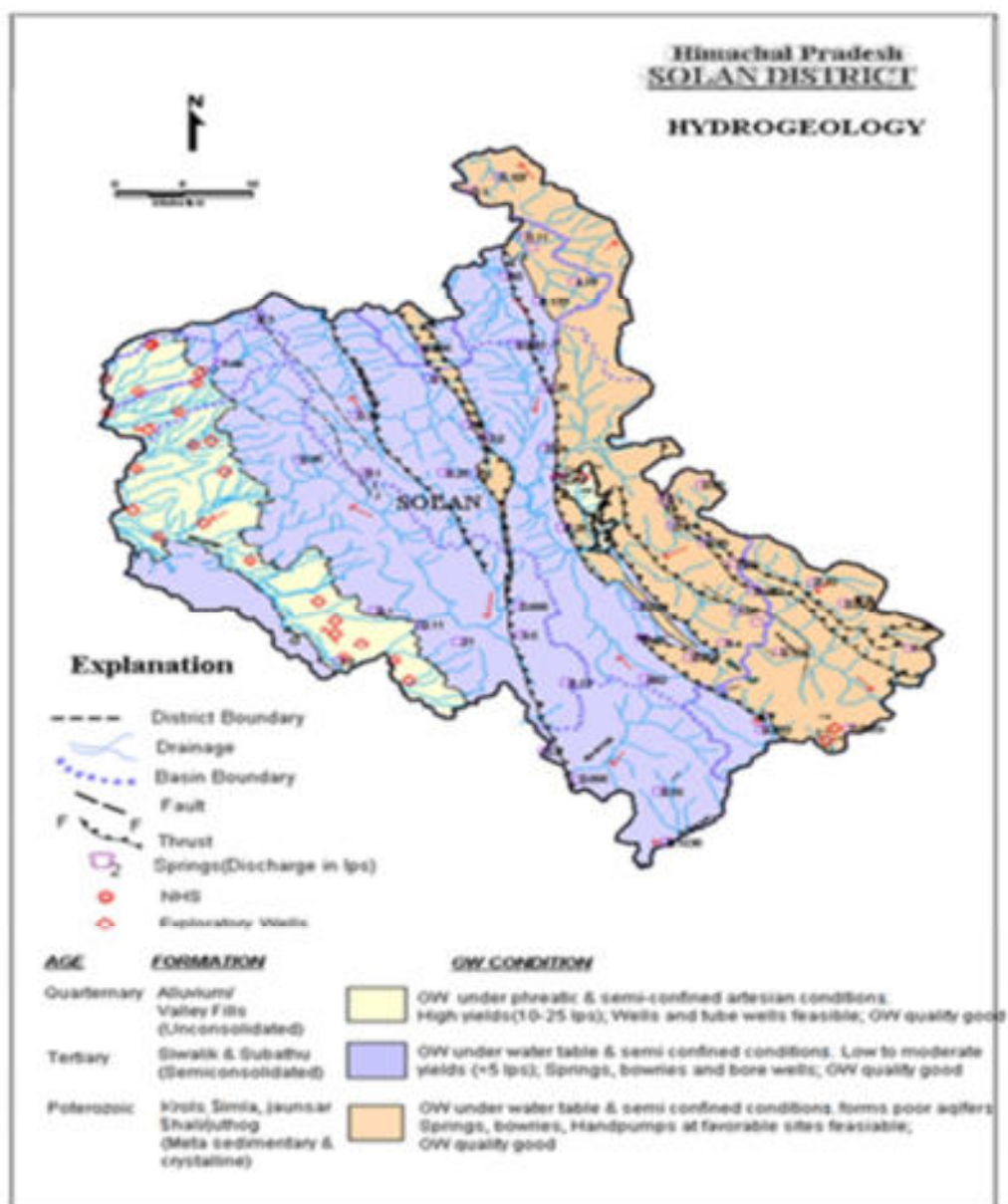
114. **Soils.** Soil is generally sandy loam in valley areas of the district and in rest of the hilly and mountainous areas, soil is skeletal. Soil depth is generally shallow, except in areas having good vegetative cover. It is generally dry, shallow and deficient in organic matter. Landslides are the common features in mountainous terrain. Soils are rich in nutrients and thus are fertile

115. **Geology.** The Shivalik group in the Himachal Himalaya forms a parallel foot-hill belt in the sub- Himalayan zone, extending along the southern margin of the Palaeogene Sirmour group belt from the Ravi to the Yamuna. Within Himachal Pradesh, the Himalaya has maximum width between Hoshiarpur and Jogindernagar. The Siwalik sediments, though occurring as an independent structural belt, are also seen to overlies the Muree in the Jammu sector of the Kashmir Himalaya and the Kasauli in the Himachal Himalaya. Pilgrim (1910) recorded a gradual transition from Muree beds to Lower Siwalik in the Rawalpindi and Jhelum districts of Pakistan and from Kasauli to Lower Shivalik (Nahan) in the Himachal Himalaya. This fact assumes importance because there is a tendency to ignore this normal relationship between the Shivalik and Sirmour groups at Dharamshala, Sarkaghat, and Nalagarh. At Haritalyangar near Bilaspur, the Lower Siwalik is seen resting on the Dagshai with an unconformity, which is described as the most striking discordance in the whole sequence of freshwater deposits and evidently representing a period of considerable earth movements (Pascoe 1964). The main tectonic elements of the project region include the central thrust, and boundary fault. Several NE-SW lineaments are also known from the area and these traverses across different tectonic zones. Seismically, the state constitutes one of the most active domains of the Himalayan region. Geologically, the rock formations occupying the Solan district range in age from pre-Cambrian to Quaternary period. The generalized geological succession in the district is given in Table 17 below:

**Table 17: Geological Formations in Project Region**

<b>Era</b>	<b>Period</b>	<b>Formation</b>	<b>Lithology</b>
Quaternary	Recent to Pleistocene	Alluvium /valley fills/ Older alluvium	Sand with pebble and clay, medium to coarse grained sand with pebble of sandstone and lenses of clay
Tertiary	Pliocene – M-Miocene	Siwalik Group	Sandstone, conglomerate, clay, gravel beds, shale, mudstone
	L-Miocene - Oligocene	Subathu	Sandstone, shale, nodular clay, limestone.
Proterozoic	Upper-III	Krols	Red Sandstone, Carbonaceous shale, slate, greywacke, dolomitic limestone.
	Lower-III	Simla / Jaunsar	Siltstone, greywacke, sandstone, quartzite, conglomerate, Shale, slate, phyllite, dolomite and meta-volcanics
	Proterozoic-II	Shali/ Sundernagar	Cherty dolomite, quartzite, limestone, shale, slate, phyllitised/ sporadic shale, meta-volcanics etc.,
	Un-differentiated	Jutogh Group	Shale, phyllite, schist, staurolite quartzite, dolomite, Limestone, and amphibolite

Figure 9: Hydrogeology Map for Solan District



Source: CGWB

116. **Hazard Profile of District Solan.** In recent past there has been an increase in the number of natural disasters. The growing incidents of natural disasters are highly correlated to the increasing vulnerability of households and communities in developing countries. District Solan have also been ravaged by catastrophic events in the past and has worst experience in terms of loss of life and property.

117. **Seismic Hazard:** According to Global Seismic Hazard Assessment Program (GSHAP) data, the state of Himachal Pradesh falls in a region of "Moderate" to "High" seismic hazard. As per seismic zonation map of India published by the Bureau of Indian Standards (IS- 2002), the district of Solan falls in the seismic zone i.e., Zone IV, high risk zone. The movement of large

blocks along the thrust planes resulting in the release of stored energy is the basic cause of earthquakes in this region.

118. **Landslides** have been a major and widely spread natural disaster in Himachal Pradesh and often affect life and property and occupy a position of major concern. Looking into the past history of landslides within Solan has brought forth that large part of its territory is prone to hazard of landslides especially during the rainfall and snowfall months of the year.

119. **Floods.** Flash floods are short lived extreme events, and due to high velocity of the current which can wash away all obstacles in its way, this phenomenon has resulted in enormous loss of life and property in various parts of the region. Glacial melting due to global warming is another major cause of flash floods as the major glaciers in the higher hill tops are receding at an alarming rate due to natural anthropogenic reasons. Heavy rains and floods cause damages to cultivated land of the farmers and wash away the bridges, human beings and cattle heads. The Hotspots of Flash Floods during rainy season within Solan District are specifically chikni khud in Nalagarh & Baddi Tehsil. None of the project sites are proposed within the above-mentioned hotspots of flood prone areas.

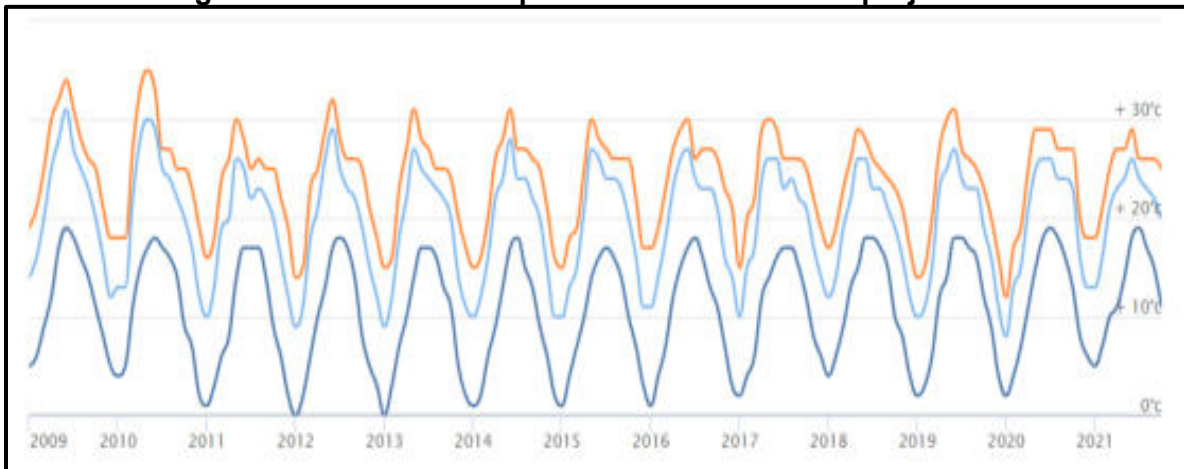
120. **Cloud Burst.** A cloudburst accompanied with hail and thunder is capable of creating flood conditions. It is one of the common disasters in the district which is largely responsible for flash floods. The Solan district is classified as low vulnerability regarding cloud bursts in District Disaster Management Plan of Solan.

### 3. Climate

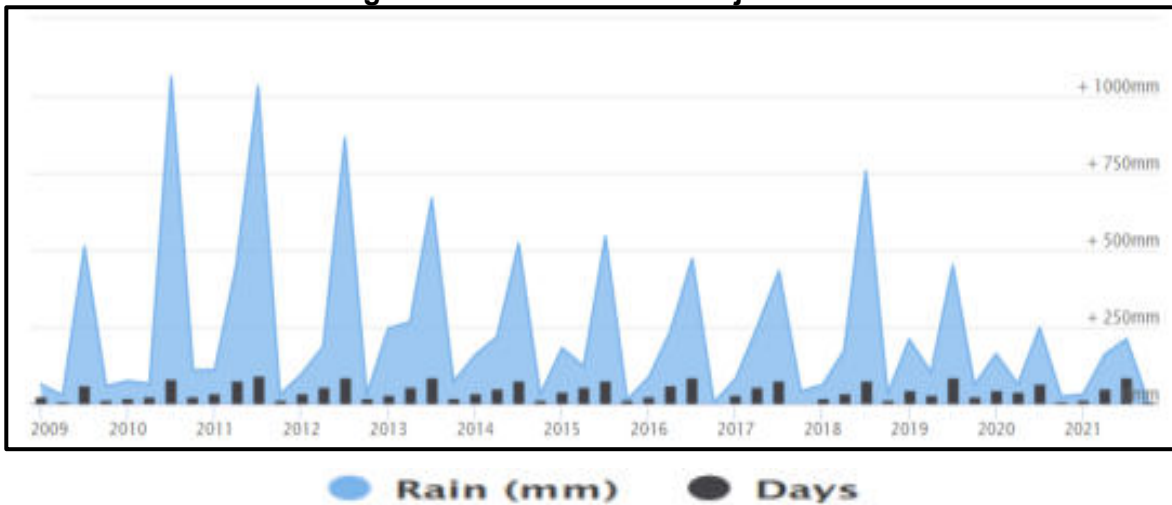
121. The climate of the subproject area in district solan is sub-tropical in the valley and tends to be temperate on the hilltops. There are four major seasons. The winter season commences from November to February and ends in March; summer season extends from March to June, followed by the monsoon period extending from July to September. Maximum precipitation occurs during July to September. Average annual rainfall in the district is about 1140.86 mm, out of which 85% rainfall occurs during June to September. In the winter season, precipitation as snowfall also occurs in the higher reaches up to 1000 m elevation and as rainfall in low hills and valleys of the district. Mean maximum and minimum temperature ranges between 32.2°C (May) and 0.6°C (January).

122. The temperature exhibits seasonal variation, lowest during the winter, and higher during the summer. May, June, and July are the hottest months while January, February, and December are the cold months. The project area has May & June as the warmest month and December is the coldest month of the year. The Figure 10 below indicates the historical temperature variation in the project area. It depicts that the minimum temperature drops to 10 C and reaches maximum up to 340 C.



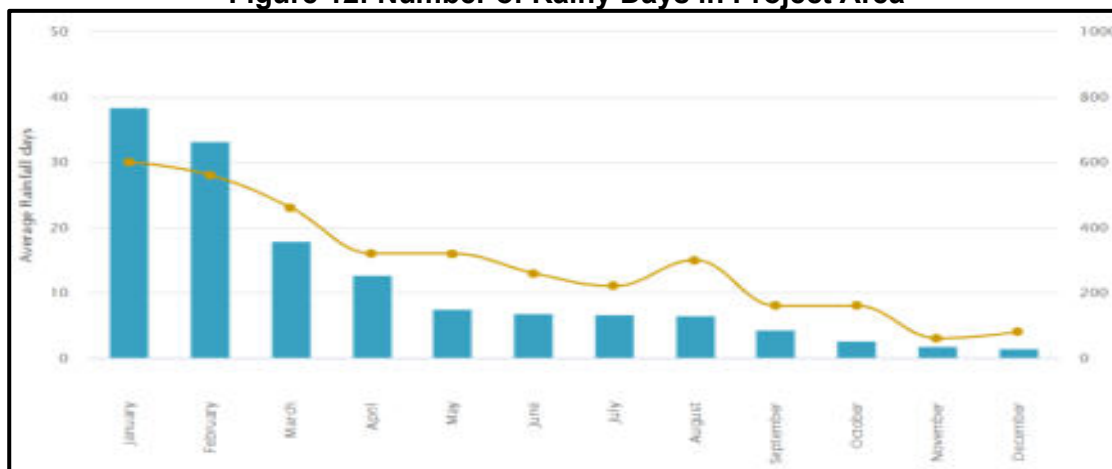
**Figure 10: Historical Temperature Variance in the project area**

\*Source – Worldweatehronline.com

**Figure 11: Rainfall in the Project Area**

123. The project area received daily rainfall for 30 days in January, maximum in last five year. On an average in the months of July and August there are 15-20 rainy days, from October to December this number comes below than 5. Therefore, contractor is advised to prepare the work plan accordingly.

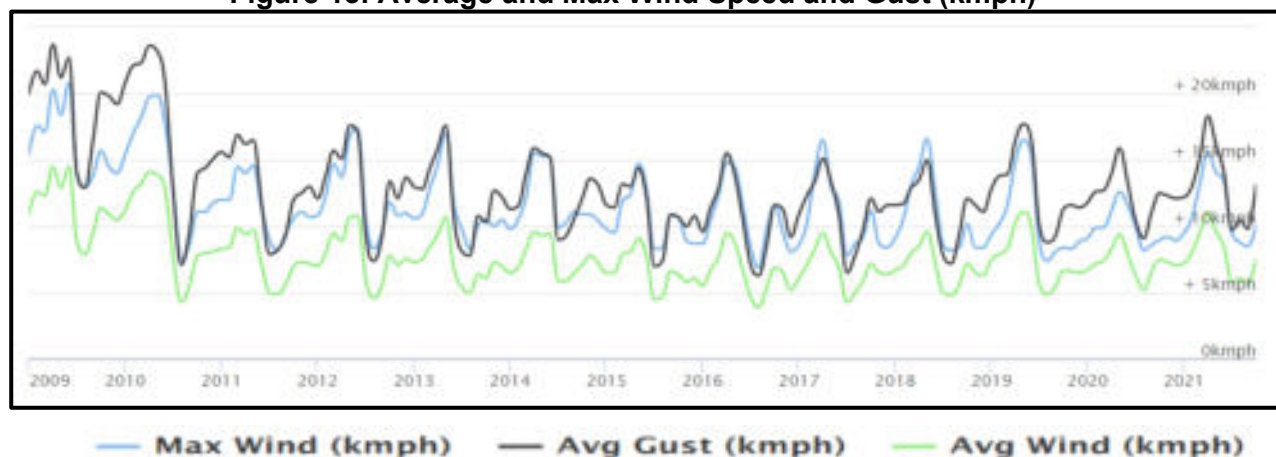


**Figure 12: Number of Rainy Days in Project Area**

Source – Worldweatehronline.com

124. Humidity. Based on long-term climatology data of the Solan district, it is found that relative humidity is high for 2.8 months between June 23 to September 17 with the onset of monsoon and reaches a maximum (100% in the morning and 70% in the evening) in the peak of the monsoon period. Skies are heavily clouded during the monsoon months and for short spells when the district is affected by western disturbances.

125. Wind speed and direction. The average hourly wind speed in Solan experiences mild seasonal variation over the course of the year. The windier part of the year lasts for from February to June, with average wind speeds of more than 6.1 miles per hour. The windiest day of the year is May 13, with an average hourly wind speed of 7.6 miles per hour. The calmer time of year lasts from June to February. The calmest day of the year is August 28, with an average hourly wind speed of 4.7 miles per hour.

**Figure 13: Average and Max Wind Speed and Gust (kmph)**

Source – Worldweatehronline.com

#### **4. Climate change and its impact on different aspects in Solan district**

126. Solan district is environmentally most fragile with large scale human activity due to tourism, power projects and vehicular movements. Unpredictable period of rains and rising

temperature are indicative of the temperature rising in Solan district. The Asian Development Bank report on Climate Change Adoption in Himachal Pradesh had analysed temperature and rainfall data at Himachal Pradesh Agricultural University from 1976 to 2006. It found that rainfall in Kangra and Chamba increased; it decreased in Solan. It had said the state could experience a difference of 1-5 degrees Celsius in minimum temperature and 0.5-2.5 degrees Celsius in maximum temperature by 2030. These observations, suggest that global warming and climate change has affected snow-glaciers melt and runoff pattern in the Himalayas, along with effects on agriculture, tourism, economic loss to people.

127. Climate change issues are of global concern all over the world but pose major challenge over mountain environment as mountain ecosystem is highly vulnerable and sensitive to the climatic variations. Mountains cover close to 20 percent of the Earth's surface, providing a home to approximately one-tenth of the global human population. With their steep and varied topography, and distinct altitudinal ecological zones, mountains support a high diversity of species and ecosystems and a large percentage of global endemic species. Mountainous areas throughout the world provide essential resources such as timber, minerals, recreational escapes, and a significant portion of the freshwater consumed by humans. They are rich sites for cultural diversity. Mountains have a special role in showing the effects of climate change. The Himalayan ecosystem has 51 million people who practice hill agriculture and whose vulnerability is expected to increase on account of climate change.

128. The recent Intergovernmental Panel on Climate Change (IPCC) reports warns that mountain ecosystem is much more susceptible to the vagaries of climate change than the other regions of earth and poses serious challenge to the people of mountain regions in dealing with this global threat for sustaining their economic and social development. The state of Himachal Pradesh, which forms a part of the Northwestern Himalaya, is environmentally fragile and ecologically vulnerable. occurrence of natural hazards emanating from the effects of climatologically variations are a matter of immediate concern to the state of Himachal Pradesh, as every year the state experiences the fury of nature in various forms-like cloudburst, flash floods, landslides, snow avalanches droughts etc. The fragile ecology of the mountain state coupled with large variations in physio-climatic conditions has rendered it vulnerable to vagaries of climate. The incidence of cloudbursts in the last few years has baffled both the meteorologist and the common man equally. Notwithstanding, continuous efforts made by the Government to cope with such hazards through relief and rehabilitation measures, the recurrence of uncertainties continue to inflict widespread harm and damage to human life as well as property. The roads that are the state's lifeline are repeatedly damaged, blocked or washed away by one or the other acts of nature. The Snow and glaciers which are considered to be best indicators of changing climate have been affected by the rising temperature throughout the Himalayan belt. It has been observed that the estimates on the magnitude of glacial retreat and their impact on natural resources have been varying considerably. However, the impact of climate change and rising temperature has been noticed even by a common man in far flung parts of the Himalayan eco system. Depletion of small glacierets in the Himachal Himalaya which were providing the sustained discharge to many rivulets for irrigation to agriculture fields and sustaining the water resources in downstream areas has been reported by the villagers.

## **5. Surface Water**

129. Solan district is drained by streams/rivers forming part of the drainage basins of the Sutlej, the Yamuna and the Ghaggar rivers. However, major part of the district is drained by tributaries of Sutlej River viz., Ghambar River and Sirsa nadi. Ghambar River flows almost from the central part of the district towards north-east to join the Sutlej River in Gobind Sagar Lake.

Another important-tributary of the Sutlej River is the Sirsa Nadi, flowing towards north-west in the Nalagarh valley. The Giri River and its tributary, Assan flows towards south in the eastern part over a small area and are part of Yamuna River basin. Ghaggar River flows towards south-west and marks the south-eastern boundary of the district. Most of the rivers/streams/khads maintain base flow for major part of the year. In hilly terrain, the drainage density is high and fine, but it become coarse in foothills, kandi areas and valleys. Direct abstraction only for the subproject of water is proposed from Giri river, remaining proposed sources are tubewells. Maps showing river course, tributaries, and proposed intake/check dam location etc are given in Figure 17.

130. Surface water source proposed in SZ-03 is Giri river.

- (i) **Giri River:** Giri River is also famous as “Giri Ganga” and is an important river which feeds the Yamuna River. Giri River originates from the hills of Kotkhai and drains at the parts of Himachal in the southeastern areas. It flows through the district of Sirmaur and further merges with the Yamuna River. At this point, it divides the Sirmaur district into two equal parts which are Cis-Giri and Trans-Giri region and then they join Yamuna upstream of Paonta below Makkampur. Giri is one of the important tributaries of the Yamuna River.
- (ii) **Gambher River:** It is a tributary of river Satluj which chiefly flows from Mandi and Solan districts. The river flows in a north-westerly direction in the district. Its catchment falls within the five blocks (Kandaghat, Solon, Dharampur, Kunihar, Nalagarh of Solan district and Bilaspur of Bilaspur district).
- (iii) **Ashwini Khad:** Ashwani Khad enters District Solan upstream of Village Sadhupul. The catchment area in District Solan mainly comprises of villages i.e., Kohari, Ded, Galai, Mathia, Shanbar, Andi, Sunnu Tikri, Bayela, Jalkhara, Dawarli and exits District Solan at Village Gaura near Yashwantnagar. The total stretch of Ashwani Khad in District Solan is approx. 22 km. The Ashwani Khad meets River Giri at Village Gaura in Yashwantnagar. There is no industrial area in the entire stretch of Ashwani Khad in Solan District from Sadhupul till it meets River Giri at Yashwant Nagar. Yashwant Nagar falls in Sirmour district of Himachal Pradesh.
- (iv) **Sirsa Nadi:** Sirsa river is a perennial river which flows south-westerly in the area and joins Sutlej 10 kilometres upstream of Ropar. The river enters the Himachal Pradesh in Solan district near Baddi and flows down to the Sutlej River in Punjab

131. The major sources of irrigation are small water channels or the Kuhl's in the district and an area of 37.6 k Hactare is brought under irrigation by various sources like canals, tanks, wells, and other sources.

132. Sources proposed in the project area are located in isolated areas where no potential pollution source is found.

133. Since Giri river is one of the rivers of significance in the subproject region so water quality data of this river obtained under MINARS Program 2019-20 is given in Table 18. The results shows the river water quality meets surface water quality criteria of Class-C.<sup>8</sup> The water quality monitoring will be conducted by the DBO contractor prior to the start of construction works. The JSV has also conducted water testing at different sources at HP IPH Water Testing

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<sup>8</sup> Drinking water source after conventional treatment and disinfection

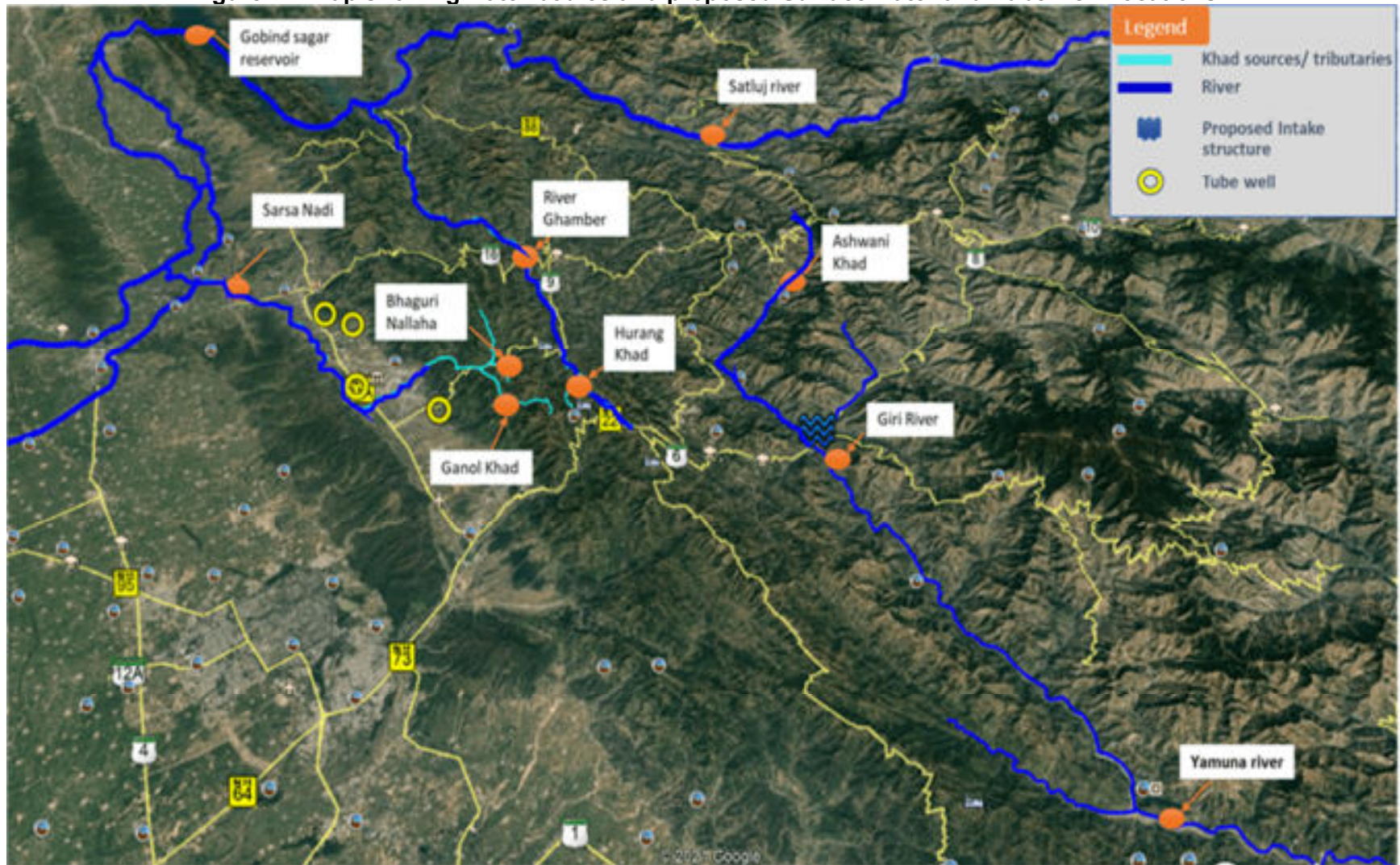
Laboratory to determine the suitability of water for potable use. The test results are attached as Appendix 9.

**Table 18: Water Quality Data of Giri River**

<b>Name of location</b>	<b>Parameters</b>	<b>Class C Surface Water Quality criteria</b>	<b>Apr 2019</b>	<b>May 2019</b>	<b>June 2019</b>	<b>July 2019</b>	<b>Aug 2019</b>	<b>Sept 2019</b>	<b>Oct 2019</b>	<b>Nov 2019</b>	<b>Dec 2019</b>	<b>Jan 2020</b>	<b>Feb 2020</b>	<b>Mar 2020</b>
<b>Giri River Village Maryaog after Confluence of R. Giri &amp; Ashwani river</b>	pH	6 to 9	7.8	7.14	7.76	8.0	7.8	8.13	8.31	8.15	7.51	7.25	6.4	7.12
	DO	4 mg/L or more	8.1	7.8	6.6	6.8	5.7	6.1	6.1	6.1	6.3	6.4	6.4	6.3
	BOD	3 mg/L or less	0.4	1.8	3.8	0.4	0.9	0.1	0.1	0.2	0.7	0.6	0.4	0.9
	TC	5000 or less	33.0	47	170	27	120	27	22	26	70	14	33	33.0

Source: Water quality of major Rivers in Himachal Pradesh under MINARS Program 2019-2020

Figure 14: Map showing water bodies and proposed Surface water and Tube well Locations





## 6. Ground Water

134. Hydro-geologically, the unconsolidated valley fill or alluvial formation occurring in the valley area, semi-consolidated formations belonging to Siwalik Group and older consolidated hard rocks forms the aquifer in the district. Intergarnular pore spaces in the sedimentary formations and secondary fissured porosity in hard rocks, topographical set up coupled with precipitation in the form of rain and snow, mainly govern the occurrence and movement of ground water. Porous alluvial formation occurring in the valley area, forms the most prolific aquifer system, where as the sedimentary semi-consolidated formations and hard rocks, form aquifer of low yield prospect.

135. Major parts of the district are hilly and mountainous with highly dissected and undulating terrain. These areas are underlain by semi-consolidated and consolidated hard rocks of Tertiary and Proterozoic age. Springs are the main ground water structures that provide water for domestic and irrigation in major rural and urban centers.

136. Springs in the district are mainly gravity, contact or fracture type and springs located along major thrust/faults or structurally weak planes are high yielding. The springs are locally called as Chasma and the discharge varies from seepages to as high as nine litres per second. Bowries, a type of dug well, are another structure constructed on the hill slopes to tap the seepages. Such Bowries are very common and found all over the district. Recently, state department have drilled shallow bore wells fitted with hand-pumps to provide domestic water. The hand pumps have an average depth of 50-60m with low discharges upto 1 lps.

137. To establish baseline scenario, ground water quality data was obtained from the Central Ground Water Board is given below in Table-17. Chemical quality data of ground water from shallow as well as deep aquifers in the district, indicates that ground water is generally alkaline in nature and suitable for both domestic and irrigation use. All the parameters are well within the permissible limits of safe drinking water, as per Bureau of Indian Standard (BIS). The range of chemical parameters, as per samples collected by the Central Ground Water Board from hydrograph network stations of CGWB in the district are summarized below. The water quality data for the project region is given in Table 19 below.

**Table 19: Ground Water Quality in Subproject Area**

Parameter	pH	EC μS/cm	HCO <sub>3</sub>	Cl	NO <sub>3</sub>	F	Ca	Mg	Na	K	Total hardness as CaCO <sub>3</sub>
Minimum	7.50	320	81	14	5.40	0.11	16	9.5	25	1	20
Maximum	8.10	1100	228	264	107	0.33	55	29	138	6	208
Drinking Water Standard Value	6.5-8.5	No limit specified	No limit specified	250 (1000)	45	1 (1.5)	200	100	No limit specified	No limit specified	600

Tr = traces. All parameters units in mg/l, except pH; Figures in parenthesis are maximum limits allowed in the absence of alternate source

Source: Government of India, Ministry of Water Resources, Central Ground Water Board, 2014

## 7. Air Quality

138. No air pollution sources (point or nonpoint) have been seen in the surroundings of subproject influence area. The main source of air pollution and increased noise are vehicles as Solan is along national highways. Ambient air quality and noise levels around the subproject sites, are expected to be within Central Pollution Control Board standards as the sites are in the hills and these may be classified as silence zones. In order to record baseline ambient air quality, data published by Central Pollution Control Board (CPCB) has been referred. The data for ambient air for district headquarter town of Solan has been obtained from the report on National Ambient Air Quality Status and Trends 2019 published by CPCB and is given in Table-20. It is clear from the tables that ambient air quality is well within the limits in respect of SO<sub>2</sub> and NO<sub>x</sub>, but PM<sub>10</sub> levels are higher than the NAAQS. Higher PM<sub>10</sub> values are mainly due to vehicular pollution and road dust in the town of Solan. However, given the the mostly rural nature of the subproject areas, PM<sub>10</sub> is also expected to be within the limits as there is no notable source of air pollution such as traffic.

**Table 20: Ambient Air Quality data**

Location	$\mu\text{g}/\text{m}^3$ (24 hourly average)	Parameter		
		SO <sub>2</sub>	NO <sub>x</sub>	PM <sub>10</sub>
Parwanoo Solan	Minimum	2	5	29
	Maximum	4	34	192
	Average	2	6	148
No of observations in the year		254	255	269
Exceeding NAAQS		0	0	2
National Ambient Air Quality Standard ( $\mu\text{g}/\text{m}^3$ ), 2009 (24 hour)		80	80	100
WHO Air Quality Guidelines, 2005 ( $\mu\text{g}/\text{m}^3$ ) (24 hour)		20	-	50

Source: [https://cpcb.nic.in/upload/NAAQS\\_2019.pdf](https://cpcb.nic.in/upload/NAAQS_2019.pdf)

## 8. Noise Level

139. There are no industrial establishments in and around the subproject area. As the traffic density is very low, the noise either from point or nonpoint sources is not expected in the project area. Moreover, there will be limited rise in noise levels due to proposed construction activity and the impact would be temporary and reversible. Noise levels data is not available for the sub project site locations. The data available for the nearest location in Solan district has been referred. This data has been given in Table 21. It is clear from this table that noise levels are well within the permissible the limits.

**Table 21: Ambient Noise Levels in Solan district**

SI No.	Location	Noise Levels dB (A)			
		2014	2015	2016	2017
1	Parwanoo Sector (IV) - Solan	61	50	52	54
2	Applicable Noise Level Standards	55	55	55	55

Source: *Ambient Air Quality and Noise Levels, Published by CPCB for 2017*



Receptor/ Source	India National Noise Level Standards (dBA) <sup>a</sup>		WHO Guidelines Value For Noise Levels Measured Out of Doors <sup>b</sup> (One Hour LA <sub>q</sub> 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

<sup>a</sup> Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010.

<sup>b</sup> Guidelines for Community Noise. WHO. 1999

140. In order to have site specific Ambient air quality monitoring and noise levels data, monitoring will be conducted by the contractor(s) prior to start of construction works with the aim of establishing baseline conditions.

## B. Ecological Resources

### 1. Forests

141. Forests in Himachal Pradesh currently cover an area of nearly 37,691 km<sup>2</sup> (14,553 sq. miles), which is about 38.3% of the total land area of the state. The variation in the landscape has created great diversity of flora and fauna. From the snowbound peaks of the Himalayas to the moist Alpine scrub, sub-Alpine forests, dry-temperate and moist-temperate forests to moist deciduous forests, the state possesses a wide biodiversity that in return nurtures a large multiplicity of floral and faunal forms. Reserve forests constitute 71.11%, protected forests cover 28.52%, and unclassified forests constitute 0.35% of the total forest area. Solan district has about 45.99 % forest of geographic area. The most portions of these forest areas are managed by the Forest Department. The forest areas under very dense, moderately dense and open category are presented below in Table 22:

**Table 22: Different Categories of Forests Solan District**

District	Very Dense Forest Area (KM <sup>2</sup> )	Moderate Dense Forest Area (KM <sup>2</sup> )	Open Forest Areas (KM <sup>2</sup> )
Solan	41.44	444.54	404.31

Source: State Forest Department

142. The forests of subproject district can be classified into six main categories namely: (1) the tropical dry deciduous forests, (2) the Sal forests (3) the Chir forests, (4) the oak forests, (4) the deodar, fir and spruce forests, and (5) the Alpine pastures.

143. The complete vegetation of Himachal Pradesh relies on two factors - height and rainfall. The southern most part of the state is at a lower altitude level and it contains both humid and subtropical dry broadleaf woodlands, along with subtropical moist broadleaf forests. Majority of the area is covered by Himalayan subtropical broadleaf forests. Apart from this, the state has some of the vegetation that is abundant with Sal, Sisham, Chir pine, dry deciduous, and moist broad-leaved forests. The landscape that falls in temperate regions has trees like oak, deodar, blue pine, fir, and spruce. The trees found in higher elevations include alders, birches, rhododendrons, and moist alpine scrubs. Himachal Pradesh has abundant fruits like apple, peaches, plums, and berries. It is rightly called the "fruit bowl of India." There are plenty of fruit orchards, and fruits are exported to various parts of the country and abroad. The pleasant climate also helps numerous flower varieties like gladiolas, lilies, tulips, chrysanthemums, roses, marigolds, carnations, etc. to grow in abundance.

144. Himachal Pradesh is home to approximately 1,200 birds and 359 animal species. This includes leopards, Ghoral, snow leopard, musk deer (state animal), and western tragopan (state bird). The state is an ideal tourist destination for animal lovers as it hosts 12 main national parks and sanctuaries. It has two major national sanctuaries-the Great Himalayan National Park and the Pin Valley National Park.

145. The project area is located in Western Himalayan broadleaf forests with hilly terrain of mainly agriculture and forest landuse. The forest area transverse by subproject components are classified as protected forest with shrubs and tree species. There no wildlife species of threatened category has been reported in the project area. As such, the area is associated with very high species richness. It also harbors some endemism, notably in flora and birds.

146. North India is within a broad migratory flyway for birds moving between breeding grounds to the north and wintering grounds to the south. Some sites within the region are seasonally important for these migratory birds, and may represent Critical Habitat owing to globally-significant concentrations of migratory/congregatory species – such as Renuka Ji Dam (BirdLife International 2020b). No such sites have yet been identified in the subproject Area of Analysis.

147. **Flora and Fauna around Subproject area.** The common trees in the surroundings of sub-project sites Chir, Deodar, Ban, and Kail, mainly deodar and pine trees in the city. Oak forests are also at higher elevations around moist locations. Places like Chail is the most predominant one for different species of vegetation. Besides the natural or indigenous vegetation, there are ornamental and alien plantations too. It consists of silver oak, jhakranda, bottle brush, weeping willows, kachnar, grasses, etc.-At few sites some trees need to be cut to facilitate construction.

148. The fauna in the surroundings of sub-project sites includes- Himalayan black bear & panther are the Carnivora whereas the Ghoral and the barking deer are the herbivores in and around the Solan Planning Area. Other animals include the jackal, mongoose, the Jangli Billi, monkeys & langurs, etc. The game birds include jungli murga, kabutar, ghughhi, dhaula teetar and kolsa etc. No evidences of endangered or rare species fauna at any sites could be found during consultation with forest department and local inquiry.

149. From an aquatic perspective, the project area falls within the Ganges-Himalayan Foothill freshwater ecoregion. It is an area of very high aquatic species richness and was believed to be an area of only moderate aquatic species endemism. For aquatic species, freshwater habitat is the most important parameter to consider in the selection of an ecologically contiguous area. In

Himachal Pradesh 61 species of fish observed, belong into 13 families in general waters and trout waters, with estimated length of 600 km and 2400 km respectively. The major fishes available in these streams are Trout, Mahseer (*Tor putitora*), *Nemacheilus* spp, *Barilus* sp, *Schizothoracids* *Crossocheilus* sp. *Glyptothorax* spp. etc. Rainbow trout and Mahasheer are the important fishes in Himachal Pradesh. The trout being the local fish, the seed of brown and rainbow trout used to be produced in three trout farms located at Chirgoan, Mahli/ Patlikuhl and Barot. Beas River and its tributaries in the Kullu valley is habitat for both brown and rainbow trout, while many rivers and streams in the Kangra valley are well-known for Mahseer. Mahseer is distributed all along the Himalayas including the freshwaters of Kashmir, Sikkim, Himachal Pradesh, Uttar Pradesh, Punjab, Haryana, Darjeeling district of West Bengal and Assam. It inhabits the mountains and sub mountains regions, running streams and rivers. The fish species is present in around 500 sq. km area of Himachal Pradesh state. The rivers Beas and Satluj in Himachal Pradesh like other Himalyan rivers supports a good population of *T. putitora*. The state has recorded highest 45.311 MT Mahseer catches during year 2019-20. The production is mainly from water reservoirs named Gobind Sagar, Koldam, Pong Dam and Ranjeet Sagar. The state has Golden Mahseer fish eggs production of 20900, 28700 and 41450 during year 2017-18, 2018-19 and year 2019-20; respectively.

150. Based on the information obtained from, Fisheries department, and local inquiries reveals that Mahseer, *Schizothorax* sp. (Gugli), *Cyprinun* *Carpio* (Common Carp), Trouts, and Minnows/Chal are available in the Giri river course (Appendix 6A). A biodiversity assessment report prepared for SZ 03 subproject (Appendix 6B) indicates that the potential impacts arise because the presence of protected fish species (Mahseer) in Giri river section where intake structure for Grid SS-1 is proposed under the subproject component. As informed by the local fisherman there is a fish breeding zone in the 2 km upstream of the proposed intake location on Giri river at Maryog and Mahseer is found during monsoon.

151. It is therefore, proposed to construct a RCC open frame type intake structure at Maryog village near the river bank where water is available even during lean seasons. The water will draw through submersible pump from Giri River. Water withdrawal is negligible even in lean season (<1%), and further to avoid any impacts on fish species

152. As per Fisheries department this intake location is approximately 2km downstream of the bridge located at Giri Pool which a fish breeding/spawning ground. Director, Fisheries department, Solan has issued a certificate (Appendix 6B) with a note that since the water requirement of the proposed scheme of Grid SS1 is only 11.5 L,PS whereas the flow of the Giri river during the lean period is 2320 LPS which is more than sufficient for fish breeding and thus there will be no hindrance due to construction of above scheme as far as fish breeding is concerned and Fisheries department has no objection this regard.

## 2. Protected Areas

153. In Himachal Pradesh there are 5 National Parks, 26 Wildlife Sanctuaries and 3 Conservation Reserves. The details are as under:

**Table 23: Details of Protected Area**

Sr.No.	Category of Protected Area	Area in km <sup>2</sup>
1	National Parks	2407.28
2	Wildlife Sanctuaries	5964.9731
3	Conservation Reserves	19.17
	<b>Total</b>	<b>8391.4231</b>

154. In Solan district two Wildlife Sanctuaries namely Chail and Majathal are located. Chail Wildlife Sanctuary in Solan district has also been notified as an Eco Sensitive zone. The proposed intake on Giri River at Grid SS-1 is at about 6 km from Chail Wildlife Sanctuary. Proposed SR Bawasni is at an aerial distance of ~31km from Majathal wildlife, proposed intake structure on Giri river in Grid SS-1 is about 17 KM from Churdhar WLS in Sirmaur district and is about 23 km from Shimla water cantonment WLS in Shimla District, The construction of these small components will not have any impact on the protected areas. There are no endangered terrestrial, avifauna or migratory species. Aquatic life is observed in Giri river which also act as the breeding and spawning area fishes.

155. There are 92 wetlands in Himachal Pradesh covering 2.25 hectares area, out of which 85 are natural and 7 are man-made which constituted one percent of the total geographical area. Pong Dam Lake (Kangra), and Renuka (Sirmaur) have been identified as Ramsar sites whereas Rewalsar (Mandi) and Khajiar (Chamba) have also been included by the MOEF&CC for its conservation and management. Nearest proposed component from designated wetland Renukaji lake in district Solan Package SZ-03 is the proposed Intake structure on Giri river (Grid SS 1) which is about 37 KM from (areal distance) Renukaji lake. Therefore, the project will pose no risk or impact on biodiversity and natural resources

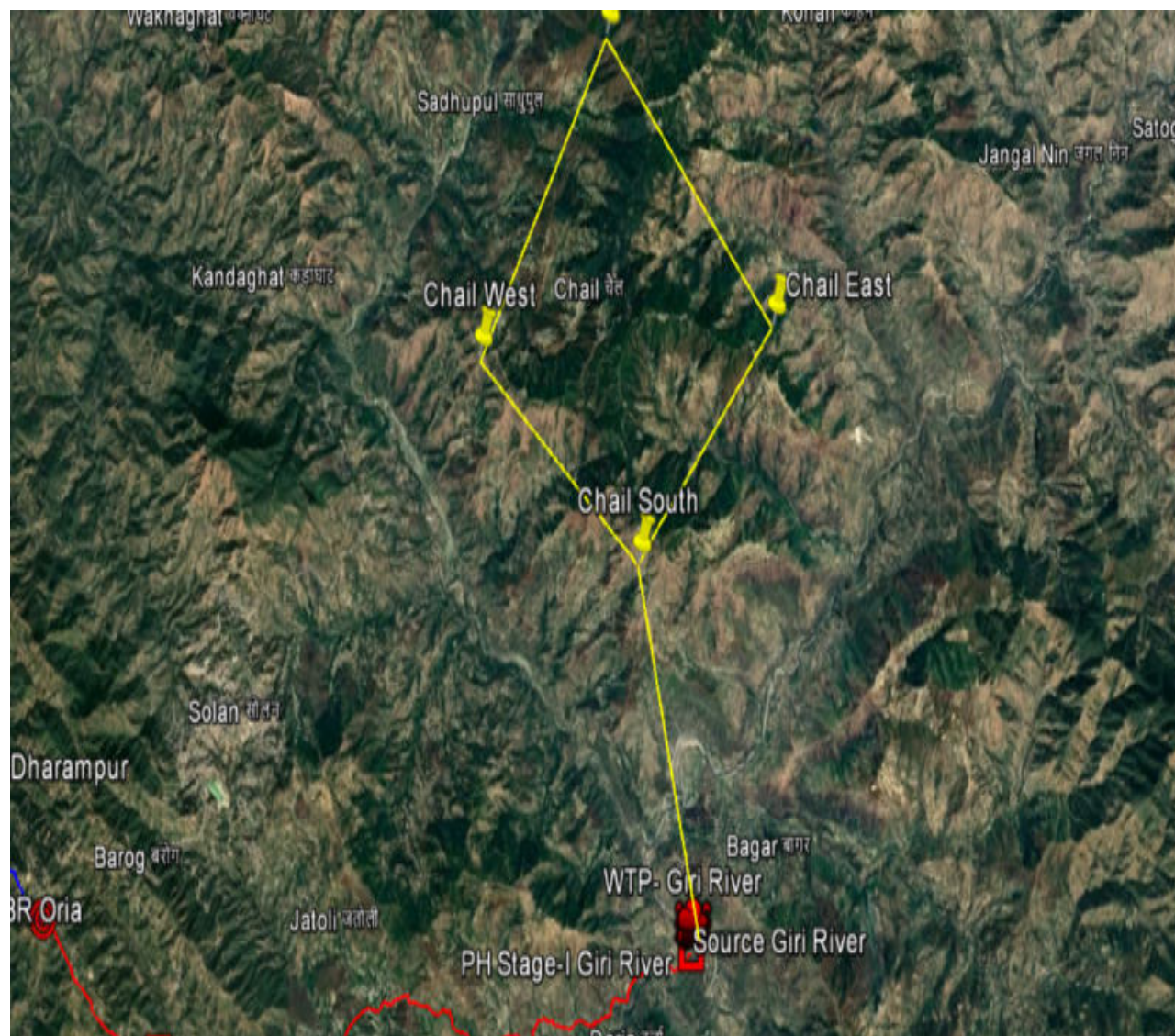
156. None of the project components, except water pipelines at some sections, are falling in forest areas. Water supply pipelines at some location will traverse forest areas, but mostly along trails / earthen roads, where there are no notable trees in the alignment. Forest department has exempted from clearance procedure for laying of drinking water pipelines requiring excavation/trench of less than 1m width and 2 m depth along the roads in forest land. In case of sample subproject IEEs, the proposed trench width is 0.6m; hence permission from local forest department will be adequate for pipeline laying (Appendix 7). The water pipelines will be laid along the roads and within the existing right of way with no notable tree felling anticipated as per preliminary design. However, it will be finalised during detailed design period and if any tree felling is required, compensatory tree plantation will be carried out in 1:10 ratio. No Protected Forest land needs to be diverted for this subproject.

157. Screening via Integrated Biodiversity Assessment Tool (IBAT) indicates presence of various protected areas and key biodiversity areas within 50 km radial distance; however, none are located close to the subproject area. Total 22 species of threatened category and 4 restricted range species are found in 50km radius in subproject components area as result of IBAT analysis.

158. The distance of protected areas with respect to the proposed Grids under package SZ-03 in Solan district is marked in following Google images.

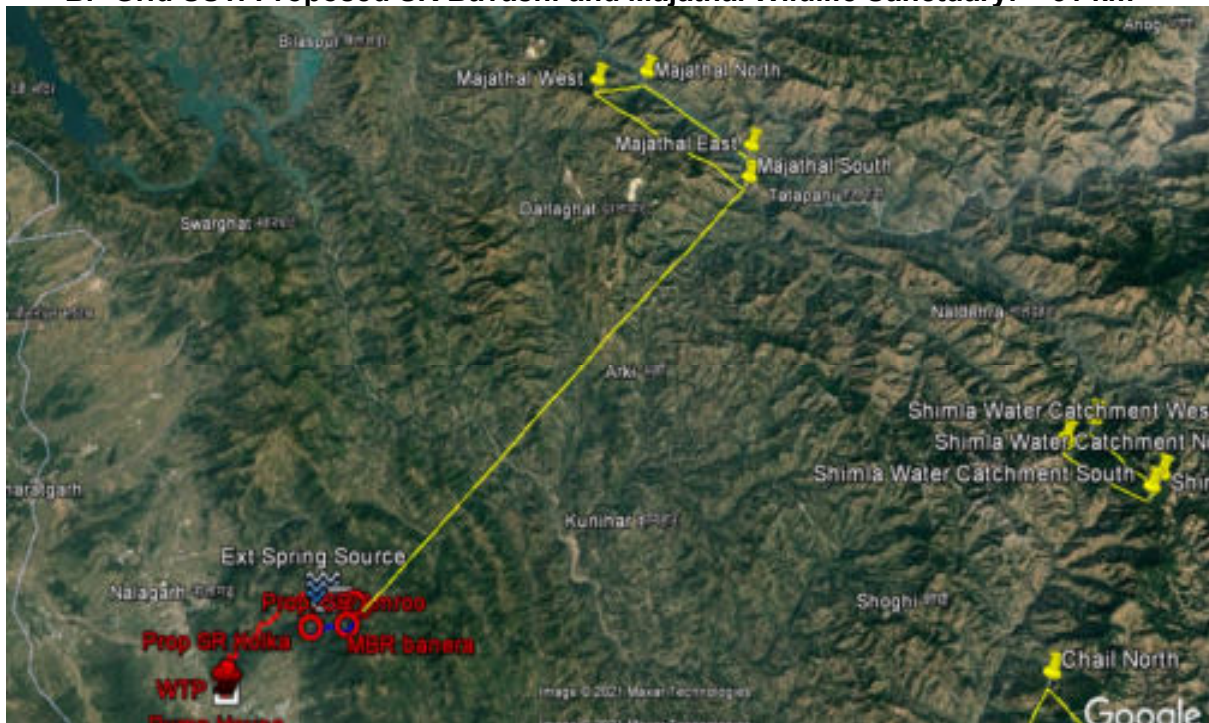
**Figure 15: National Parks and Sanctuaries in Himachal Pradesh**

**A. Grid SS1: Proposed Intake Structure on Giri river and Chail Wildlife Sanctuary: ~ 6 km**

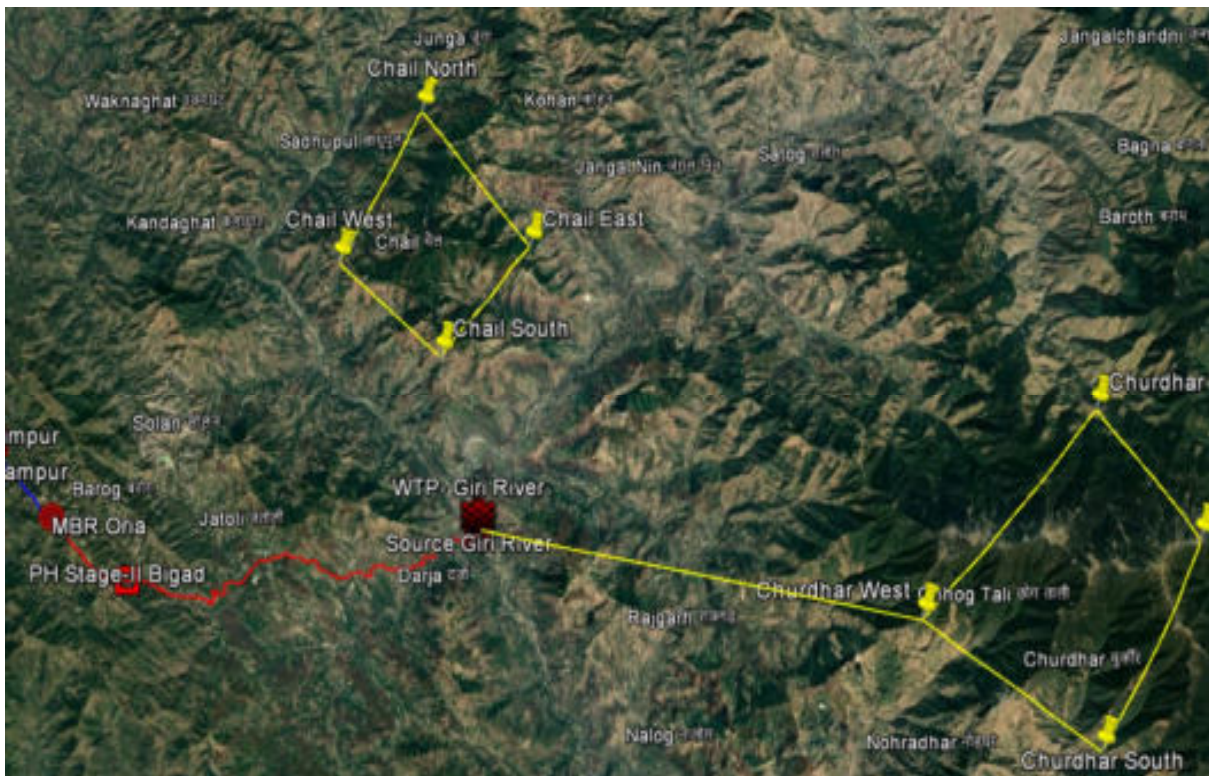




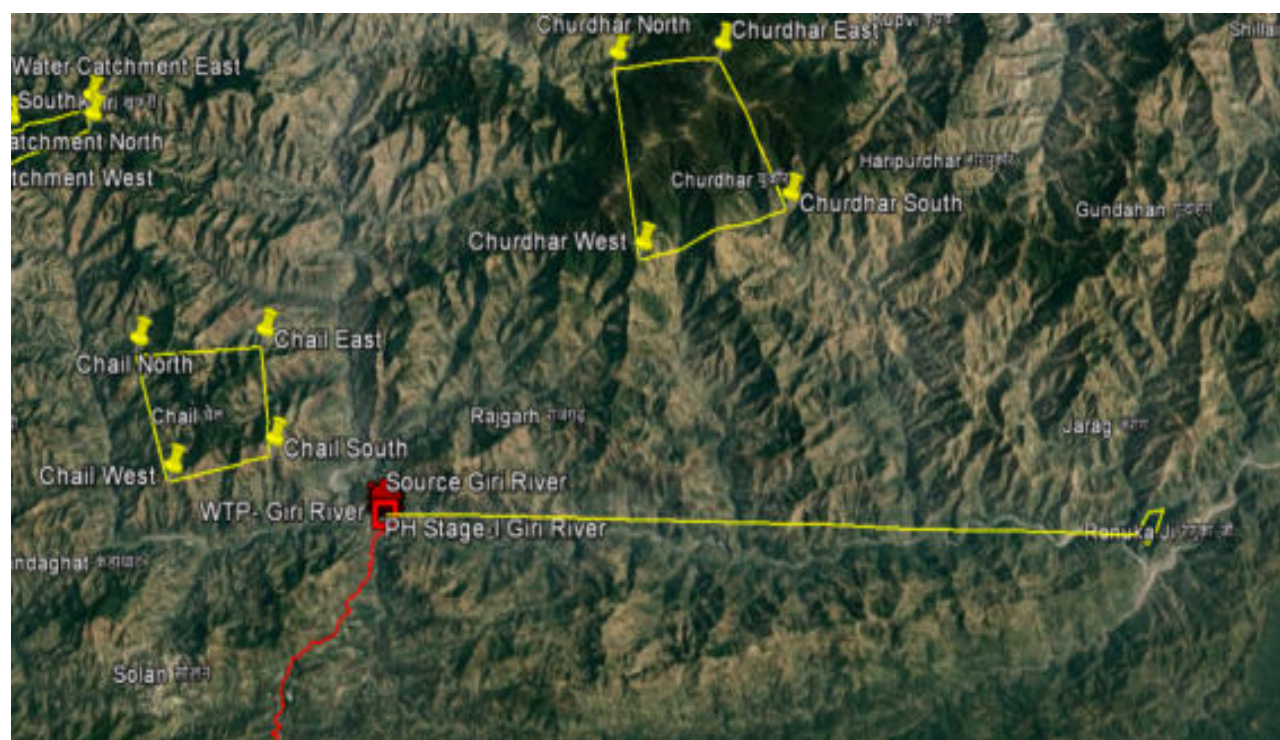
**B. Grid SS1: Proposed SR Bavasni and Majathal Wildlife Sanctuary: ~ 31 km**



**C. Grid SS1: Proposed Intake Structure on Giri river and Churdhar Wildlife Sanctuary: ~ 16 km**







## F. Economic Development

### 1. Transportation

159. The subproject area in Solan is well connected with two national highways – NH 5 (Kufri to Shimla) and NH 105 from Swarghat to Kalka, NH 205 and SH-16 from Shimla to Nalagarh. The nearest airport is Shimla Airport within range of 50 Kms. Chandigarh airport is within a range of 70 Kms. The nearest railway stations are Shimla ISBT and Chandigarh ISBT within a range of 60 kms and 75 kms respectively

160. Road network in the area are divided in National highways, Major district roads, Other district roads, Village roads and Katcha path in case habitations. National highways are generally of 14m of width bituminous road, major district road is generally 10.5 m in width bituminous road, Other district road are of 7m width bituminous road and village roads are generally 3.5m bituminous road or brick roads. Maximum diameter of pipes proposed to be laid under this subproject are less than 250 mm diameter pipes which can be easily laid in shoulders of the roads.

### 2. Agriculture Development & Industry

161. Agriculture is the main stay of the rural economy and more than fifty per cent of the working population of the district is engaged in agriculture. Maize, wheat, rice and pulses are the main crops, while cash crops such as sugarcane and off-season vegetables are grown in Nalagarh, Solan and Kandaghat tehsils.

162. The Solan district has 15 notified industrial areas. The district has pharmaceutical, cement, food processing and packaging, electrical accessories, wires and cables, Breweries and communication systems industries. These industries are spread in all parts of district. The sub-project location has also significant number of industries. There are about 246 large and medium industries in the district. In addition to large and medium industries, there are many micro and small enterprises in the district.

### 3. Land Use

163. The district is spread over the valleys and higher elevations. The cultivation is possible only in small terraces in the hills or along the streams/khads in most parts of the district. However, in the valleys the cultivation is spread over a vast area. Except the valley area most of the land is either under shrub forests or grassy land with Chil trees upto the height of 1,500 metres from the mean sea level and Kail and Deodar on the high altitudes. It is only in the Doon, Saproon and Kunihar valleys that the land is mostly flat and fertile.

**Table 24: Land Use Pattern of Solan District**

Land Use	Area (In '000 Hect)
Geographical area of district	180.9
Area under forest, dense and open forest	20.3
Misc. Tree, crops and Groves (Not included in net area sown)	0.6
Permanent Pastures & Other Grazing Lands	77.3



Land Use	Area (In '000 Hect)
Culturable Waste land	14.09
Land put to Non-Agri-Culturalble Uses	12.9
Barren & Unculturable Land	11.7
Current Follows	3.3
Other Follows	2.4
Net Area sown	37.6
Net Area sown more than once	26.1
Total cropped area	63.8

Source: District Census Handbook Solan District, 2011

#### 4. Electrification

164. There is 100 % electrification in rural and urban areas of Solan district as per Statistical abstract published by Department of Economics and Statistics, GOHP for the year 2015-2016.

#### 5. Irrigation

165. Majority of area in Solan district is irrigated by lift irrigation, Kuhals, bore wells, tanks etc. Solan district has an area of 1937 Km<sup>2</sup> of which 383 Km<sup>2</sup> [1] i.e., 20% is the net sown area. Among which the Net irrigated area is about 105 Km<sup>2</sup> (all values as of 2013). Based on the figures one can see that the irrigated area is low. Majority of the agriculture pockets are rain fed. Paddy, wheat and maize are the major field crops produced.

#### 6. Sewerage and Drainage

166. Our project area lies in rural pockets of Solan. There is no centralized sewage collection system in the project area. Households mainly depend on individual sanitation systems like pit latrines, flush latrines, some connected to septic tanks. Open drains along the roads are provided in few places.

#### 7. Solid Waste Management

167. In the rural parts of Solan, solid waste from the respective households is dumped in community pits (also called Kua). This waste is either burnt or left in the pit as such. There are few dustbins kept in common places by the panchayath for collection at public places.

#### 8. Health Facilities

168. The GOHP run health facilities in Solan district include 6 hospitals, 6 Community Health Centres and 34 Primary Health Centres. The Ayurvedic related health facilities include 2 hospitals. In addition to the above-mentioned government run health facilities there are nearly 13 private hospitals in the district.

## **9. Education Facilities**

169. In the Solan district, there are 766 primary schools, 148 middle schools, 162 secondary and senior secondary schools, and 15-degree colleges. In addition to this, there are many private owned schools, degree colleges, polytechnic institutes and Industrial Training Institutes.

## **10. Socio- Economic Profile**

170. The Solan district Solan Planning Area covers 3343 hectares = 33.43 km<sup>2</sup> of land (2nd Largest city area in Himachal Pradesh). Out of total population, 15,640 were engaged in work or business activity. Of this 12,147 were males while 3,493 were females. In census survey, worker is defined as person who does business, job, service, and cultivator and labour activity. Of total 15640 working population, 93.31% were engaged in Main Work while 6.69% of total workers were engaged in Marginal Work. Solan Municipal Council has total administration over 9,803 houses to which it supplies basic amenities like water and sewerage.

171. Solan is an industrial hub of Himachal Pradesh. It is also known for Pharmaceutical industry. The Small Scale and Medium industrial units provide employment and play role in the economy of inhabitants.

172. Solan is hub of horticulture produce marketing. Tomatoes, plums, apricots, kiwi, apples and seasonal vegetables constitutes major economic activity of the town. There is big complex on Saproon bypass housing vegetables and fruits market. Mushrooms are widely grown in town and contributes to the economy of the inhabitants. Tourism also contributes to the economy of the city.

## **G. Social and Cultural Resources**

### **1. Demography**

173. The Solan district has a total area of 1936 sq. km. According to Census 2011, the total population of the Solan district was 580,320 as per the 2011 census, which accounts for 8.4% of the state's population of which males were 308,754 and remaining 271,566 were females. This population of the district forms 8.45 per cent of the state population. Out of the total population of the district 82.40 per cent lives in rural areas while 17.60 per cent lives in urban areas. The total rural population in the district is 478173 comprising 249736 males and 228437 females. The total urban population in the district comes to 102147 consisting of 59018 males and 43129 females. Overall, the district has 2544 villages. The total rural population is distributed in 2383 inhabited villages. Rests of the 161 villages have been returned as un- inhabited. The density of population in Solan district comes to 300 per sq.km. against the state density of 123 persons. There are 880 females for every thousand males in Solan district. As per Census 2011, Solan district reported 76.6% percent population as literate of the total population. The proportion of male and female literates in the district is 84.8 and 66.9 per cent, respectively. The literacy rate is similar to the state average of 76.1%. Out of the total population of 580,320 of the districts, 5,48,579 (94.53 per cent) have reported their religion as Hindu followed by 14678 (2.52 per cent) as Muslim, 13926 (0.0225 per cent) as Sikh. Remaining Buddhist, Christian, Jain and other religions have a negligible representation in the district.

174. The mother tongue in Solan district is Hindi. The other local languages such as Punjabi and Kangri are spoken by a very small fraction of population. The majority of the people are Hindu Brahmin, Rajputs, Banias, and scheduled castes and scheduled tribes. There are also

minority populations of Sikhs, Muslims and Christians. The traditional dress for men is the kurta, pyjama, and a woollen jacket used in winter. Women generally wear the salwar kameez.

## 2. History, Culture and Tourism

175. **History.** The history of Solan goes back to the era of Pandavas. According to local folklore, Pandavas lived here during their exile.[7] In 1815 British won Baghat state (now Solan) from the Gurkhas, Gurkha fort or Arki Fort is still standing tall on a mountain near to Solan city and it is one of the historic tourist attractions of Solan.[8] The town has been a capital of the princely Baghat State. The word Baghat is derived from Bau or Bahu, meaning "many", and Ghat meaning "pass". Initially the state headquarters of the Baghat State was located at Bhoch in the Bhuchali pargana, but the headquarters of the state was shifted to Solan after the construction of cantonment over here. The railway was set up in 1902.[9] The evolution of Solan city can be understood in the following order or sequence :-

- (i) Establishment of a cantonment area at Solan by Britishers.
- (ii) Establishing Solan brewery in 1855 due to availability of excellent quality mineral water.
- (iii) Shifting of the headquarters of Baghat State from Bhoch to Solan.
- (iv) Start of Kalka-Shimla rail line in 1902.
- (v) Start of transportation activity on Kalka-Solan-Shimla Road.
- (vi) The urban local body i.e., Municipal Council Solan came into existence in 1950.
- (vii) Solan became an independent district on 1 September 1972, and the town of Solan became the district headquarters.<sup>9</sup>

176. **Culture & Heritage.** There are no heritage sites notified by Archaeological Survey of India (ASI) within or near the subproject area sites. Similarly, no common property resources such as public wells, water tanks, playgrounds, common grassing grounds or pastures, market areas and community buildings will be affected by the proposed subproject.

177. The heritage sites in the subproject area are Surya Narayan Temple Nirath, Vice Regal Lodge (Rashtrapati Niwas), Maha Kaleshwar Shiv Temple, Mohan Shakti National Heritage Park, and Kuthar Palace and fort. The Surya Narayan Temple Nirath is at a distance of ~67 km from intake structure in Grid SS-1 at Giri River, the Vice Regal Lodge (Rashtrapati Niwas) monument is at a distance of ~25 km from SR Sunaradi Anji LWSS Sunaradi in Grid SS-1, the Maha Kaleshwar Shiv Temple is ~45 km from WTP near Giri river in Grid SS -1, the Mohan Shakti National Heritage Park is ~10 km from WTP near Giri river in Grid SS-1, and the Kuthar Palace fort monument is ~6 km from SR Bhaguri in grid SS 1.

178. **Tourism.** The major tourist attractions in the subproject area are Barog railway station, The Menri Monastery, Kuthar Palace and fort, and Jatoli Shiv Temple, Solan.

- (i) Barog railway station: The station lies on UNESCO World Heritage Site Kalka–Shimla Railway. The station is located at an altitude of 1,531 metres (5,023 ft) above mean sea level. This station is at a distance of ~4 km from MBR Oria in Grid SS-1
- (ii) The Menri Monastery: It is a Bon monastery in Solan which is the second oldest Bon monastery in the world. The Bon monastery offers picturesque views of the

<sup>9</sup> [https://en.wikipedia.org/wiki/Solan#cite\\_note-Historical\\_Evolution\\_Solan\\_City-9](https://en.wikipedia.org/wiki/Solan#cite_note-Historical_Evolution_Solan_City-9)

town and snow-capped mountains. The monastery is a grand spectacle, boasting manicured gardens and an impressive statue of Tonpa Shenrab Miwoche. The monument is ~7 km from intake structure in grid SS 1 at Giri River.

- (iii) Kuthar Palace and fort: The Kuthar Fort is as old as 800 years. The fort once served as the royal residence for the family of Kuthar. It is a picturesque place and a part of it is privatized and converted into a resort. Within the fort, sprawling over an expanse of 52.8 sq km, one can see a beautiful garden, freshwater springs and an ancient temple. The monument is ~6 km from SR Bhaguri in Grid SS-1
- (iv) Jatoli Shiv Temple, Solan: Asia's highest Shiv temple, this shrine is indeed an architectural marvel. Jatoli Shiv Temple is one of the famous holy destinations of Solan which attract a large number of pilgrims. The monument is ~6 km from PH stage 2 in Bigad in Grid SS-1.

179. A number of fairs and festivals are celebrated in Solan i.e., Salloni Fair at Solan, Koti Fair, Sayari Fair, Bani Fair, Dev Bara Fair, Sharad Purnima Fair etc.

- (i) Salloni Fair or Solan fair is held in Solan, Himachal Pradesh, in the last week of June for three days. The tradition of celebrating this fair is followed way before the birth of the modern Solan town which was established in the honor of the Goddess 'Shoolini'. The Goddess' temple is located in the nearby village – Solan Gaon. The famous Shoolini Devi Temple and the Lord Shiva Temple are worth visit places in and around Solan.
- (ii) Sharad Purnima Fair: It is held in Unchagaon (Kunihar) in a round surrounding tank for two days in January- February. It starts from Puranmashi and lasts upto next day. It is held in honour of 'Sharad Purnima" and Devta Dano Dev.
- (iii) Sayari Fair: It is held for a day at Baili adjoining Kunihar on Sankrant in September. A cattle show is arranged, and owners of best animals are given awards.
- (iv) Koti Fair: It is held in Koti village in the last month if May/June for a day. It is held in honour of Mira Devi whose temple is situated here.

## **H. Environmental Settings of Investment Program Component Sites**

180. Subproject components are located in immediate surroundings of small towns/villages which were mainly rural in set up. Proposed Intake, WTP, MBR, SR will be constructed on vacant land mostly under possession of JSV. Some components are also proposed on vacant lands under the ownership of government revenue department and private owners. None of the project components are proposed in forest lands and do not have any notable sensitive environmental features with no tree cover/vegetation. At some locations, water pipelines will traverse through some forest lands, mostly along forest trails (walk paths / earthen roads), and therefore no notable tree felling envisaged as per preliminary design. However, it will be finalised during detailed design period and if any tree felling is required, compensatory tree plantation will be carried out in 1:10 ratio. There are no AC pipes in the existing water supply system which may create hazardous conditions for the workers and surrounding community.


181. There are no wetland, eco-sensitive or protected areas within proposed project activity areas of Package SZ03. Nearest proposed component from designated Ramsar site Renukaji lake in Shimla zone, of Package SZ-03 (Solan district) is proposed Intake structure on Giri River in Grid SS 1 which is about 37 km (areal distance) from Renukaji lake.




182. In Solan district two Wildlife Sanctuaries namely Chail and Majathal are located. Chail Wildlife Sanctuary in Solan district has also been notified as an Eco Sensitive zone. None of the subproject component is falling within any protected areas. There are no endangered terrestrial, avifauna or migratory species. Aquatic life is observed in Giri river which also act as the breeding and spaning area of Golden Mahasheer and other aquatic life.






183. There are no heritage sites notified by Archaeological Survey of India (ASI) within or near the subproject area sites. Similarly, no common property resources such as public wells, water tanks, playgrounds, common grassing grounds or pastures, market areas and community buildings will be affected by the proposed subproject. Hence, the construction of these proposed small components will not have any impact on the biodiversity of the area.

184. Site environmental features of all subproject sites and photographs are presented in the following Table 25.







**Table 25: Site Environmental Features**








Infrastructure	Environmental and Social Features	Photos
<b>GRID SS 1</b>		
<p>One Intake structure is proposed on Grid SS-1 on Giri river</p>	<p>The proposed RCC open frame intake structure will be built on Giri river located at coordinates of Lat.30.874956°N and Long. 77.217756°E.</p> <p>Salient features of the intake source/location are given below:</p> <ul style="list-style-type: none"> <li>• Source is Giri river at village Maryog</li> <li>• Giri river originates at Khada Pathar (100km).It is Snow fed/spring origib</li> <li>• Meets with Yamuna river at Ponta Sahib (60 km d/s)</li> <li>• Width 50 m HFL ; 10m LFL at source</li> <li>• Ashwani khad in u/s and Khwal Khad merges in Giri near the proposed source. Many small nallahs/springs also meets with Giri river.</li> <li>• Dam at Renuka (Hydropower) 40 km d/s on Giri river</li> <li>• At 3 km u/s existing there is WSS Giri (open intake structure) on Giri river.</li> <li>• Giri river is a perennial river . Lean period is November and December.</li> <li>• Water quality is good. Rocks /boulders forms the river bed.</li> <li>• As per Fishery department information Schizothorax sp. (Gugli), Tor Tor (Mahseer) and Cyprinus Carpio (common carp) are found in Giri river.</li> <li>• in the down stream of proposed source (200m) there is one crematorium,</li> </ul> <p>The proposed site location is under the ownership of Revenue Department. and land transfer to JSV has been initiated. The water quality parameters of the river source in general, is within acceptable limits. This water can be used for potable purposes, after conventional treatment followed by disinfection. The proposed land is vacant, and in an isolated location and devoid of any nearby human settlements. There aren't any major human activities in this area. There is no permanent or temporary structures or non-title holder (NTH) on the proposed land. No involuntary resettlement impact is anticipated.Tree cutting will not be required as land is vacant.</p> <p>The Proposed site is 9.67 km away from Chail Wildlife sanctuary.</p> <p>Common flora found in the vicinity is Chil, Deodar, Ban, and Kail, silver oak, jhakranda,</p>	






Infrastructure	Environmental and Social Features	Photos
	<p>bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p>	
<p>One Construction of Water Treatment Plant is proposed in Grid SS-1</p> <p>1. Proposed WTP near Giri River</p>	<p>Water Treatment Plant is on the left bank of the Giri River located at Coordinate 30°52'28.02"N 77°13'7.01"E having an area of 6300 sqmt. The proposed WTP will be constructed on the available government land under the ownership of Revenue department. Land transfer to JSV has been initiated. The site is not prone to flooding. The site is present in an isolated location and devoid of any nearby human settlements. There aren't any major human activities in this area. There is no permanent or temporary structure or non-title holder (NTH) on the proposed land. No involuntary resettlement impact is anticipated. Thus, no temporary or permanent IR impact envisaged. Tree cutting will not be required as land is vacant.</p> <p>The Proposed site is 9.67 km away from Chail Wildlife sanctuary.</p> <p>Common flora found in the vicinity is Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p>	
<p>Three Pumping Stations are proposed in grid SS-1</p> <p>1. Proposed Pumping station near Proposed MBR Dharampur</p> <p>2. Proposed Pump House Stage-2 near Proposed Sumpwell Stage-2 Bigad</p> <p>3. Proposed Pump House Stage-1 near Proposed WTP at Giri River</p>	<p>Among the 3 proposed Pumping stations, one will be located inside the campus of WTP. The other two are located i) near sumpwell at Bigad and ii) near MBR Dharampur.</p> <p>The sites are present in an isolated location and devoid of any nearby human settlements. There aren't any major human activities in this area.</p> <p>All Pump houses will be constructed on the available vacant/unused government land under the ownership of Revenue Department. The land transfer process to JSV has been initiated. Thus, temporary or permanent Social impacts or Community issues were not observed. There is no permanent or temporary structure or non-title holder (NTH) on the proposed lands.</p> <p>The pump houses require 63.5 sqm area only and this can be accommodated without any trees being cut.</p> <p>The proposed site for PH near MBR</p>	 <p>PH Dharampur</p>  <p>PH Stage-II Bigad</p>






Infrastructure	Environmental and Social Features	Photos
	<p>Dharampur is located on Revenue Land and is 17.2 km away from Chail Wildlife sanctuary. Pumphouse at Bigad comes is 15.3 km away from Chail Wildlife sanctuary.</p> <p>Common flora found in the vicinity are Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p>	 <p>Proposed PH Stage-I At Giri River</p>
<p>Seven nos. Main Balancing Reservoir (MBR) are proposed in Grid SS-1.</p>	<p>Six out of Seven MBRs proposed in this grid i.e. MBR Oria, MBR Garkhal Larah, MBR Kasuali, MBR Badeha, MBR Chabal, MBR Jhanger will be constructed at same location of existing MBRs.</p> <p>Proposed MBR Kasuali is on cantonment land for which request for consent/NOC from Cantonment Board has been initiated by the JSV.</p> <p>The proposed site for MBR Dharampur is located on Revenue Land. All other MBRs comes on government land (revenue) and land transfer to JSV has been initiated. The land area devoid of any nearby human settlement that could result in Environmental and social issue.</p> <p>Proposed MBR Dharampur is proposed at coordinate 30°54'7.74"N 77° 1'40.19"E. The MBR Garkhal Larah will require 169 sqm and MBR Badeha and MBR Jhanger with 64 sqm and all other MBR's will require an area of 81sqmt.</p> <p>The Proposed site for MBR oria, MBR dharampur, MBR Kasauli, MBR Garkhal Larah, MBR Badeha, MBR Chabal and MBR Moti Kona are M, 21.3KM and 20.2KM away respectively from Chail Wildlife sanctuary. Whereas MBR Jhanger is 15.9km away from Sukhana wildlife sanctuary.</p> <p>All these region falls within the radius of 5km as such the common flora found in the vicinity of these MBRs are Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p>	 <p>MBR Dharampur</p>  <p>MBR Chabal</p>  <p>MBR Oria</p>  <p>MBR Kasuali</p>







Infrastructure	Environmental and Social Features	Photos
		 <p>Proposed MBR GarkhalLarah</p>  <p>MBR Badeha</p>  <p>Proposed MBR Jhanger</p>
<p>10 nos. of Service Level Reservoirs are proposed in Grid SS-1.</p>	<p>Proposed 9 Nos. of SRs, i.e. SR Seri Thana, SR Kasauli, SR Sunaradi Anji, SR Satyana Shiva, SR Shilar, SR Hurang Combined, SR Jangeshu, SR Jhanger-2 and SR Jhanger-3 will be constructed at the same location of existing SRs by dismantling of the existing SRs. The SR Satyna Shiva lies on private land and consent has been obtained for voluntary donation of land to JSV.</p> <p>The proposed site location all SRs comes on government land (revenue) and land transfer to JSV has been initiated. All the sites are present in an isolated location and devoid of any nearby human settlements. There aren't any major human activities in this area. There is no permanent or temporary structure or non-title holder (NTH) on the proposed land.. No tree cuttings will be required.</p> <p>The new proposed SR Bhaguri will be located at coordinates 30°57'3.08"N 76°54'57.24"E Among the 10 SRs, 8 no. of SR having area of 81sqmt. and one SR Satyna Shiva having area 121 sqm and SR Shilar of area 64.</p> <p>The Proposed site of SR Aunardi Anji, SR Satyana Shiva, SR Shilar, SR Hurang kotla, is 19.7km, 23.1km, 22.9km and 21.7km away from Chail Wildlife sanctuary.</p> <p>The Proposed site of SR Seri Thana, SR</p>	 <p>SR Seri Thana</p>  <p>SR Kasauli</p>  <p>SR Sunaradi Anji</p>






Infrastructure	Environmental and Social Features	Photos
	<p>Kasauli, SR Jangeshu, SR Jhanger-2 SR Jhanger-3, and SR Bhaguri is 15.3km, 17.5km, 15.2km, 21.5km, 20.2km and 18km away from Sukhana Wildlife sanctuary.</p> <p>All these SRs are proposed in similar altitude and Climate thus they share Common flora which are Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna that are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p>	 <p>SR Satyana Shiva</p>  <p>SR Shilar</p>  <p>SR Hurang</p>  <p>SR Jangeshu</p>  <p>SR Jhanger-2</p>  <p>SR Bhaguri</p>  <p>SR</p>






Infrastructure	Environmental and Social Features	Photos
		Jhanger-3
Distribution Mains	<p>Distribution Lines will be laid from Service Reservoirs to the respective Land settlements. The alignment of distribution lines is such to ensure maximum nearby household connections. Thus, they will be laid in the katcha pathways and streets of the habitations. Hence, temporary social issues may arise while laying the pipes near the houses. The public has been sensitized about the issues faced while laying of pipelines, during public consultations conducted. Since the pipelines will go underground (where possible), its less likely to impact any household permanently.</p> <p>The Pipes will be laid in a manner so that no cutting of the trees is required. The public will be intimated prior the implementation period. Contractor shall execute the work during non-harvest season to avoid disruption to agricultural fields if required.</p> <p>Distribution lines with a total length 68.4 KM with diameter varying from 25 mm to 125 mm is proposed in Grid SS-1. About 16 KM of length is lying on forest land. New pipelines will be mostly laid along the existing pipeline in forest areas or along the forest trails / roads. No tree cutting will be required for laying pipelines.</p>	 
Gravity Mains and Rising mains	<p>It was observed during the transect walks along the gravity mains, that there are no premises which are in way of the pipeline alignment. Few agricultural lands and private properties may come along the alignment. The proposed route is free of any encumbrances. The Gravity mains are preferred to be laid along the existing alignments, or along road's and small pathways. However, temporary social issues may arise while laying the pipes going through the agricultural fields and private lands.</p>	 
Rising mains	<p>The private landowners and panchayat members were sensitized about the minor inconveniences in laying of pipelines, during the public consultations conducted. Hence necessary consent of support was obtained from the panchayat offices. Prior intimation will be given at panchayat office by contractor before executing the work. The Contractor shall execute the work during non-harvest season to avoid disruption to agricultural fields. The laying will be carried in a way to avoid tree cutting.</p>	

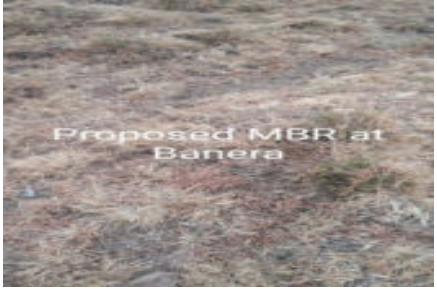



Infrastructure	Environmental and Social Features	Photos
	<p>Rising mains with a total length of 30.4 KM out of which ~ 16 KM of pipeline is proposed to pass through forest land and proposed 200 mm in Grid SS-1.</p> <p>Gravity main with a total length 42 KM with diameter varying from 50 mm to 150 mm is proposed in Grid Grid SS-1. About 33 KM of length of pipe is lying on forest land.</p> <p>New pipelines will be mostly laid along the existing mains in forest areas or along the forest trails / roads. No tree cutting will be required for laying pipelines.</p>	
<b>Grid SS-9</b>		
<p>Four Tube wells are proposed in Grid SS-9.</p>	<p>The proposed tubewells are located at coordinates</p> <p>i) Tube well Dumanwala at 30°59'16.62"N 76°46'12.09"E</p> <p>ii) Tubewell Landeywall at 30°55'18.70"N 76°47'19.00"E</p> <p>iii) Tubewell Amroo Bawasni at 31° 00' 11.8"N 76°44' 08.07E</p> <p>iv) Tubewell Mandhala at 30°53'54.53"N 76°52'14.64"E</p> <p>Proposed Tube wells will be constructed on the available government lands under the ownership of Revenue department The land transfer to JSV has been initiated under the letter no. JSD-NLG-DB-NDB- /2020-19507-10 dated 27.3.2021 Water can be used for potable purposes, after conventional treatment followed by disinfection.. Tree cutting will not be required as lands are vacant/unused. There is no permanent or temporary structure or non-title holder (NTH) on the proposed land.</p> <p>The Proposed Tube well Dumanwala, Landeywall, Amroo Bawasni and Mandhala is 26.6km, 17.8km, 28km and 13.9km away respectively from Sukhana Wildlife sanctuary.</p> <p>All the proposed land are in the proximity and falls in same region, altitude and climatic zone thus they share the Common flora which are Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga,</p>	 <p>Proposed Tubewell Dumanwala Site (Red Mark)</p>  <p>Proposed Tubewell Sit Landeywall</p>  <p>Tubewell Site Mandhala</p>  <p>Proposed Amroo Baswani Tubewell Site</p>









Infrastructure	Environmental and Social Features	Photos
	<p>kabutar, ghughi, dhaula teetar and kolsa etc.</p>	
<p>Five Water Treatment Plant are proposed in Grid SS-9.</p>	<p>5 Water treatments plants based on Slow Sand Filter (SSF) method is proposed in SS - 9. The Water Treatment Plants are located at:</p> <p>i) SSF at Dumanwala of 355 KLD and 675 sqm at coordinates 30°59'18.00"N 76°46'12.70"E. The Proposed site is 26.4 km away from Sukhana Wildlife sanctuary.</p> <p>ii) SSF at Amroo Bawasni of 355 KLD and 675 sqm at coordinates 30°59'59.23"N 76°44'23.94"E. The Proposed site is 28 km away from Sukhana Wildlife sanctuary.</p> <p>iii) SSF at Barotiwala of 208 KLD and 445 sqm at coordinates 30°54'14.38"N 76°50'26.95"E. The Proposed site is 14.8 km away from Sukhana Wildlife sanctuary.</p> <p>iv) SSF at Mandhala of 320 KLD and 485 sqm at coordinates 30°53'50.13"N 76°52'23.09"E. The Proposed site is 13.9 km away from Sukhana Wildlife sanctuary.</p> <p>v) SSF at Landeywal of 64 KLD and 325 sqm at coordinates 30°55'18.64"N 76°47'18.77"E. The Proposed site is 17.9 km away from Sukhana Wildlife sanctuary.</p> <p>All the proposed WTPs will be constructed on the available government land owned by the Revenue Department. The Land transfer to JSV has been initiated</p> <p>The sites are present in an isolated location and devoid of any nearby human settlements. There aren't any major human activities in this area.. Tree cutting will not be required as land is vacant.</p> <p>There is no permanent or temporary structure, Non-Title Holder (NTH) on the proposed land. No temporary or permanent IR impact is envisaged</p>	 <p>Site for Pumping Station and WTP Dumanwala</p>   <p>Proposed PH and WTP Site Mandhala</p>  <p>Proposed WTP Amroo Bawasni</p>





Infrastructure	Environmental and Social Features	Photos
	<p>All the proposed land for WTP are in the proximity and falls in same region, altitude and climatic zone thus they share the Common flora which are Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p>	 <p>Proposed WTP and PH Barotiwala</p>
<p>Eight Pumping station are proposed in Grid SS-9.</p>	<p>Among the 8 pump houses proposed 4 Pumping stations will be constructed in the same campus of SSF and remaining 4 at the sumpwells They are proposed at :</p> <p>i) Pump House near Proposed Sumpwell Stage-1 at coordinates 31°2'26.73"N 76°47'26.40"E. The Proposed site is 30 km away from Sukhana Wildlife sanctuary.</p> <p>ii) Pump House near Proposed Sumpwell Stage-2 at coordinates 31° 2'24.47"N 76°48'2.48"E. The Proposed site is 30.7 km away from Sukhana Wildlife sanctuary.</p> <p>iii) Pump House near Existing Sumpwell in Village Landeywall at coordinates 30°55'27.99"N 76°46'40.09"E. The Proposed site is 16.8 km away from Sukhana Wildlife sanctuary.</p> <p>iv) Pump House near Proposed Sumpwell Mandhala at coordinates 30°54'40.76"N 76°51'28.97"E. The Proposed site is 13.9 km away from Sukhana Wildlife sanctuary.</p> <p>Pump houses will be constructed on the available vacant government land under the ownership of Revenue Department. The land transfer process to JSV has been initiated There is no requirement of tree cutting as lands are vacant land</p> <p>All the proposed lands are in the proximity and falls in same region, altitude and climatic zone thus they share the Common flora which are Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc</p>	 <p>Site for Pumping Station and WTP Dumanwala</p>  <p>Proposed PH Stage- II</p>  <p>Proposed PH and WTP Site Mandhala</p>  <p>PH Mandhala 2</p>



Infrastructure	Environmental and Social Features	Photos
		 <p>Proposed WTP and PH Amroo Baswani</p>  <p>Proposed PH Stage-I Amroo Baswani</p>  <p>Proposed PH Stage-II Amroo Baswani</p>  <p>Proposed WTP and PH Barotiwalla</p>
<p>Two no. of Main Balancing Reservoir (MBR) are proposed in grid SS-9</p>	<p>MBR Ambroo and MBR Banera are proposed at new locations. Proposed MBRs will be constructed on the available government land under the ownership of Revenue department. The land transfer to JSV has been initiated Tree cuttings will not be required at the proposed locations as it is relatively vacant. The MBRs are proposed at;</p> <p>Both the tanks are of 64 Sqmt. The site is present in an isolated location and devoid of any nearby human settlements. Thus, temporary or permanent Social impacts or Community issues were not observed.</p> <p>i) MBR Amroo at coordinates 31° 2'12.56"N 76°48'38.74"E. The Proposed site is 29.4 km away from Sukhana Wildlife sanctuary. Common flora found in the vicinity is</p>	 <p>Proposed MBR Amroo</p>

Infrastructure	Environmental and Social Features	Photos
	<p>Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p> <p>ii) MBR Banera at coordinates 31° 1'42.23"N 76°48'23.86"E. The Proposed site is 28.8 km away from Sukhana Wildlife sanctuary.</p> <p>Common flora found in the vicinity is Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p> <p>Both the tanks are of 64 Sqmt. The site is present in an isolated location and devoid of any nearby human settlements. Thus, temporary or permanent Social impacts or Community issues were not observed.</p>	 <p>Proposed MBR Banera</p>
<p>Eleven Service Level Reservoirs are proposed in Grid SS-9</p>	<p>Proposed SR Dumanwala, SR Sitalpur, SR Landeywall SR Surajpur and SR Mandhala will be constructed at the same location of the existing SRs</p> <p>The proposed new SRs, SR Damuwala is located at 30°55'13.67"N 76°51'34.36"E. The Proposed site is 26.9 km away from Sukhana Wildlife sanctuary.</p> <p>Common flora found in the vicinity is Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p> <p>SR Kolka is located at 31° 1'39.18"N 76°47'6.79"E. The Proposed site is 28 km away from Sukhana Wildlife sanctuary.</p> <p>Common flora found in the vicinity is Chil, Deodar, Ban, and Kail, silver oak, jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc.</p>	 <p>SR Basolan</p>  <p>SR Dumanwala</p>  <p>SR Jatti Majra</p>



Infrastructure	Environmental and Social Features	Photos
	<p>Proposed SR Bavasni located at 31° 2'13.03"N 76°48'49.19"E. The Proposed site is 28.4 km away from Sukhana Wildlife sanctuary.</p> <p>Proposed SR Amroo is located at 31° 2'17.21"N 76°48'33.56"E. The Proposed site is 30 km away from Sukhana Wildlife sanctuary.</p> <p>SR Basolan is located at 31° 0'57.87"N 76°46'50.43"E. The Proposed site is 28.4 km away from Sukhana Wildlife sanctuary.</p> <p>SR Damuwala is located at 30°55'13.67"N 76°51'34.36"E. The Proposed site is 26.9 km away from Sukhana Wildlife sanctuary.</p> <p>Proposed SR Jatti Majra located at 31° 0'25.43"N 76°46'58.80"E. The Proposed site is 27.3 km away from Sukhana Wildlife sanctuary.</p> <p>Proposed sumpwell stage-1 is located at 31°46'15.78"N 76°31'48.22"E. The Proposed site is 15.3 km away from Chail Wildlife sanctuary.</p> <p>Proposed sumpwell stage-2 is located at 31°46'15.78"N 76°31'48.22"E. The Proposed site is 28 km away from Sukhana sanctuary.</p> <p>Proposed Sumpwell at proposed PH Mandhala is located at 31°46'15.78"N 76°31'48.22"E. The Proposed site is 13.9 km away from Sukhana Wildlife sanctuary.</p> <p>.</p> <p>All the proposed sites are located on government land (revenue) and transfer of land to JSV has been initiated. . Tree cutting will not be required at the proposed locations. In cases where trees are present on the periphery of the sites design adjustment would be done in such a way to avoid tree cutting as land is almost vacant. There are no other nearby premises. The site is present in an isolated location and devoid of any nearby human settlements.</p> <p>Common flora found in the vicinity is Chil, Deodar, Ban, and Kail, silver oak,</p>	 <p>SR Sitalpur</p>  <p>SR Landeywall</p>  <p>SR Mandhala</p>  <p>SR Surajpur</p>  <p>SR Amroo</p>  <p>SR Bavasani</p>

Infrastructure	Environmental and Social Features	Photos
	<p>jhakranda, bottle brush, weeping willows, and common fauna found in the area are jackal, mongoose, the Jangli Billi, monkeys, langurs, jungli murga, kabutar, ghughi, dhaula teetar and kolsa etc</p>	 <p>SR Kolka</p>  <p>SR Damunwal</p>
<p>Gravity mains Rising mains</p>	<p>It was observed during the transect walks along the gravity mains, that there are no premises which are in way of the pipeline alignment. Few agricultural lands and private properties may come along the alignment. The proposed route is free of any encumbrances. The Gravity mains are preferred to be laid along the existing alignments, or along road's and small pathways. However, temporary social issues may arise while laying the pipes going through the agricultural fields and private lands.</p> <p>The private landowners and panchayat members were sensitized about the minor inconveniences in laying of pipelines, during the public consultations conducted. Hence necessary consent of support was obtained from the panchayat offices. Prior intimation will be given at panchayat office by contractor before executing the work. The Contractor shall execute the work during non-harvest season to avoid disruption to agricultural fields. The laying will be carried in a way to avoid tree cutting.</p> <p>Rising mains with a total length of 38.14 KM out of which ~ 13 KM of pipeline is proposed to pass through forest land and proposed diameter varying from 50 mm to 125 mm in Grid SS-9.</p> <p>Gravity main with a total length 7.13 KM with diameter varying from 50 mm to 80 mm is proposed in Grid SS-9. About 3 KM of length of pipe is lying on forest land.</p>	  <p>SS-1</p> <p>:Indicative Alignments of Gravity Main (80-100 mm) and Distribution Network at Market Place near Attri Tent House (50 mm)</p>

Infrastructure	Environmental and Social Features	Photos
Distribution Mains	<p>Distribution Lines will be laid from Service Reservoirs to the respective Land settlement patches. The alignment of distribution lines is such to ensure maximum nearby household connections. Thus, they will be laid in the katcha pathways and streets of the habitations. Hence, temporary social issues may arise while laying the pipes near the houses. The public has been sensitized about the issues faced while laying of pipelines, during public consultations conducted. Since the pipelines will go underground (where possible less likely to impact any household permanently).</p> <p>The Pipes will be laid in a manner so that no cutting of the trees is required. Thus, the public will be intimated prior the implementation period. Contractor shall execute the work during non-harvest season to avoid disruption to agricultural fields if required.</p> <p>Distribution lines with a total length 117.6 KM with diameter varying from 25 mm to 125 mm is proposed in Grid SS-9. About 36 KM of length is lying on forest land.</p>	  <p>Indicative alignments of Distribution Network at Market Place in VillageBanyad(40-65 mm)</p>

## VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### A. Introduction

186. Potential environmental impacts of the proposed infrastructure components are presented in 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.

187. 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 and mitigation is devised for any negative 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&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.

188. 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).

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

190. The ADB Rapid Environmental Assessment Checklists for Water system have been used to screen the project for environmental impacts and to determine the scope of the IEE.

191. In the case of this project (i) most of the individual elements involve straight forward construction and operation, so impacts are mainly localized and not greatly significant; (ii) 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 (iii) being mostly located in an rural area and not falling in any environmentally sensitive zones except in some Forest land will not cause direct impact on biodiversity values. The project properties are held by the local government and access to the project location is through public rights-of-way and existing village roads hence, land acquisition and encroachment on private property will be avoided. However, NOC is required for some identified location from concerned authority.

## 1. Pre-Construction Impacts – Design & Location

192. **Design of the Proposed Components.** Technical design of the (i) source components like intake facilities at river and tube wells etc. (ii) water treatment plants; (iii) raw water and clear water mains (iv) storage reservoirs, and (iv) distribution network, house connections and other items like flow meters, follows the relevant national planning and design guidelines, focusing on providing a robust system which is easy to operate, sustainable, efficient and economically viable. Following environmental considerations are included in the project:

- (i) Discontinuation of current unsafe, inadequate and/or unsustainable sub/surface water sources and creating new comprehensive water supply schemes based on sustainable surface water (river) and/or groundwater
- (ii) Recovering wash water from treatment process to optimise the water use
- (iii) Treatment and reuse of sludge from treatment process
- (iv) Minimizing water losses from pipelines by perfect jointing and alignments using appropriate techniques
- (v) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage
- (vi) Reducing the incidence of water borne diseases by providing 100% population with potable water supplies; regular water quality monitoring
- (vii) Installing the noise-producing pumps and motors etc., in enclosed buildings with noise reducing walls, and also maintaining adequate buffer to the nearby inhabited areas
- (viii) Provision of appropriate personal protection equipment to the workers and staff
- (ix) Improve water use efficiency and reduce water wastage at household level by recording and monitoring the water usage, and charging the consumers as per usage;
- (x) Instrumentation is preferably being incorporated in case of multiple village scheme (Major/Mega schemes) depending upon techno-economic feasibility. For efficient functioning of pipeline system of the project suitable provision shall be made for leak detection as well as swabbing instruments. The automation up to main balancing reservoir shall be provided in lift schemes;
- (xi) Provision of operator rooms and toilet facilities at pump houses is made  
Solar panels for campus lightning and automation components are considered.

193. **Distance from Protected Areas:** Proposed project area mostly comprises of rural habitation areas, agricultural, vacant and barren lands. In Solan district two Wildlife Sanctuaries namely Chail and Majathal are located. Chail Wildlife Sanctuary in Solan district has also been notified as an Eco Sensitive zone. The proposed intake on Giri River at Grid SS-1 is at about 6 km from Chail Wildlife Sanctuary. Proposed SR Bawasni is at an aerial distance of ~31km from Majathal wildlife, Proposed intake structure on Giri river in Grid SS-1 is about 17 km from Churdhar WLS in Sirmaur district and is about 23 km from Shimla water cantonment WLS in Shimla District, The construction of these small components will not have any impact on the protected areas. Aquatic life is observed in Giri river which also act as the breeding and spawning

area of Mahasheer and other aquatic life.

194. There are 92 wetlands in Himachal Pradesh covering 2.25 hectares area, out of which 85 are natural and 7 are man-made which constituted one percent of the total geographical area. Pong Dam Lake, Chandratal and Renuka have been identified as Ramsar sites whereas Rewalsar and Khajiar lakes included by the MOEF & CC under national wetlands for its conservation and management. Nearest proposed component from designated Ramsar site Renukaji lake in Shimla zone, of Package SZ-03 (Solan district) is proposed Intake structure on Giri River in Grid SS 1 which is about 37 KM (areal distance) from Renukaji lake.

195. **Impacts due to location – in Forest land.** Given the large expanse of forest lands in Himachal Pradesh, locating some water supply pipeline in forest lands is unavoidable. However, none of the project components like intake, WTP, and reservoirs are located in forest areas, and there are no notable sensitive environmental features with no tree cover/vegetation. Water pipelines of around 117 km will traverse forest area but mostly along forest trails (walk paths / earthen roads), where there are no notable trees. Forest department has exempted from clearance procedure for laying of drinking water pipelines requiring excavation/trench of less than 1m width and 2 m depth along the roads in forest land. The proposed trench width is 0.6m; hence permission from local forest department will be adequate for pipeline laying (Appendix 7). The pipelines will be laid along the existing roads and within the right of way with no notable tree felling envisaged as per preliminary design. However, it will be finalised during detailed design period and if any tree felling is required, compensatory tree plantation will be carried out in 1:10 ratio. No Protected Forest land needs to be diverted for this subproject.

196. **Location of Tube Wells:** Four proposed tube wells with combined discharge of 24 lps will be installed in Dumanwala, Landeywal, Amroo Bawasni and Mandhala on Revenue lands for which JSV will obtain necessary permissions. The lands are vacant away from human settlements and free from of any encumbrances. Proposed tube well locations are away from houses, shops or any other premises used by people, thus establishing a buffer to reduce the effects of noise, dust and the visual appearance of the site. Only shrubs and bushes are present at sites and therefore no tree cutting will be required during construction of tube well as per preliminary design. No wildlife is reported at the sites. A feasibility study has been conducted

197. **Sensitive project locations.** Subproject components are mostly located in the rural hilly areas of Solan district. About 117 km water supply pipeline will traverse through some forest lands. The clearance of vegetation needs to be minimized, and adequate compensatory tree plantation needs to be taken up. Removal of vegetation and trees shall be minimized by selecting the site appropriately within the campus and minimize tree cutting. Following measures will be adopted.

- (i) Minimize removal of trees, vegetation on hill sites; undertake replantation of the sites as far as possible immediately after the construction;
- (ii) All the cut and open surfaces shall be properly consolidated and protected with surface pitching /grass turfing, etc., as appropriate to avoid any surface erosion in the hill slopes;
- (iii) Conduct census of trees to be removed, obtain permission, and undertake compensatory tree plantation at the rate of 10 trees for 1 tree removed;



- (iv) Avoid removal of trees and vegetation along the roads best pipeline alignments and layout planning of reservoirs and facilities, however, if this cannot be avoided fully, undertake compensatory tree plantation (10 trees to 1 tree removed).

198. **Natural hazards:** Water supply utilities are vulnerable to a variety of hazards including natural disasters such as earthquakes, flooding and landslides. The expected effects of earthquakes, floods and landslide on drinking water systems can be summarized as follows:

- (i) Total or partial destruction of intakes, conveyance structures, treatment facilities, storage, and distribution;
- (ii) Breaks in delivery and distribution pipes and damage in connections between pipes or with tanks, resulting in a loss of water;
- (iii) Interruption of electric power, communications, and access routes;
- (iv) Change in water quality because of landslides;
- (v) Variation (decrease) in the flow of underground or surface collector works;
- (vi) Change in the site of water outlets in springs;
- (vii) Total or partial destruction of intakes located in rivers or ravines;
- (viii) Sedimentation, resulting in silting up of components;
- (ix) Breaks where exposed pipe crosses ravines and/or rivers;
- (x) Contamination of the watershed;
- (xi) Damage to pumping equipment;
- (xii) Total or partial destruction of all installations, in particular intake and distribution structures, located on or in the main path of active slides, especially in unstable mountainous zones with steep slopes or in slopes with steep grades that are susceptible to slides;
- (xiii) Indirect impacts such as the interruption of electrical service, communication or blockage of roads.

199. All structures under the subproject have been designed considering Seismic Zone IV (High damage risk zone). The Zone V & IV mainly covers Himalayan region in India and Himachal Pradesh being a hilly state lies in Himalayan region hence design has been prepared keeping in mind the seismic hazards. The topography of the entire subproject area is hilly. As per local enquiries carried out during field visits, the sites are not prone to flooding. Water Treatment Plants proposed near river is proposed at 600 mm above the high flood level (HFL) of the Khads to mitigate the flooding during rainy/monsoon season. The site selection of construction of structures under the subproject have been done keeping in view the landslide vulnerability. Only the sites which are not vulnerable to landslides have been selected under the subproject.

200. **Water Source Sustainability:** The proposed water sources for project area belonging to Solan package SZ 03 comprises of Tube wells and Giri river. There is a total of five (5) locations where water sources will be tapped in Shimla zone SZ-03. Amongst them, one existing source which will be retained in the proposal.

201. **Source selection criteria** is based on its ability to meet the ultimate year (2042) water demand of its respective command area. The water demand per capita per day is taken as 95 LPCD (70 lpcd plus loss). The population of 2042 of respective command areas has been computed by decadal growth method.

202. Under HPRDWILP, water availability is assessed based on lean season water flow of rivers/streams etc., to account for further fluctuations, as thumb of rule, 70% of the lean period

discharge is calculated and considered as “available discharge” for water supply. This is done to avoid over exploitation and to keep the environmental water flow in the source intact. Then, “Available discharge” is compared against the water demand for the area. If “available discharge” is greater than water demand, then the source is deemed sustainable and considered as project source.

203. This criterion is ensured for both existing and proposed sources used in this project. The JSV has also conducted water testing at sources to determine the suitability of water for potable use. In terms of water availability and quality of water, selected sources are adequate and suitable to meet the project water demand, and there are unlikely to be any issues related source sustainability during the project life cycle.

204. **Methodology of diacharge measurement.** Jal Shakti Vibhag (JSV), Himachal Pradesh has the authority to measure, record and analyse the water discharge in all water bodies in Himachal Pradesh. JSV measure the discharge in surface sources generally by two methods

- (i) **Area velocity method:** This depends on measuring the average velocity of flow and the cross-sectional area of the channel and calculating the flow from equation:  $Q(m^3/s) = (m^2) \times V(m/s)$
- (ii) **V-Notch method:** Triangular weirs are sharp crested thin plates with V-shaped opening (or notch). These plates are installed at the exit of a channel, tank, or basin in order to measure the real-time flow of water. For a given weir profile size and shape, the flow of water is related to the head of water at the weir.

205. V - Notch method is generally used in the water bodies where existing head weir or check dam lies. Whereas for rest of the water bodies Area Velocity method is utilised.

206. For analysing the lean period discharge following timelines are utilised.

- (i) For snow fed sources measurement is done in extreme winter season i.e., December and January
- (ii) For rain fed sources measurement is done in extreme summer season i.e., May and June.

207. JSV has measured the lean period discharge at proposed water supply source locations during the feasibility stage of this project. Based on the analysis of recorded data JSV has issued the discharge certificate.

208. **Groundwater or Sub-surface water as source.** In case of ground water sources, the decision for providing number of tube wells / bore wells well/ infiltration gallery are considered based on availability of 3 phase electricity (in hours per day). To ensure the sustainability of ground water source, long term summer yield test is conducted to access specific yield. Considering summer draw down and accordingly cone of interference spacing between two tube-wells shall invariably preferably be 500 meters. For the selection of proposed ground water sources advance geophysical /resistivity survey technique is adopted for estimation of the yield. If there is presence of percolation well or tube well in the vicinity of the proposed site, then it is a good indication that the surrounding soil has enough porosity and is feasible for tube well. Water quality of the proposed site is judged by the water quality of the nearby source (tubewell or percolation well). No major source of pollution should be present in the upstream of the source, as applicable.



209. As discussed in preceding paragraph, four bore wells are proposed as water source which will serve the entire command area for Grid SS 9. Feasibility reports obtained from the Senior Hydrologist, JSV measuring the potential yield of four bore wells (24 lps) by electrical resistivity method confirms that bore wells are sufficient to meet the water demand of 16.3 lps for the respective command areas till the design year 2042. The stage of ground water development in Solan district has not been calculated by the CGWB due to hilly terrain and localized aquifers. Hence, no area or block in the district has been notified from the groundwater development point of view.

210. The flow measurement certificates of proposed sources measured by JSV and raw water quality reports are enclosed as Appendix 8 and Appendix 9 respectively. Grid wise details of sources proposed water demand and discharge availability are given in Table 24 and discussed below:

- (i) **GRID SS 1** (Source: Proposed intake structure on Giri river) Giri river discharge in lean period is 2340 lps. The water demand of the command area for year 2042 is 17.51 LPS. Giri River has huge water discharge (2320 lps) even during the lean season, while the water demand of Grid SS-1 based on Giri River is 17.5 lps, which is 0.75%. So, no major reduction of flow will happen in the source and there will be no water conflict at downstream of the source, discharge of the percolation well was reported in the feasibility report provided by senior hydrologist based on electric resistivity survey.
- (ii) **GRID SS 9:** There are a total of 5 sources proposed in Grid SS 9 including one existing tube well source.
  - (a) **Source- Proposed Tube well at Dumanwala:** Proposed Tube well at Dumanwala has a potential yield of 8 LPS during lean periods. The water demand of the command area to be catered is 6.1 LPS, the source has enough discharge to meet the water demand of the ultimate design year i.e., 2042, As ground water is utilised under grid SS 9, no conflict will arise with any community. Feasibility report was prepared measuring the potential yield of tube well by senior hydrologist.
  - (b) **Source- Proposed Tube well at Landeywal:** Proposed Tube well at Landeywal has a potential yield of 3 LPS during lean periods. The water demand of the command area to be catered is 1.1 LPS, the source has enough discharge to meet the water demand of the ultimate design year i.e., 2042, As ground water is utilised under grid SS 9, no conflict will arise with any community. Feasibility report was prepared measuring the potential yield of tube well by senior hydrologist
  - (c) **Source- Proposed Tube well at Amroo Bawasni: Proposed Tube well at Amroo Bawasni** has a potential yield of 6 LPS during lean periods. The water demand of the command area to be catered is 3.6 LPS, the source has enough discharge to meet the water demand of the ultimate design year i.e., 2042, As ground water is utilised under grid SS 9, no conflict will arise with any community. Feasibility report was prepared measuring the potential yield of tube well by senior hydrologist
  - (d) **Source- Proposed Tube well at Mandhala:** Proposed Tube well at Mandhala has a potential yield of 7 LPS during lean periods. The water demand of the command area to be catered is 5.5 LPS, the source has enough discharge to meet the water demand of the ultimate design year i.e., 2042, As ground water is utilised under grid SS 9, no conflict will

arise with any community. Feasibility report was prepared measuring the potential yield of tube well by senior hydrologist

- (e) **Source- Existing Tube well at Barotiwala:** Existing Tube well at Barotiwala has a lean period discharge of 17.5 LPS. The water demand of the command area to be catered is 2.42 LPS, the source has enough discharge to meet the water demand of the ultimate design year i.e., 2042, As ground water is utilised under grid SS 9, no conflict will arise with any community. Discharge Certificate was prepared measuring the lean period discharge of tube well.

211. All sources are duly selected keeping in mind the downstream conditions and water requirement. upto Two kilometres downstream of the sources, it was observed that there will not be any significant water reduction that will impact the users downstream. Source like Giri river has huge water discharge and in this proposal less than 1% of that discharge (lean period) is extracting to serve a particular command area or scheme (Table 26). In other seasons, water abstraction will even be very minimal or negligible. There are no notable water abstraction points in the downstream, and moreover many streams are joined with it in both upstream and downstream. Therefore, no notable downstream impacts or user conflicts envisaged.

212. Thus, as presented above, in terms of water availability and quality of water, selected sources are adequate and suitable to meet the project water demand, and there are unlikely to be any issues related source sustainability during the project life cycle. Considering water demand 95 LPCD (70 lpcd to customer end) total water demand for the ultimate year 2042 will be approximately 36.23 lps .The present lean period water discharge available from all the proposed sources is 2382 lps as mentioned in Table 26., Hence it can be concluded that the proposed sources are capable to meet projected demand and sustainable for this water supply scheme and can provide water to till ultimate design year (2042) and only 1.61% of lean period water will be abstracted. Water quality test reports recommends that the available water is fit for the human consumption and fulfil the standards mentioned in BIS 10500. Raw water quality is good given that there are no notable pollution sources. However, care must be taken to not to locate intake in the downstream of wastewater outfalls from villages / towns, either treated or untreated discharges, if any. Raw water quality shall be carefully analyzed and appropriate design and monitoring measures shall be put in place to ensure that water supply to consumers always meet the drinking water standards.

**Table 26: Details of Sources, Yield and Water Demand for the Year 2042**

Grid	Source Type	Yield (LPS)	Water Demand (LPS) for 2042	% of Water Abstraction
SS1	Proposed intake structure at Giri River	2340	17.51	0.75
SS 9	Proposed Tube well at Dumanwala	8	6.1	76.25
	Proposed Tube well at Landeywal	3	1.1	36.67
	Proposed Tube well at Amroo	6	3.6	60.00
	Proposed Tube well at Mandhala	7	5.5	78.57
	Existing Tube well at Barotiwala	17.5	2.42	14.57
	<b>Total</b>	<b>2381.5</b>	<b>36.23</b>	<b>1.61</b>

213. Given the climate change effects, the rainfall is becoming more erratic and unpredictable, combined with increasing frequency of extreme weather events. The project should therefore account for these. to ensure groundwater sustainability, the following measures should therefore be implemented during the implementation:

- (i) Prepare a groundwater harvesting and artificial recharge plan;
- (ii) Creation of artificial recharge pits in public places / public buildings. Local body can issue a notification to this effect.
- (iii) Household level artificial recharge (like roof top rainwater harvesting) should be encouraged.
- (iv) Groundwater regulation – options to close / discontinue all the tube wells in houses used for domestic purposes in service area in a phased manner once the project is implemented.

214. **Biodiversity assessment and impacts on aquatic life.** A biodiversity assessment report has been prepared for the sub project which includes critical habitat assessments, biodiversity and impacts and mitigation measures. This biodiversity report is attached in Appendix 6B

215. A habitat analysis carried out for the Critically Endangered (CR) and Endangered species (22 species of threatened category and 4 restricted range species) reported in the project area of influence (50 km) shows that it is likely that these identified in IBAT are mostly located inside the ecological areas and not within the project area of influence (PAI). Except Tor Putitora, which is reported in Giri river and its tributary streams in the Solan district, none of the species qualify the Project area as Critical Habitat. Tor Putitora species presence has been mapped from Kargnoo to Sataun of approximately. 70 km section of Giri River in Solan and Sirmaur district. It is possible the species actually occurs in the Project area. Thus, this species is likely to qualify the Project area as Critical Habitat.

216. From an aquatic perspective, the Project area falls within the Ganges-Himalayan Foothill freshwater ecoregion (Abell et al. 2008). As with terrestrial species, it is an area of very high aquatic species richness and was believed to be an area of only moderate aquatic species endemism. It is with 11 fish species endemic to the region though the distribution of species in the region remains too poorly understood to have high confidence in this. For aquatic species, freshwater habitat is the most important parameter to consider in the selection of an ecologically

contiguous area. The Giri River is the primary river in the catchment where the subproject infrastructure will be located. It originates at Khada Pathar (100km upstream) of proposed intake and merges with the Jamuna river at Ponta Sahib (60 km downstream). Ashwani khad in upstream and Khwal Khad in the downstream merges in Giri river near the proposed source. Many small nallahs/springs also join the Giri river. A dam at Renuka Ji was built on Giri river, at 40km downstream of proposed intake location, for hydropower generation.

217. In Himachal Pradesh 61 species of fish observed, belongs into 13 families<sup>10</sup> in general waters and trout waters, with estimated length of 600 and 2400 kms; respectively. The major fishes available in these streams are Trout, Mahseer (*Tor putitora*), *Nemacheilus* spp, *Barilus* sp, *Schizothoracids* *Crossocheilus* sp. *Glyptothorax* spp. etc. Rainbow trout and Mahaseer are the important fishes in Himachal Pradesh. The trout being the focal fish, the seed of brown and rainbow trout used to be produced in three trout farms located at Chirgoan, Mahli/ Patlikuhl and Barot. Beas River and its tributaries in the Kullu valley is habitat for both brown and rainbow trout, while many rivers and streams in the Kangra valley are well-known for Mahseer.

218. Mahseer is distributed all along the Himalayas<sup>11</sup> including the freshwaters of Kashmir, Sikkim, Himachal Pradesh, Uttar Pradesh, Punjab, Haryana, Darjeeling district of West Bengal and Assam. It inhabits the mountains and sub mountains regions, running streams and rivers. The fish species is present in around 500 km area of Himachal Pradesh state. The rivers Beas and Satluj in Himachal Pradesh like other Himalayan rivers supports a good population of *T. putitora*. The various tributaries of Beas river<sup>12</sup> in downstream stretch of Pandoh dam have been identified as spawning grounds of *T. putitora* (Golden Mahseer). Baner stream is one of the spawning ground of Golden Mahseer. Uhl is one of the largest tributary of Beas is known as a temple sanctuary of fish and population of Golden mahseer is known to occur in this lake and is considered to be spawning ground of Golden mahseer. The state has recorded highest 45.311 MT Mahseer catches during year 2019-20. The production is mainly from water reservoir named Gobind Sagar, Koldam, Pong Dam<sup>13</sup> and Ranjeet Sagar water. The state has Golden Mahseer fish eggs production<sup>14</sup> of 20900, 28700 and 41450 during year 2017-18, 2018-19 and year 2019-20; respectively.

219. The fish species population data is not available for individual river system. However, as per the consultation with fishery department and local community the fish species has been recorded from Giri river course and is a potential habitat for the fish species of Mahseer. Mahseer lives and grows to maturity in large rivers, migrate to headwater, stream, creeks to spawn during the wet season from May to September. The fish species ascend streams to breed over gravel and stones and returns to perennial ponds after breeding. A mature mahseer produces 45,800 to 75,000 eggs and are reported to deposit their spawn<sup>15</sup> in several batches in a period of several months. They forage in large groups over open gravel bed and their profound habitat are snowfed or rainfed running water broken into pools and rapids with moderate depth of water.

<sup>10</sup> Fish Fauna of Himachal Pradesh: A Case Study, Department of Zoology, (Aquaculture Laboratory), Shri Shivaji College, Parbhani, July 2013

<sup>11</sup> Day 1873 and Sen and Jayaram, 1982

<sup>12</sup> Cumulative Impact & Carrying Capacity Study (CIA&CCS) of Beas Sub Basin In Himachal Pradesh, January 2019 by R. S. Envirolink Technologies Pvt. Ltd.

<sup>13</sup> The endangered species found abundantly in the state and contributes about 10-15 percent of total catch in the state reservoirs especially in Pong reservoir.

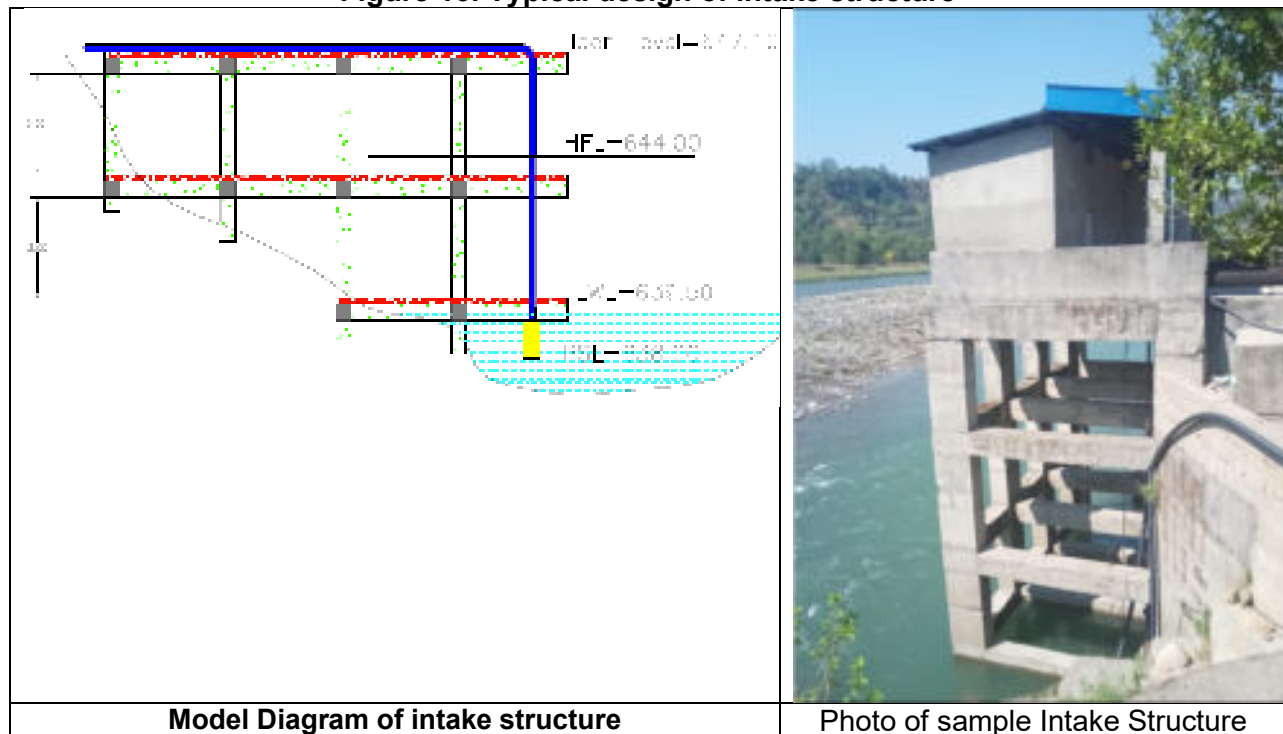
<sup>14</sup> Efforts of State Government succeed in saving Golden Mahseer from brink of extinction, December 2020

<sup>15</sup> Beavan, 1877

220. The possible extended habitat for the fish species (*Tor putitora*) is in subproject component area. The fish species population data is not available for individual river system. However, as per investigations in Giri River reveals that the population of the Golden Mahseer contributes significantly to the fishery in the river and it comprises 37-40% of the total catch. Further, as per the consultation with fishery department and local community, GiriPul a location on 2km upstream of subproject component is a recognized breeding ground for the fish species of Golden Masheer (*Tor putitora*).

221. *Tor putitora* fish species have good food value and medium in size and likely targets for fishing by construction workers, meaning that potential impact (before mitigation) is considered of Low Significance. The construction work will involve small intake structure (RCC open frame) on the bank which is supported by 2-4 support columns in river bed just adjacent to the bank. The water will be drawn via a intake pipe and submersible pump suspended to the open frame. Casting of footing/columnn for the intake structure in water on the riverbank will cause disturbance to fish species at the proposed location and upto 2m radius. The water will draw through submersible pump from Giri River. The noise from submersible pump and change in pressure of water flow upto 2m radius due to intake operation are potential impacts during operational stage. On this basis, the potential construction work and noise from induced fish mortality is considered of Medium Significance.

**Figure 16: Typical design of intake structure**



222. Small intake chamber construction work and operation of water intake from river have potential for significant disturbance impacts on aquatic species. On this basis, the potential *construction noise-induced fish mortality is considered of Medium Significance.*

223. Following measures are suggested to minimize, mitigate biodiversity impacts.

- (i) Use only existing licensed quarries outside of rivers and streams for sourcing aggregates.
- (ii) Avoid borrow pits in areas of Natural Habitat and within 200 m of waterways.
- (iii) Avoid introduction of new invasive species to, and spread of existing invasive species within, the subproject area through:
- (iv) barricade the construction site with controlled entry and exit from construction workers
- (v) washing of vehicles, equipment and supplies before entry to the Project area;
- (vi) monitoring for invasive species; and
- (vii) control/eradication of invasive species where found.
- (viii) Prohibit cleaning of construction vehicles/equipment within 300 m of waterways/drains.
- (ix) Maintain natural courses of rivers and streams.
- (x) Restrict intake well construction works to the dry season or lean season in order to limit hydrological changes, erosion and runoff from construction sites.
- (xi) Restore temporary diversions to their natural courses as soon as possible, if put any.
- (xii) Restrict construction works to the dry season or lean season in order to limit hydrological changes, erosion and runoff from construction sites.
- (xiii) Store chemicals and oils in secure, impermeable containers.
- (xiv) Equip construction camps with sanitary latrines that do not pollute surface waters.
- (xv) Prohibit siting of construction camps and disposal of construction waste within 500 m of waterways.
- (xvi) Store chemicals and oils in secure, impermeable containers.
- (xvii) Prohibit cleaning of construction vehicles/equipment within 300 m of waterways/drains.
- (xviii) Restrict construction works to the dry season in order to limit hydrological changes, erosion and runoff from construction areas.
- (xix) Avoid piling and blasting during construction.
- (xx) Install low noise pump set and proper maintenance to avoid excessive noise generation.
- (xxi) Install mechanical barrier/screen for fish in water at tapping point
- (xxii) Restrict construction works to the dry season.
- (xxiii) Avoid piling and blasting during construction.
- (xxiv) Install screen to barricade construction site in water
- (xxv) Installation of mechanical barrier for fish species at tapping point
- (xxvi) Engage an aquatic fauna/fisheries expert during the detailed design phase to design
  - design the intake screen in Giri river to avoid entry of fish into pipe
  - design proposed pumping equipment near Giri river in SS 1 Grid with minimal noise levels
- (xxvii) Prohibit hunting and fishing of endangered fish species by staff and contractor, with heavy penalties applied.
- (xxviii) Train staff and contractor in good environmental practice and prohibited activities.
- (xxix) Ensure contractors supply all necessary food, cooking fuel and appropriate housing

224. The field assessment as part of IEE report preparation, as per the consultation with fishery department and local community, Giri Pul a location on 2 km upstream of subproject component is a recognized breeding ground for the fish species including of Golden Masheer (*Tor putitora*). The Director, Fisheries department, Solan has issued a certificate (Appendix 6C) citing that since the water requirement of the proposed scheme of Grid SS1 is only 11.5 LPS whereas the flow of the Giri river during the lean period is 2320 LPS which is more than sufficient for fish breeding. Thus, there will be no hindrance due to construction of above scheme as far as fish breeding is concerned and Fisheries department has no objection this regard.

225. **Use of Chlorine as Disinfectant.** Vacuum gaseous chlorination is proposed at all locations of water treatment plant. Vacuum operated pressure feed gaseous chlorinator of Chloromax for chlorination of water is proposed by directly feeding chlorine gas to the water mains. Components provided in the Chlorination system are:

- (i) Chlorinator capable to deliver 0-1000 gm/hr of chlorine gas comprising of spring opposed inlet valve, rate valve, flow meter remote ejector assembly with built in check valve, vacuum tubing, vent tubing and injection assembly.
- (ii) Booster pump set of 2 No: 1W+ 1S with electric motor of make Crompton/ Kirloskar/ ABB operated on 400/440-volt, 3 phase 50hz electric supply to suit ejector assembly of chlorinator, mounted on common base frame.
- (iii) Water piping from water main/UGR Set of 2 No: 1W+ 1S to booster pump and delivery of water to ejector through 20mm CPVC pipe complete with all fitting such as 20 mm inlet gate valve, 20mm delivery valve, Y type strainer and solution delivery piping 20mm heavy duty PVC plumbing pipe such 80 up to injection point before ejector assy/piping up to delivery mains. Total piping not exceeding 24 m.
- (iv) Multi-purpose cylinder Key-1 No. lead washers-6 Nos. Ejector gasket- 2 sets. Hose clips- 4 Nos. Ammonia Bottle – 50ml -1 No.
- (v) Four nos. of chlorine cylinders: Chlorine gas cylinders 100 kg capacity as per BIS duly certified by CCE Nagpur and filled with Chlorine gas.
- (vi) Chlorine Leak Detector with sensor and alarm.
- (vii) Electric Panel for booster pumps & leak detector.

226. To avoid any risk to workers and public, the chlorination facility at the WTP should be designed developed with all appropriate safety features and equipment to meet with any accidental eventuality, which may include:

- (i) Chlorine neutralization pit with a lime slurry feeder
- (ii) Chlorine absorption and neutralization facility
- (iii) Proper ventilation, lighting, entry and exit facilities
- (iv) Visible and audible alarm facilities to alert chlorine gas leak
- (v) Facility for isolation in the event of major chlorine leakage
- (vi) Eye wash & shower facility
- (vii) Personal protection and safety equipment for the operators in the chlorine plant (masks, oxygen cylinders, gloves, etc.,)
- (viii) Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier

- (ix) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Hindi Languages

227. **Energy Efficiency.** Owing to hilly topography of the project area, the water supply schemes require pumping (using the electrical energy) to lift the water at various stages coupled with the use of gravity system to obtain the requisite terminal pressure to reach the consumers.

228. To optimize the power consumption, the hydraulic design shall follow optimal approach, and the following shall also consider in design and selection of pumping systems. According to Manual for the Development of Municipal Energy Efficiency Projects in India (jointly developed by Bureau of Energy Efficiency (BEE) and International Finance Corporation in 2008), energy savings, at minimum, of 25% to 40% is possible with appropriate measures. The following measures shall be considered and incorporated into the subproject designs:

- (i) Installation of Energy Efficient Motors
- (ii) Efficient Pumping system operation
- (iii) Installation of Variable Frequency Drives (VFDs)

229. **Wastewater & Sludge from WTP - Treatment and disposal.** Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. Following are included in the subproject design to dispose the sludge and back wash:

230. **Provision of recirculation system for backwash water** - backwash water from filter beds will be re circulated to WTP inlet and mixed with raw water; this arrangement will minimize wastage of water, which otherwise would have disposed to open drains, and avoids the pollution of receiving water body. Since backwash water is recovered and recirculated in the WTP, no wastewater will be generated from water treatment process. Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. In the WTP sludge will collected, thickened and disposed of or reused as soil conditioner. Sludge will be tested periodically for heavy metal concentration.

(i)

231. **Provision of sludge drying** - accumulated sludge from clarriflocculator will be flushed to sludge drying beds, for natural drying.

232. **Dried sludge will be used as soil conditioner.** Largest water treatment plant proposed in the Shimla Package SZ03 in Solan district is of 2300 KLD at Dharol - Sunaradi Anji in Grid SS-1. It is estimated based on the source water quality that 0.15 Kg of sludge is expected to be generated per day. As per the water quality report received the source turbidity in the raw water is 0.3 NTU. The sludge generated will be dried in the sludge drying beds for use as manure in green area within the WTP complex. Therefore, no additional land will be required for sludge disposal. During detailed design phase an inventory of requirement for use of sludge in locally in gardening / horticulture / agriculture will be carried out. 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 will 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 Municipal Solid Waste Rules 2016, shall be adopted.

**233. Groundwater Quality.** The DBO contractor must ensure that supplied water to the household meets the drinking water standards as per BIS 10500 (2012) and if any additional / specific treatment (such as defluorination or softening) required, it must be included in the treatment process. A source protection plan shall be prepared to avoid source contamination at tube wells.

- (i) Prepare a source protection plan for tube 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) A cement seal between ground level and 5 m below land surface may be provided to avoid surface contamination to the ground water.
- (vi) The tube well should be developed with air compressor followed by pump till the water becomes sand / silt free.
- (vii) Awareness programs shall be conducted regarding the sanitation practices and its effect on groundwater quality

**234. Social and Cultural Resources.** There are no notable or significant archeological places or 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 the below 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 Archaeological 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 10).

**235. Tree cutting at selected project sites.** None of the sites are located in forest lands except pipelines, which are mostly along forest trails and/or earthen roads. No notable tree cutting envisaged. However, at few locations some trees and bushes may be required to be cleared for construction activity as described in Table 14. Following measures will be implemented to compensate for the loss of tree cover.

- (i) Minimize removal of trees by adopting to site condition and with appropriate component laying layout design.
- (ii) Obtain prior permission for tree cutting
- (iii) Plant and maintain 10 trees for each tree that is removed

**236. Development of WTP site:** All the 6 proposed WTPs are located on government land. The topography of these sites is undulating. As per local enquiries carried out during field visits, the sites are prone to flooding. Water Treatment Plant in Grid SS-1 is proposed near the river, and it is proposed 600mm above the high flood level of the river.

237. **Development of Intake site:** Construction of RCC open frame intake structure at river Giri located on Government land is proposed. Water withdrawal is proposed via an intake pipe extended into water. There is an existing intake structure 3 km upstream of the proposed location. of intake structure and there are no head weirs or check dams on Giri river within 2 km in both upstream and downstream.

238. The proposed intake structure will not result in any major reduction in downstream flow due to abstraction (especially during lean season) as the demand is less than the lean period discharge of river. River is perennial and both snow fed and rain fed. Many springs and nallahs merge in the upstream of the river. The water withdrawal will be limited to the tune of 0.75% of the total discharge of Giri river (2340 lps). It can be concluded that even after the abstraction of the water for meeting the demand there will be enough water available in the river for downstream users. There will be no water use conflicts as the areas in the downstream are served by other sources.

239. **Social and Cultural Resources.** There are no notable or significant archaeological places or protected monuments or areas in and around project area. Therefore, no impacts envisaged but risk of uncovering archaeological remains, given the long history of town, during the excavations cannot be ruled out completely. Construction contractors therefore should follow the below 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 Archaeological 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 10).

240. **Environmental Audit of Existing Water Supply Infrastructure.** It is proposed to utilize existing water supply infrastructure like Main Balancing Reservoirs (MBR), overhead tanks (OHTs), Service Level Reservoirs (SR) and pump houses etc. with necessary improvements. As per the ADB SPS 2009, these are associated facilities and therefore the component operation shall comply with the ADB and applicable environmental laws of India. Besides, ADB SPS lays emphasis on impacts and risks on biodiversity and natural resources, pollution prevention abatement including hazardous waste, occupational health and safety, community health and safety, and physical cultural resources. A random environmental audit is conducted to (i) assess the compliance of the existing infrastructure with environmental legislations and (ii) improve environmental performance to minimize future potential liabilities. A more detailed environmental audit and risk assessment shall be carried out during detailed design stage and incorporated into the final IEE.

241. The proposed water supply subproject area is a rural area and there is no involvement of Protected forest land except water supply pipe laying which is permitted in Himachal Pradesh. There are no protected or sensitive environmental areas such as wildlife sanctuaries, wetlands or archeologically protected areas. Therefore, there are no risks or impacts on biodiversity and natural resources. There are no AC pipes in the existing facilities which may create hazardous conditions for the workers and surrounding community. Besides, the generation and disposal of debris and discarded materials, and construction phase health and safety need to be considered and mitigated to comply with the SPS provisions. Following Table 27 provides component wise compliances and concerns. Corrective actions for the identified environmental

concerns are discussed in the following section.

**Table 27: Environmental Audit of Existing Facilities**

Infrastructure	Details	Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns
<b>Service Level Reservoirs</b>	<p>The following existing structures are to be repaired / rehabilitated:</p> <p><u>Grid SS9</u></p> <p>Existing SR Barotiwala 1,2 (Staging 20m) - 504 KL</p>	<ul style="list-style-type: none"> <li>▪ <b>Retrofitting of existing Service Level Reservoirs including Boundary Wall and Approach Road</b></li> <li>▪ Civil repairs, rehabilitation, and construction of replacement of pipes, connections, electrical and mechanicals parts as required</li> <li>▪ Cleaning of OHT/SR</li> </ul>	<p>No requirements under existing laws</p>	<p>There are no asbestos containing materials / pipes in existing connections</p> <p>Occupational health and safety, public safety during the construction works</p> <p>Disposal of discarded material, debris</p>
<b>Main Balancing Reservoir</b>	<p>The following existing structures are to be repaired / rehabilitated:</p> <p><u>Grid SS1</u></p> <p>Existing MBR Moti Kona (Staging 20m) - 60 KL</p>	<ul style="list-style-type: none"> <li>▪ Retrofitting of existing Main Balancing Reservoirs including Boundary Wall and Approach Road</li> <li>▪ Civil repairs, rehabilitation, and construction of replacement of pipes, connections, electrical and mechanicals parts as required</li> <li>▪ Cleaning of MBR</li> </ul>	<p>No requirements under existing laws</p>	<p>There are no asbestos containing materials / pipes in existing connections</p> <p>Occupational health and safety, public safety during the construction works.</p> <p>Disposal of discarded material, debris</p>
<b>Pump Houses</b>	<p><u>Grid SS 9</u></p> <p>PH near proposed WTP Barotiwala- 63.15 sqmt</p>	<ul style="list-style-type: none"> <li>▪ Replacement of pumps, motors Civil repairs and rehabilitation,</li> <li>▪ Replacement of pipes, connections, electrical and mechanicals parts as required</li> </ul>	<p>No requirements under existing laws</p>	<p>Spillage of oils, lubricants etc., Occupational health and safety, public safety during the construction works</p> <p>Disposal of discarded</p>

Infrastructure	Details	Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns
				material, waste oils, mechanical and electrical parts, debris
<b>Transmission and Distribution Network</b>	<p>Currently, there is about 14.1 km existing Gravity Mains and 86.8 km distribution network consists of GI pipes in water supply in 2 grids of Package SZ03 but its pipeline network is more than 25 years old and most of the existing pipes cannot be used in proposal as there condition is bad. There are no asbestos cement (AC) pipes in the existing system.</p> <p>Distribution network which consists of bulk water lines from SR to inhabited land parcels are under stress due to the increased water demand and to meet the low-pressure heads at household levels. Also, new land pockets have been inhabited within the command area which were earlier completely vacant lands, necessitating the need to replace the bulk water lines from SRs to villages to the farthest extent of the village or habitation.</p>	<p>In the entire project area, 186 km new water pipelines will be laid, and new house service connections will be provided from the newly laid main.</p> <p>Most of the existing pipelines shall be left buried as it is.</p> <p>If the existing water pipes are in the same lining of new water supply pipes, the contractor through a detailed survey will establish the requirement of old pipes removal for giving way to new pipelines.</p> <p>Those pipes shall be removed and disposed in a controlled manner so as not to harm the environment.</p>	No requirements under existing laws	<p>There are no AC pipes in the existing transmission and distribution networks</p> <p>Accidental disturbance / need to remove in narrow roads</p> <p>Occupational health and safety, public safety during trenching</p> <p>Disposal of old pipes / debris</p>

242. **Corrective Measures.** As presented in the above table, there are no regulatory non-compliance issues in the existing infrastructure. The environmental concerns are mainly related to occupational health and safety, public safety; disposal of debris, discarded materials etc., A work specific environmental management plan needs to be prepared for these aspects. The exact nature of rehabilitation and repair works will be known only during the detailed design phase as the detailed technical audit will be conducted by the DBO contractor and the required rehabilitation and repair measures, and corrective measures if any will be proposed accordingly.

## 1. Pre-Construction Impacts

243. **Utilities.** Telephone lines, electric poles and wires, water lines within the proposed project locations may require to be shifted in few cases. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with JSV will (i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; (ii) Inform in advance local residents and businesses of any utility shifting and the possibility of unscheduled interruption and (iii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

244. **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, or in areas which will inconvenience the community.

245. 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 is to be prepared by DBO contractor prior to start of construction and approved by PIU. 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 for beneficial 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 narrow and heavy traffic routes and important religious or tourist sites

246. **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 assessed by PIU. Priority would be sites already permitted by the Geological Wing of Industries department, Himachal Pradesh after obtaining Environmental clearance from MOEF&CC. If new sites are necessary, these should be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of Department of Industries and local revenue administration. If additional quarries will be required after construction is started, then the construction contractor shall use the above-mentioned criteria to select new quarry sites, with written approval of PIU.

## 2. Construction Impacts

247. Main civil works in the subproject include construction of (i) Source structures -1 Intake

structure and 4 Tube wells (ii) 6 water treatment plants, (iii) 11 pumping stations, (iv) 9 Main Balancing Reservoirs and (v) 21 Service Reservoirs at the identified sites. These works 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, as many of the subproject components will be fixed to concrete plinths and most will be housed in buildings with at least some concrete structural elements. 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. Some components of may comprise a variety of prefabricated elements which will be are installed on site as ready-made individual units. These will be directly 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. Since these works are confined to the boundary of identified sites, there is no direct or significant interference of construction work with the surrounding land use. 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. It may be noted that due to hilly terrain, some sites are not accessible by motorable roads, and in such cases, material will be transported manually, and work will be conducted with minimal tools and mostly manually. During the construction phase of pipeline, impacts arise from the invasive nature of excavation and trenching work mostly along the roads. However as most of the individual elements are relatively small and involve straightforward construction, the potential environmental impacts (i) will be mainly localized, temporary and not greatly significant; (ii) will not cause direct impact on biodiversity values and (iii) are common impacts of construction, and there are well-developed methods for their mitigation. Given the hilly terrain, cuts and fills can promote instability and erosion although proposed excavation will not be significant, necessary measures will be put in place to avoid construction during rains, and cuts, fills and sloped surfaces in construction sites will be properly stabilized to avoid erosion. Site clearance will be strictly confined to actual work area, no clearance of topsoil or vegetation will be done outside the site. Temporary containment drains, silt fences will be used to contain silt laden run off from sites. Various measures will be put in place for work in forest lands during pipe laying to avoid any impacts or damage / disturbance to flora and fauna.

248. Since these works are confined to the boundary of identified sites, there is no direct 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 negative impacts, which needs to be avoided or mitigated properly.

249. Subproject also includes laying of approximately 72.54 km pumping main, about 49.13 km long gravity mains and about 186 km long distribution mains. it is proposed to lay the pipelines mostly along the existing pipeline alignments and at certain places along the roads which carry traffic, and along the Katcha path. It is proposed that the pipelines will be laid by open cut method along most of the alignment, however, the pipe which is proposed to be laid along the Khads provision of anchor blocks is considered to ensure safety of the pipelines. Due precaution would be taken while laying the pipelines along the busy roads to minimise public inconvenience and to avoid road closures and traffic disruptions, other important issues such as safety, and blocking access to properties, business and houses will also be considered.

250. Road network in the subproject area are classified as National highways, State Highways, Major district roads, other district roads, village roads and katcha path in case habitations. As per the indicative alignment, pipelines will primarily traverse one National highway, NH-205 and one State highway, SH 16, at various locations which will be further assessed during the time of DMS

251. **Open cut trenching method** of pipe laying involves excavation for laying pipes along the roads, placing pipes in the trench, jointing and testing, and refilling with the excavated soil. The trenches will be of 0.6m – 0.65 m wide and 0.7 to 0.75 m depth. Earth work excavation will be undertaken by machine (backhoe excavator) and include danger lighting and using sight rails and barricades at every 100 m., while pipe laying works will include laying pipes at required gradient, fixing collars, elbows, tees, bends and other fittings including conveying the material to work spot and testing for water tightness. Enough 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. As trenches are 0.7 to 0.75m deep, there is risk of collapse of trenches or damage to surrounding buildings. Necessary precautions such as bracing or shoring in the trench will be provided. Once they are laid, pipes will be joined as per specification and then tested for any cracks or 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. About 95% of the excavated soil will be used for refilling the trench after placing the pipe and therefore residual soil after pipe laying and refilling is not significant.

252. 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 villages/towns 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 mitigation measures to limit the impacts to acceptable levels. Physical impacts will be reduced by the method of working and scheduling of work.

253. Anticipated impacts during the construction phase are discussed below along with appropriate mitigation measures to avoid, minimize or mitigate those impacts to acceptable levels.

254. **Sources of Materials.** Significant amount of sand and coarse aggregate will be required for this project, which will be sourced from only licensed quarries as per JSVs policy. Quarries inevitably cause extensive physical changes; as construction materials are excavated from the ground, leaving large cavities, or levelling hillsides, etc. The physical damage caused by quarries is controlled by allowing them to operate within specific limited areas only, so the damage is restricted in extent and not allowed to spread indiscriminately. New quarries are subject to a rigorous process of environmental assessment to ensure appropriate siting and adequate environmental controls on the operation. It will therefore be important to ensure that construction materials for this project are obtained from government approved licensed quarries only, to ensure these controls are in place. Contractor should avoid new borrow pits / quarries as far as possible, if necessary, all the permissions, including conduct of environmental assessment, and environmental clearance as necessary shall be obtained prior to start of quarrying activity. The contractor should also make a concerted effort to re-use as much excavated material from this project as possible. The construction contractor will be required to:



- (i) Obtain construction materials only from government approved quarries with prior approval of PIU;
- (ii) PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval;
- (iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each source (quarry/ borrow pit);
- (iv) Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including Environmental Clearance prior to approval by PIU.

255. **Air Quality.** Laying of transmission & distribution pipes, construction of storage reservoirs, construction of WTPs, drilling of tube well, and pump house building along with generator & guard houses, and transport & installation of pumps are the major construction activities of the project. Most of the works do not involve heavy machines except in constructing deep tube well which will produce some extent of noise for a certain period of time. There will be some activities such as transportation, loading/unloading of construction materials viz. sand and aggregates, stockpiling of construction waste and construction materials and earthworks. These will cause effect into air quality due to dust generation and vehicular emission as well as noise pollution. Use of power horns and movement of heavy vehicles can cause a serious disturbance to the community, educational institutes, hospitals/health centers and residences etc.

256. Also, emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality. Anticipated impacts include dust and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulphur oxides, particulate matter, nitrous oxides, and hydrocarbons. Dust generation from construction work in individual and confined work sites like WTP, pumping station, reservoirs etc., will be mainly during the initial construction phase of earth work. As the site is confined, dust can be effectively controlled with common measures. Dust generation will be significant during pipeline laying along the roads. Increase in dust/ particulate matter in ambient air is detrimental and may have adverse impacts on people and environment. There will be greater impact on air quality from the inadequately managed or haphazard project activities that includes burning of firewood for cooking & heating in work and labour camps and open burning of solid waste by workers. 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. contractor's vehicles and equipment should compulsorily have PUC and submit PUC to PIU before deployment at site
- (vii) Limit idling of vehicles on the construction sites to 3-5 minutes
- (viii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers etc. if specifically established for this project.
- (ix) 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 HPSPCB 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

- (x) Strict Prohibition of open burning of solid waste
- (xi) Regular inspection & maintenance of construction/transportation vehicles • Supply of clean cooking fuel to workers instead of allowing them to use firewood for cooking
- (xii) Conduct ambient air quality monitoring periodically as per Environmental Management Plan (EMP)

257. **Surface Water Quality.** Run-off from stockpiled materials and chemicals from fuels and lubricants during construction works can contaminate downstream surface water quality of the streams. Project area is hilly / undulating and receives considerable rainfall, although mostly confined during the monsoon months. The WTP sites are located close to the raw water source. It is important that runoff from the construction areas, which may contain silt and chemical traces do not enter these water bodies. Impact will be temporary, and may not be significant, but needs to be mitigated. Construction contractor will be required to:

- (i) Prepare and implement a spoils management plan (Appendix 11);
- (ii) All earthworks be conducted during the dry season to prevent the problem of soil run-off during monsoon season;
- (iii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (iv) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;
- (v) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (vi) As far as possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it
- (vii) 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.
- (viii) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (ix) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling
- (x) Dispose any wastes generated by construction activities in designated sites; and
- (xi) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

258. **Groundwater Quality.** Groundwater is proposed as source of water supply at five locations in Grid SS 9. 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<sup>3</sup>/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.

259. The project area is in Solan district which is categorized as “non-regulated zone” as per CGWB. Thus, leaving a large scope for further development of the resource for domestic,

industrial, agricultural and other uses. However, this large scope may give rise to over exploitation of the resources, in case its development is not planned properly in a scientific way.

260. In addition, construction waste, if left unattended, may 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

261. Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. In the project area, groundwater depth is shallow, there are numerous water bodies and streams, and it also receives high rainfall during the monsoon. Conducting excavation works during non-monsoon season will certainly help, but due to high water table, water may collect in pits as they are excavated. The water collected in excavated pits will contain silt and disposal of this in drainage channels lead to silting. To avoid this the contractor needs to be implement the following measures:

- (i) Create a temporary drainage channel around the work area to arrest the entry of runoff from upper areas into the work area;
- (ii) Pump out the water collected in the pits / excavations to a temporary sedimentation pond; dispose of only clarified water into drainage channels/streams after sedimentation in the temporary ponds;
- (iii) Consider safety aspects related to pit collapse due to accumulation of water.
- (iv) Prepare and implement a spoils management plan (Appendix 14);
- (v) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (vi) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas;
- (vii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (viii) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (ix) Dispose any wastes generated by construction activities in designated sites; and
- (x) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

**262. Generation of Construction Wastes.** Solid wastes generated from the construction activities are excess excavated earth (spoils), discarded construction materials, cement bags, wood, steel, oils, fuels and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odour and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

- (i) Prepare and implement a Construction Waste Management Plan;
- (ii) As far as possible utilize the debris and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc.;
- (iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated
- (iv) soils should be disposed of to approved designated areas immediately;
- (v) If disposal is required, the site shall be selected preferably from barren, infertile lands; site should locate away from residential areas, forests, water bodies and any other sensitive land uses;
- (vi) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site; create a compost pit at workers camp sites for disposal of biodegradable waste; non-biodegradable / recyclable material shall be collected separately and sold in the local recycling material market;
- (vii) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of in disposal sites approved by JSV;
- (viii) Prohibit burning of construction and/or domestic waste;
- (ix) Ensure that wastes are not haphazardly thrown in and around the project site provide proper collection bins and create awareness to use the dust bins;
- (x) Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that site is properly restored prior to issuing of construction completion certificate.

**263. Noise and Vibration Levels.** The proposed components of the work like water intake works, tube well, WTP, Pump house, MBR's & SR's except laying of pipelines are all the construction works proposed to be executed at selected sites in the sparsely populated hilly terrain. The pipelines will be laid in the areas, where there are houses, schools, religious places and small-scale businesses. The sensitive receptors are the general population in these areas. 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 nearby 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) 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; and Ensure proper

- training of construction workers on the safe usage of pneumatic drills and exposure limits per day; provide appropriate personal protection equipment - safety glasses or goggles/face shield, helmets, safety shoes or boots, hearing protection aids etc.,. Set up screens or shields in areas where nearby workers or community may be exposed to flying fragments, chips, dust and excessive noise.
- (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) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity.
  - (vi) Consult 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.
  - (vii) Monitor noise levels to ensure they are within local and/or international maximum levels, whichever is lower

264. **Landscape and Aesthetic.** Some trees may be required to cut due to which landscape and aesthetics of those sites will be reduced. No forest land will be used for construction of purposed. 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 1:10 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) Prevent generation of solid waste by adopting practices and methods (such as avoiding the use of disposable, single use items in the workers' camp if reusable items are practical and affordable); manage generated solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- (viii) Removal and proper disposal of 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.

265. **Impact on Flora & Fauna** Some trees will be felled during construction period. However, the project will avoid tree felling as far as possible. During pipe laying works, some of the top soil may be lost. The construction works may induce noise that will create discomfort to the faunas existing in those areas. Haphazard site clearing, parking, movement of construction vehicles, use of various equipment, stockpiling, illegal harvesting of forest resources as fuel for cooking by workers and hunting of animals by workers will result in unnecessary loss of vegetation & fauna. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration. The mitigation measures for this impact include:

- (i) Plantation of tree saplings for the felling of trees in and around the project area as compensatory plantation in the ratio 1:10 for every tree felled.
- (ii) Replace the excavated top soil to its original position after the completion of pipe laying works
- (iii) Re-vegetating disturbed slopes and grounds, as applicable
- (iv) Awareness programs regarding conservation of existing flora & fauna, to the workers and the community;
- (v) Adopt the suitable mitigation measures proposed to minimize noise pollution
- (vi) Regular Monitoring by PDMSC & PIU.

266. Impacts on aquatic life. During the construction of the intake structure all necessary arrangements will be made so as to minimize impacts on the movement, spawning, and breeding of the fish. Sufficient measures for trapping silt and wastes will be employed to minimise any negative impacts. During construction phase, nearby water bodies may be used by the workers for their daily activities like waste disposal, sanitation activities which may pollute the river quality which in turn lead the habitat of aquatic life towards risk. The impact is direct in nature, local in extent, medium in magnitude and short-term in duration. The mitigation measures for this impact include:

- (i) Construction activities should be carried out during non-breeding periods of fishes in consultation with fishery officials
- (ii) Strict Monitoring on the daily activities of workers ;
- (iii) Provision of temporary but well equipped toilets;
- (iv) Restriction to workers from fishing;
- (v) Adopt measures for the solid waste management.

267. **Sedimentaion of stream water** During constructions of intakes the removal of bank/ in stream soil and vegetation clearing will cause sedimentation affecting fish and aquatic invertebrates sensitive to changes in the water quality parameters such as, increased turbidity, changes in temperature etc.

268. Fresh water fish and some other aquatic organisms are unlikely to live and breed well in such modified areas. In addition, sediment eroded from stream banks may be carried further downstream where it is deposited, smothering eggs and invertebrates. Moreover, extreme (too high) flow variations will increase sediment load from the project site, which inhibits percolation and lowers available oxygen. Sediment in the flow scours spawning beds for breeding species.

269. Fish species that rely on vision to obtain food would be adversely affected as a result of sedimentation. Poor visibility due to sedimentation of stream water (by construction activities). The mitigation measures for this impact include:

- (i) Monitor water flow during construction and maintain the minimum ecological requirement for all khads to ensure water is available downstream all the time.
- (ii) Maintain the desired hydrological connectivity in the system (upstream-downstream and maintain low water temperature necessary for survival of the moderately flow-sensitive species found at this site;
- (iii) Ensure riverine protection through observing the 6-30m away from the river banks and planting of indigenous riparian trees to reduce sedimentation.

270. **Accessibility.** Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. Roads are narrow and carry

considerable local traffic, mainly comprise bicycles, 2 wheelers, Mini trucks, buses etc. Cultivation is predominant in the area and large number of vehicles carrying vegetable produce to market can be seen in the area. Primary main pipeline work will be conducted along roads from intake to WTP and WTP to MBR & SR locations, which has potential to create accessibility to issues to surrounding houses and business and may also affect the traffic movement. Works related to all the remaining components will be confined to the selected sites, therefore there is no direct interference of these works with the traffic and accessibility. Hauling of construction material, equipment, construction waste, etc., to and from the work site may increase the road traffic on local roads, which are not in good condition. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

### **1. Hauling (material, waste/debris and equipment) activities**

- (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) Drive vehicles in a considerate manner
- (vi) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

### **2. Pipeline works**

- (i) Confine work areas along the roads to the minimum possible extent; all the activities, including material & waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required
- (ii) Leave spaces for access between mounds of soil to maintain access to the houses / properties
- (iii) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.
- (iv) Inform the affected local population 1-week in advance about the work schedule
- (v) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.
- (vi) Keep the site free from all unnecessary obstructions;
- (vii) Coordinate with Traffic Police for temporary road diversions, where necessary, and for provision of traffic aids if transportation activities cannot be avoided during peak hours

**271. Socio-Economic – Income.** 1 SR is proposed to be constructed on small pieces of private land, and the owners of land have consented to donate the land for the community good. The entire civil works proposed under the subproject for the transmission main is proposed along the alignment of existing pipeline, along the Khads and within the boundaries or RoW of government roads (mainly panchayat roads, PWD roads). Resettlement and social issues are being studied in a parallel resettlement planning study of this subproject. Blocking of access to the business / livelihood activities, especially during pipeline laying along the roads, may slightly



impact the income of households. However, given the alignment of pipeline, and the measures suggested for ensuring accessibility during pipeline works, no notable impact is envisaged.

**272. Socio-Economic – Employment.** Manpower will be required during the 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 and Secure construction materials from local market.

**273. 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 5);
- (ii) Following best practice health and safety guidelines: IFC's General EHS Guidelines,<sup>16</sup> 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) Guidelines.<sup>17</sup>
- (iii) ADB's Interim Advisory Note on Protecting the Safety and Well-Being of Workers and Communities from COVID-19 (2020) (Appendix 14)
- (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 Training<sup>18</sup> for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
- (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

<sup>16</sup><https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

<sup>17</sup><https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES>

<sup>18</sup> 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, 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.

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
- (c) Provide necessary medicine and facilities to take care of dehydration related health issues
- (d) Provide supplies of potable drinking water;
- (e) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
- (f) 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;
- (g) 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;
- (x) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- (xi) Ensure moving equipment is outfitted with audible back-up alarms;
- (xii) 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
- (xiii) 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.
- (xiv) Conduct regular health check-ups for workers
- (xv) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites

**274. Work within River / Reservoirs.** Since during construction of intake, workers should have to work within or adjacent to the river, safety precautions and emergency protocol is necessary. Caution shall be maintained against flash floods in general, and untimely/unexpected rains and floods, dam releases etc., during the construction phase, and necessary safety protocols and awareness shall be created among workers, supervisory staff etc., Works shall be conducted in the lean season and confining work area to avoid any pollution of water, no chemical use, and cleaning up the site after completion of work etc., needs to be followed. Arrangement will be made to maintain the flow of the river to downstream uninterrupted during the works.

**275.** Special precaution particularly using safety equipment and training on swimming and mitigation under emergency is necessary. River training and protection work shall include construction of guide bunds, guide walls, bank protection, flooring and approach embankment protection as required for ensuring safety of the structures and their approaches against damage by flood / flowing water. Construction of various components shall conform to IRC:89 and its Specifications or as directed by the Engineer.

**276. Asbestos Materials.** No Asbestos containing material (ACM) is proposed to be used in the subproject construction. The existing pipelines are of mild steel (MS) and galvanized iron

(GI) pipes, and there are no asbestos cement (AC) pipes.

**277. 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-vehicle movement 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.
- (v) Provide proper barricades around deep excavation pits.
- (vi) Provide prior information to the local people about the nature and duration of work

**278.** 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 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 Panchayat shall be planned
- (ii) All trenches deeper than 1.5 m shall be provided with safety shoring/braces;
- (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 of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches

**279. 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 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; and (vii) regular disinfection of work areas, vehicles and equipment; 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.

**280. 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) Provide temporary rest and eating area at all work sites
- (v) Ensure conditions of livability at work camps are maintained at the highest standards possible 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 GI sheets, tarpaulins, etc., shall not be used as accommodation for workers; accommodation shall meet the IFC standards for workers accommodation<sup>19</sup> 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 15). Prohibit employees from poaching wildlife and cutting of trees for firewood;
- (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) Prevent generation of solid waste by adopting practices and methods (such as avoiding the use of disposable, single use items in the workers' camp if reusable items are practical and affordable); manage generated solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- (ix) Remove and safely dispose 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.

**281. 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; take any action they require ensuring its removal or protection in situ.

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<sup>19</sup>[https://www.ifc.org/wps/wcm/connect/topics\\_ext\\_content/ifc\\_external\\_corporate\\_site/sustainability-at-ifc/publications/publications\\_gpn\\_workersaccommodation](https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation)

282. **Debris disposal.** Prior to the commencement of works, contractor shall identify a debris disposal site in consultation with the PIU and PDMSC 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.

283. **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 climatic conditions (extreme hot during summers), religious fairs/celebrations in daytime etc. Contractors are 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-

**Illumination Standards for Night Working**

Minimum illumination (lx)	Areas to be illuminated	Type of work activity
54	Illumination throughout the work area	General work area lighting, and performance of visual tasks of large size, or medium contrast, or low require accuracy
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 small size, or low contrast or high required accuracy or fine finish

- (viii) 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

- (ix) All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime
- (x) Workers engaged in night works should have adequate rest/sleep in daytime before start of night works
- (xi) 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
- (xii) 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
- (xiii) 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
- (xiv) Horns should not be permitted by equipment and vehicles
- (xv) Workers should not shout and create noise  
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 lights etc. 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 start of 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 applicable labour acts
- (xxv) Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours
- (xxvi) Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.

284. **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.

### **C. Operation and Maintenance Impacts**

285. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.



286. During operation, the delivery of unsafe water is a crucial concern that can be mitigated with good operation and maintenance, prompt action on leaks and quality monitoring of supplied water. Operation and Maintenance of the water supply system will be carried out by DBO contractor for 5 years and then Jal Shakti Vibhag (JSV) directly or through an external operator. The water supply system is intended to deliver potable water meeting drinking water standards (Appendix 2) to the consumers at their homes. This must be ensured.

287. During its operation phase, 6 numbers of proposed WTP will treat 3.13 MLD of water every day (design period 2042).. The main impact of WTP operation is from (i) generation of wastewater and sludge, (ii) noise from operation of pumps and motors, (iii) chlorine gas leakage risk, and (iv) consumption of electricity. All of these are duly considered in the design of WTP, and various measures such as the following are already incorporated into the project design:

- (i) Recirculation and recovery of wastewater including backwash water generated from treatment process - backwash water from filter beds will be sent to a sump, and after allowing adequate time for settlement of solids, clarified water will be pumped back to WTP inlet. This arrangement will avoid pollution and also minimize wastage of water.
- (ii) Collection of accumulated sludge, thickening, drying and reuse
- (iii) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage
- (iv) Using low-noise and energy efficient pumping systems
- (v) Installing the noise-producing pumps and motors etc., in enclosed buildings with noise reducing walls, and also maintaining adequate buffer to the nearby inhabited areas
- (vi) Provision of appropriate personal protection equipment to the workers and staff
- (vii) Developing chlorine facility with all necessary safety measures

288. Since backwash water is recovered and recirculated in the WTP, no wastewater will be generated from water treatment process. Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. In the WTP sludge will be collected, thickened and disposed off or reused as soil conditioner. Sludge will be tested periodically for heavy metal concentration

289. Water supply system will be operated using the standard operating procedures following an operating manual, which will be prepared by the DBO contractor. This will cover all necessary items 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 awareness and mock drills for chlorine safety. Thus, considering the design and proposed operational procedures, it is unlikely that there will be any significant negative impacts due to WTP operation.

290. The project is designed to deliver potable water in sufficient quantities to the consumers in their homes with proper terminal pressure. Sources proposed in the project area are located in isolated areas where no potential pollution source is found. Water quality test reports from various sources indicates that water is suitable for drinking after conventional treatment and

disinfection, and WTP has been designed to treat the source water to meet the drinking water standards. The quality of water supplied will be affected by the raw water quality and as well as treatment efficiency at the WTP. To ensure that water delivered to consumers at all times meets the drinking water standards, the following measures are suggested:

- (i) Preparation and implementation of a water quality surveillance program including development of a laboratory as part of the project by DBO contractor to ensure that supplied water meets the drinking water standards
- (ii) Water quality surveillance program to cover source, WTP and consumer end water quality
- (iii) Development of laboratory with all necessary environment, health and safety measures and adopting international standard procedures for water quality testing

291. The system has a design life of 20 years, during which 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.

292. Recurrence of pipe bursting and leakage problems in water supply system will be managed by the leak detection and water auditing surveys. The operating agency will be required to ensure that the leak detection and rectification time is minimized. These are however likely to be minimal as proper design selection and good quality pipe material should mean that leaks are minimal. The bulk meters that are provided as part of this sub-project will be of great use in detecting leaks in network. Leak repair work will be similar to the pipe laying work. Trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary.

293. It is proposed to use chlorine for disinfection of water, therefore there is a safety risk due to handling of large quantities of chlorine at WTPs. Likely impacts will be negligible if the various measures are suggested safety features and equipment to meet with any accidental eventuality are included in the design and development of the facility. During the operation phase, it is necessary that the facility is operated by trained staff as per the standard operating procedures.

- (i) Chlorinator facility is operated only by trained staff and as per the standard operating procedures  
In case of any accident and/or maintenance activity, the staff should follow documented procedures only
- (ii) It is suggested to develop an Emergency Response System (ERS) for the chlorine leakage
- (iii) Ensure proper labelling of treatment and disinfection chemicals

294. **Use and Disposal of solar panels.** It is proposed harness solar energy to provide campus lighining in facilities like WTPs and pump houses. Photovoltaic (PV) panels will be installed to produce electricity directly from sunlight. These panels consists of a number of individual cells connected together. For proper system function, regular insepection and maintenance of solar panel system is necessary. Ensure that:

- (i) Solar panels are clean, secure and free of defects.
- (i) No parts have deteriorated/corroded.
- (ii) Vents are free of debris.
- (iii) Switches do not have any defects.
- (iv) Wiring has not been damaged/has not deteriorated.

295. Design life of solar panels is 25-30 years, after which many crystalline silicon solar panels will start seeing significant dips in energy production. This affects the power generation and needs to be discarded and replaced with new panels. Solar Pv modules are made up of PV cells, which are most commonly manufactured from silicon. Panels mainly consists of glass (75%-90%), followed by plastic, alluminum, silicon, metals etc., the composition of which vary from a silicon based PV panel to thin film based PV panel. Heavy metals like cadmium and lead are found in solar cells, which can harm the natural environment if they are not recycled or disposed of properly. Recycling of discarded end-of-life panels will enable recovering as much material from solar panels as possible e.g., frame and junction box, glass and the silicon wafer, separation and purification of the silicon cells and specialty metals (e.g., silver, tin, lead, and copper). At present there are no rules/regulations for reuse or disposal of solar panels and given the panel end-of-life of 25-30 years, JSV shall follow the rules applicable at that time. Following measures shall be followed:

- (i) Remove end-of-life / discard solar panels from site and store temporarily in an identified place; ensure no contact with soil or water
- (ii) Use appropriate personal protection equipment
- (iii) Dispose material for reuse as per the rules/regulations in force at the time of disposal
- (iv) If there are no specific regulations, follow e-waste management rules, 2016.
- (v) Maintain records of discared/end-of-life solar panels

296. The residents of the project area will be the major beneficiaries of the improved water supply system, as they will be provided with a constant supply of better-quality water, piped into their homes at an appropriate pressure. The project will improve the over-all health condition of the project area by controlling water borne diseases, so people should spend less on healthcare and lose fewer working days due to illness. Their economic status should also improve, as well as their overall health. This should also improve the environment of these areas, should deliver major improvements in individual and community health and well-being.

## **VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE**

### **A. Overview**

297. The active participation of stakeholders including local community, NGOs/CBOs, and the media in all stages of project preparation and implementation is essential for successful implementation 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 policy.

298. Most of the main stakeholders have already been identified and their representatives 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 near sites where facilities will be built (WTP, Pumphouse, MBRs, SRs and transmission mains pipelines), and government and utility agencies responsible for provision of services in project area of Solan, JSV, and HPPCB, etc., Secondary stakeholder are NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, the executing and implementing agencies (JSV, PMU and PIUs), Government of India and the ADB.

299. Due to ongoing COVID-19 pandemic, limited consultations with the selected representative of the stakeholders were conducted in a controlled manner. The assessment team, JSV officials and community were mandated to follow strict COVID-19 protection protocols during the consultations. All the JSV officials and the team were using PPEs during stakeholder consultations. The public consultations were conducted in open places wherever plausible. Adequate social distancing was followed during the consultations and site visits. During the consultation, the temperature of the participants was measured; further, oximeter was also used to analyse the blood oxygen level of the participants and only healthy participants were allowed to participate in the consultation. Thereafter, the participants were properly sanitized. The team also distributed the masks to community members who were not wearing masks, before beginning of the consultations. The team and JSV officials wore face shields during community consultations.

300. Public consultation meetings were held at few of the water supply component locations that are proposed under the package SZ 03. Consultations were carried out in early February 2021 for SZ 03 at nine proposed subproject locations. Stakeholders consultations were also held on 10<sup>th</sup> - 11th February, and 13 -14th October 2021 with JSV officials and Forest department respectively. Consultations were carried out Fishery officials for the proposed HPRDWILP on 11th and 12th November 2021 (Table 28). Further consultations with downstream users of water sources will be conducted during detailed design period.

## **B. Public Consultation**

301. The public consultation and disclosure program are a continuous process throughout the project implementation, including project planning, design and construction.

### **1. Consultation during Project Preparation**

302. Institutional consultations were conducted with the relevant Governmental Departments such as JSV officials, Fisheries Department, Forest Department and HPPCB etc. The subproject proposals are formulated in consultation with JSV officials, concerned Nagar Parishad and Panchayats to suit their requirements.

303. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. A socio-economic household survey will be conducted in the subproject area, covering sample households, to understand the household characteristics, health status, and the infrastructure service levels, and the demand for infrastructure services. General public and the people residing along the project activity areas were also consulted during visits to the project sites. Formal panchayat-level consultation meetings were conducted in October 2021 around few of the sites of the subproject areas during sites visits. The details of consultation are provided in Appendix 17. Main issues discussed are:

- (i) Awareness and extent of the project and development components;
- (ii) Benefits of Project for the economic and social upliftment 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) Forest and sensitive area nearby the project site;
- (x) Movement of wild animal etc.;
- (xi) Presence of aquatic fish species in the Giri river and information about breeding places , availability of fishes, information on endangered fish Golden Mahseer 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) Requirement of enhancement of other facilities.
- (xvii) Source selection and utilisation.

304. Consultations were conducted with key stakeholders and representatives of community in line with the ADB's requirements pertaining to environmental and social considerations. These consultations helped in identifying the felt needs/concerns and apprehensions of the communities related to the project and their priorities. Consultations were held with stakeholders including temporarily affected persons, land sellers, beneficiaries/local people, poorest of poor households (non-titleholders on government land), Gram Panchayat Pradhan's, Panchayat members/public representatives, Panchayat officials, and JSV engineers, Forest and Fishery officialst. Public consultation meetings were held at few of the proposed sub-project locations and selected sections of transmission mains network.

305. Public consultation meetings were held at few of the water supply component locations that are proposed under the package. Table 28 provides an outline where the consultations were conducted and the number of participants. A total of 295 participants attended the consultation meetings out of which 25% were females. Details public consultation are provided in Appendix 17.

**Table 28: Public Consultation held for Water Supply Subproject area of SZ03: (Shimla zone)**

S No	Date	Gram Panchayat	Location	Total No. of participants	No. of female participants
1	10-02-2021	Barotiwala	Village Barotiwala	26	3
2	10-02-2021	Sandholi	Village Landeywal	54	13
3	10-02-2021	Barotiwala	Village Damuwala	26	1
4	10-02-2021	Sandholi	Village Landeywal	18	13
5	11-02-2021	Chamian	Village Chamian	23	12
6	11-02-2021	Garkhal Kasauli	Village Garkhal,	33	18
7	11-02-2021	Hurang	Village Hurang	27	10
8	11-02-2021	Bhaguri	Village Bhaguri	29	3
9	11-02-2021	Jangeshu	Village Mussal Khana,	14	2
10	10-02-2021	JSV Officials, Solan Circle,	Hotel Baghban Baddi	8	0
11	11-02-2021	JSV Officials, Dharampur Circle,	JSV Circle Office, Solan	11	0
12	13-10-2021	Divisional Forest Officer,Nalagarh	Virtual / Google Meet.	6	0
13	14-10-2021	Divisional Forest Officer,Solan	Virtual / Google Meet.	7	0
14	11-11-2021	Fishery department	Hamni,	6	0
15	12-11-2021	Fishery department	Machhial, Jogendranagar	7	0

306. The consultations primarily highlighted the proposed developmental interventions, perceived impacts and mitigation measures and public participation during implementation. Community members largely spoke about the insufficient or no availability of potable water for use of drinking and domestic purpose; presently portable water is tapped from ground water, in the form of dug well, hand pump, etc. Average cost of purchasing packaged water per family per month was discussed; it was mentioned that water tariff will be fixed considering the affordability of the common people. Frequent power cut, bad weather, breakdown of pumps is other phenomenon also described by the residents which they perceive as their barriers to collect water to meet their daily requirements.

307. The participants conveyed their support for the project that benefits the community with safe drinking water. They expressed concern over the present quality of drinking water they consume and appreciated governments effort of distributing clear and treated water. It was reported by the participants that erratic water supply has resulted into immense hardships for the residents of the subproject area in the district. Affordability of water tax has been a pertinent question raised both by the Gram Panchayat members and the community - however almost all agreed to pay the water charges if they get the facility of household good potable water connections. Creating job opportunities was the other question of the Gram Panchayat.

308. Local people of nearby Jogindar Nagar village during consultations confirmed availability

of Mahseer, an endangered fish in the Giri river and about 2km upstream of the proposed intake location there is a fish breeding and spawning zone. Mahseer is mainly available from May to September in this area. According to Fishery Official, Golden In recent years due to their proximity to human intervention, Mahseer stock is threatened with multifaceted dangers posed by construction of series of dams, barrages / weirs across the rivers on one hand and over-exploitation on the other. The ever-diminishing catches of Mahseer from the river Satluj, Giri, Beas, Chenab and their tributaries clearly bespeaks the affects caused by the construction of Pandoh, Chamera, Pong, Bhakra & Giribata barrages. Regardless of their height, weirs and dams constitute barriers to breeding migration of Mahseer. Further, Mahseer population is also affected by morphological modifications resulting from completion of river valley projects. Normally the spawning of Mahseer takes place at confluences of the tributaries with the main streams where water is well oxygenated and has a moderate velocity. Regarding the proposed subproject based Giri River, stakeholders raised no concerns or issues. Project team explained the proposed intake and likely water withdrawal, which is negligible compared to available water. Stakedholders indicated that there are no notable fishing areas nor there is any organized / community fishing in the area. Few fishermen / local people catch fish in Giri river, nearest site is about 1-2 km from the site. Here too, no regular fishing is practiced. As per local consultations, Golden Mahseer is available in river during monsoon, and it fetches good price in the market, higher than any other fish in river. Organized fishing is mostly limited to dams and reservoirs. Stakeholders are aware of efforts of government in conservation of Golden Mahseer and establishment of artificial breeding areas. Further consultations will be conducted during the detailed design”

309. State Government through its conservation plan launched to save endangered Golden Mahseer from the brink of extinction has succeeded in improving the status of this specie in the rivers and reservoirs of Himachal Pradesh. There are many natural Mahseer sanctuaries called Machhial in the state where Golden Mahseer is being conserved spiritually by the people and department of fisheries also doing commendable work in this direction by strictly implementing fisheries Act and Rules.

310. It has been observed that people are very happy about the project as the project area currently faces severe water problem due to lack of proper potable water supply. People are very much willing to extend their cooperation as the project will be provide much needed proper potable water and enhance living standard of the public. There are no negative impacts perceived by the community, however, project team explained the likely issues during construction and proposed EMP to manage the negative impacts. Increasing traffic and disturbance to agricultural vehicle movement during the work is raised during the meeting, and it was informed that proper care will be taken for movement of construction vehicles including traffic management plan, prior information to people etc., It was also informed no road closures anticipated due to this work, and if needed during the construction phase, alternative access will be provided. These measures are included in the EMP.

## **2. Consultation during construction**

311. Prior to start of construction, JSV and PIU with the assistance of PDMSC will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. At each ward/neighbourhood level, focus group meetings will be conducted to discuss and plan construction work with local communities to reduce disturbance and other impacts.

312. A constant communication will be established with the affected communities to redress

the environmental issues likely to surface during construction phases and regarding the grievance redress mechanism. JSV/PIU and PDMSC 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/sensitive locations before and during the construction.

### **C. Information Disclosure**

313. Executive summary of the IEE will be translated in Hindi and made available at the offices of JSV/PMU, PIU, Village Panchayat offices, and displayed on their notice boards. Hard copies of the IEE will be accessible to citizens to disclose the document and at the same time creating wider public awareness. Local disclosure of the IEE should be done at least two weeks before public consultations to allow the public time to read, look for information or consult experts, and form opinions. Electronic version of the IEE in English and Executive Summary in Hindi will be placed in the official website of the JSV/ PMU after approval of the IEE by the Government and ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

314. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future. Prior to start of construction, the PMU/PIU will issue 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.

315. 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.

316. 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 will be used.

317. At minimum, 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).
- (vii) Annual Environmental Monitoring Report during O&M period

318. A concise summary of project and draft 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



other public 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 should be submitted to ADB for disclosure on ADB website.

## **VIII. GRIEVANCE REDRESS MECHANISM**

### **A. Common Grievance Redress Mechanism**

319. The project will adopt a three-tier Grievance Redress Mechanism (GRM) in implementing the project. The GRM will receive, evaluate, and facilitate the resolution of social, environmental or any other project related grievances. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. The GRM described below has been developed in consultation with stakeholders. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated and shared with affected persons and other stakeholders. The campaign will ensure that the poor, vulnerable and others are made aware of the need for and process in availing the GRM.

320. The GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A sample grievance/complaint register template is provided in Appendix 8. The three-tier GRM for the project is outlined below, each tier having time-bound schedules and with responsible persons identified to facilitate and address grievances at each stage, as required. Public awareness campaigns will ensure that awareness on grievance redress procedures is generated through the campaign. The Environmental Safeguard Officer and Social Safeguard and Gender Officer, PMU will have the overall responsibility for timely grievance redress on environmental and social safeguards concerns.

321. **Who can file a complaint:** A complaint may be registered by stakeholders who may be, directly or indirectly affected by the project? A representative can register a complaint on behalf of the affected person or group, provided that the representative is identified by the affected person or group and submits evidence of the authority to act on their behalf.

322. **What type of grievance/complaint** Any comments, complaints, queries and suggestions pertaining to safeguard compliance - environment, involuntary resettlement, and indigenous people, design related issues, compensation, service delivery or any other issues or concerns related to the project can be registered. The complaint must indicate the name, date, address/contact details of the complainant, location of the problem area, along with the problem.

323. **Where and how to file a complaint:** The contractor's site office will be the primary point for receiving and lodging any complaint. Apart from that, grievances/suggestions/queries from affected persons can be dropped into suggestion boxes or conveyed through phone or e-mails. Affected persons or any complainant will also be able to register grievances on social, environmental or other related issues, personally to the Complaint Cell at PIU level. Complaints can also be filed anonymously.

324. **Process and Timeframe:** The grievance redress process and timeframe involved in the GRM is described below:

- (ii) **1st Level grievance (Field Level).** In case of grievances that are immediate and urgent in the perception of the complainant, concerned officer (Junior Engineer, Civil) of PIU will direct the contractor to resolve the complaint and ensures that it is resolved. If the grievance is not under the contractor's scope, PDMSC (PIU level) safeguard personnel will resolve this issue with the support of respective PIU (Junior Engineer, Civil). Efforts will be made to resolve all grievances within seven days from the date of receipt of a complaint / grievance. Relevant government representatives from the respective districts and sub-districts, where the subproject will be implemented, can be consulted as and when required.
- (iii) **2nd Level grievance (PIU Level).** Grievances that cannot be redressed at first level within seven days will be brought to the notice of PIU. The Project Manager will try to resolve the grievance/ complaint within a timeframe of seven days of receiving the complaint from the first level with the support of Safeguards/Environment Officer, PIU and Environmental Safeguards Specialist or Social, Gender and Community Development Specialist, PDMSC. Government representatives from the respective districts and sub-districts (Tehsils/ Development Blocks) where the subproject will be implemented can be consulted as and when required. Any unresolved complaint at the second level will be taken up to the third level.
- (iv) **3rd Level Grievance (PMU Level):** All the grievances that are not addressed at 2<sup>nd</sup> level by PIU will be brought to the third level, Grievance Redressal Committee (GRC) at the PMU level. The GRC will meet once a month and determine the merit of each grievance/s brought to the committee. The third level grievance redress committee will resolve the grievance within fifteen days of receiving the complaint from the second level. The GRC will be chaired by the Project Director and will have the following members: Social Safeguard and Gender Officer, Environmental Safeguard Officer and Community Development Officer from the PMU, the concerned Project Manager from the PIU, the Environmental Safeguard Specialist and Social, Gender and Community Development Specialist of PDMSC, women representative from a Civil Society Organization (CSO), and local elected representative (if required).

325. In case of any inter-departmental or inter-jurisdictional coordination required for resolution of specific grievances, the PIU will refer the matter directly to the PMU for state-level or inter-departmental coordination and resolution, instead of the District-level GRC. 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. Alternatively, if the grievance is related to land acquisition, resettlement and rehabilitation, the Affected Persons can approach the Land Acquisition, Rehabilitation and Resettlement Authority (LARRA) of Himachal Pradesh, established under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation, and Resettlement Act, 2013<sup>20</sup>

326. The GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage. This can run parallel to accessing the GRM and is not dependent on the

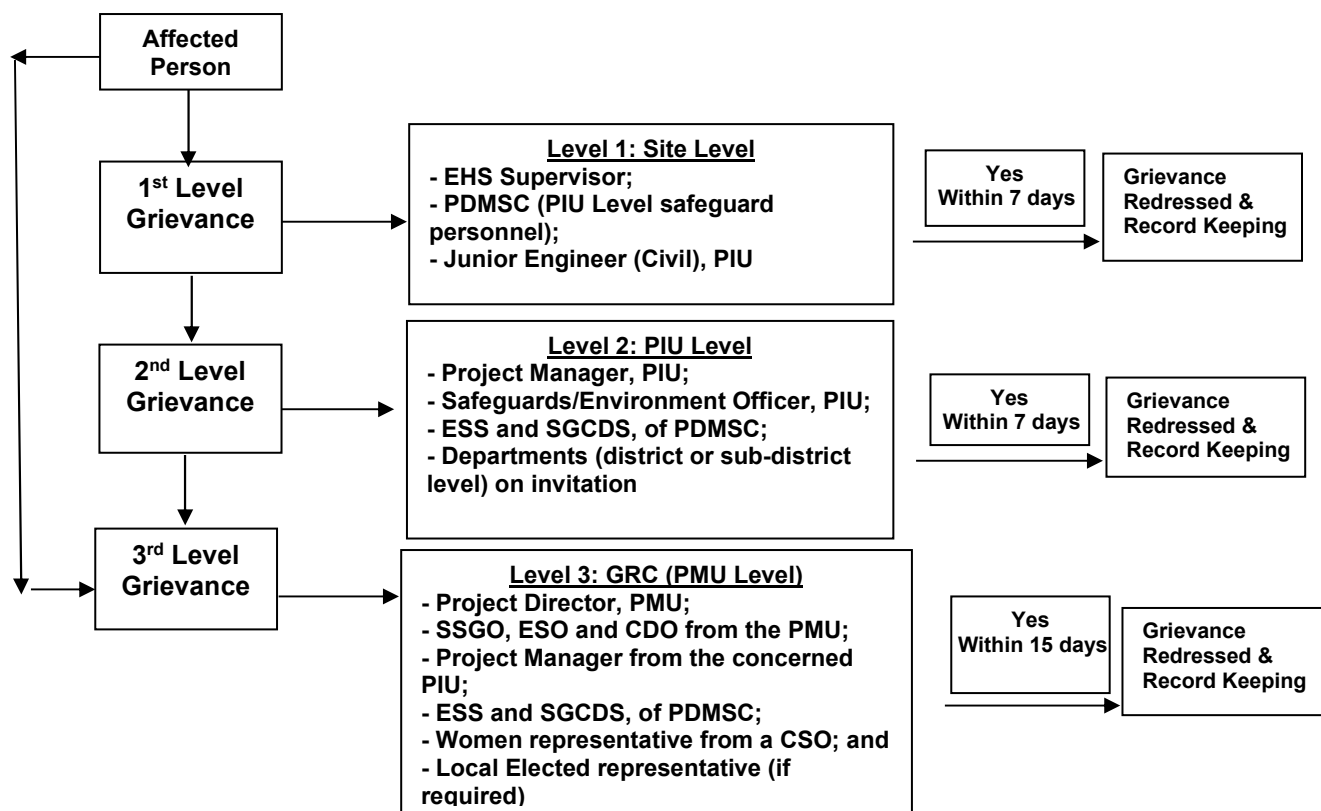
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<sup>20</sup> The Authority admits grievance only with reference to the Land Acquisition and R&R issues under the RFCTLARRA, 2013.

negative outcome of the GRM.

327. The process of the project GRM is given in Figure 17.

**Figure 17: Grievance Redressal Mechanism**



CDO = Community Development Officer; CSO = Civil Society Organization; ESO = Environmental Safeguard Officer  
ESS = Environmental Safeguard Specialist; GRC= Grievance Redressal Committee; PDMSC - Project Design, Management and Supervision Consultant; PIU = Project Implementation Unit; PMU = Project Management Unit; PM = Project Manager; SGCDs = Social, Gender and Community Development Specialist; SSGO = Social Safeguard and Gender Officer.

328. The timeframes within which to resolve the issues may be adjusted (to a maximum of 7 additional days at each level) accordingly during extraordinary circumstances, such as lockdowns or travel restrictions imposed by local or national governments due to the ongoing COVID-19 pandemic. The adjustment will depend on the period of interruption during these events and will be decided upon by the PMU.

329. **Information Dissemination Methods about GRM.** Periodic community meetings will be held by PIUs, and PDMSC with affected communities to understand their concerns and help them through the process of grievance redress (including translation from local dialect/language, recording, and registering grievances of non-literate affected persons and explaining the process of grievance redress) if required. The above Grievance Redress Process will be discussed with the different stakeholders during stakeholder consultation meetings. These meetings will be held with affected persons and community members (beneficiaries) and

the concerned local government representatives where civil works are proposed. The process and timelines for grievance redress and contact details of the persons responsible for grievance redress will be shared in the stakeholder meetings. Action taken in respect of all complaints will be communicated to the complainant by letter, over phone or e-mail or text messaging.

**330. Consultation Arrangements for GRM.** This will include group meetings and discussions with affected persons, to be announced in advance and conducted at the time of day agreed on with affected persons and conducted to address general/common grievances; and if required with the Environment/Social Specialist of PMU/PIU for one-on-one consultations. Non-literate affected persons/vulnerable affected persons will be assisted to understand the grievance redress process, at the site office of the contractor and at PIU level, the official appointed to receive grievances will assist the non-literate affected persons to register complaints and follow-up with actions at different stages in the process.

**331. Record Keeping.** Records of all grievances received, including contact details of complainant, date of receiving complaint/grievance, nature of grievance, agreed actions and measures, the date these were affected, and outcome will be kept by PIU. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PIU office, and on the website of PMU, as well as reported in the semiannual social and environmental monitoring reports to be submitted to ADB. The Environmental Officer and the Social Safeguard Officer will be responsible for maintaining the grievance record.

**332. Periodic Review and Documentation of Lessons Learned.** The PMU, and PIUs, supported by the PDMSC specialist will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

**333. Costs.** All costs involved in resolving the complaints (meetings, consultations, communication, and reporting/information dissemination) will be borne by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

**334. ADB Accountability Mechanism.** If the established GRM is not able to resolve the issue, the affected person can use the ADB Accountability Mechanism<sup>21</sup> through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make effort in good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the Indian Resident Mission [INRM]). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

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<sup>21</sup> Accountability Mechanism. <http://www.adb.org/Accountability-Mechanism/default.asp>.

## **IX. ENVIRONMENTAL MANAGEMENT PLAN**

### **A. Environmental Management Plan**

335. 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 29 to 34), which shows the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

336. The purpose of the environmental management plan (EMP) is to ensure that the activities are 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 and recommendations 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.

337. 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.

338. 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.

339. 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.

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

**Table 29: Design Stage Environmental Management Plan**

<b>Field</b>	<b>Anticipated Impact</b>	<b>Mitigation Measures</b>	<b>Responsible for Implementation/ Monitoring</b>	<b>Cost and Source of Funds</b>
Intake Locations (, River)	Water quality and ecological impacts	(i) Design inlet of intake pipe in the water body with appropriate screen to avoid entry of aquatic organisms into inlet (ii) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition (iii) Schedule the construction works during low water level period late winter months (November/December) to pre monsoon (May/June); ensure that works are completed during the same period to prior to onset of monsoon; (iv) Erect temporary barriers to form enclosed construction area with least disturbance (v) Allow adequate time to settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt laden water should be pumped to a silt pond (vi) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage (vii) Clear the work site after completion at least to pre project conditions, ensure that there are no materials, debris, spills etc., and prior to removal of temporary barriers (viii) Implement work site safety at works in water body	DBO Contractor / PIU	Project Costs
Design of water supply system	Source sustainability and efficiency	(i) Discontinuation of current unsafe & unsustainable groundwater and surface water sources and creating a new comprehensive surface water (River) and Groundwater based water supply system (ii) Locating components and facilities appropriately by avoiding protected areas (environmentally, socially, and archeologically). Recovering wash water from treatment process to optimise the water use (iii) Treatment and reuse of sludge from treatment process (iv) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage	DBO Contractor / PIU	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(v) Reducing the incidence of water borne diseases by providing 100% population including rural poor with potable water supplies (vi) Preparation and implementation of a water quality surveillance program including development of a laboratory as part of the project by DBO contractor to ensure that supplied water meets the drinking water standards (vii) Strengthening existing water testing laboratories of JSV with all necessary environment, health and safety measures and adopting international standard procedures for water and sludge quality testing (viii) Using low-noise and energy efficient pumping systems (ix) Installing the noise-producing pumps and motors etc., in enclosed buildings with noise reducing walls, and also maintaining adequate buffer to the nearby inhabited areas (x) Provision of appropriate personal protection equipment to the workers and staff		
At All Work Sites	Tree cutting	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of WTP and pump houses /MBR/SR or any other site with trees (ii) Obtain prior permission for tree cutting finalized during detailed design (iii) Plant and maintain 10 trees for each tree that will be felled	DBO Contractor / PIU	Project cost
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	PIU	Project cost
Seismic sensitivity	Damage to infrastructure and potential risks:	(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:	DBO Contractor/PIU	Project cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
	project area in Severe earthquake risk zone (Zone V)	Criteria for earthquake resistant design of structures).		
Groundwater source	Groundwater contamination	(i) Prepare a source protection plan for tube 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 regarding the sanitation practices and its effect on groundwater quality	DBO Contractor and /PIU	Project costs
Aquatic Eco-system	Disposal of waste on or nearby water bodies, sediment transport and leakage/disposal of hazardous waste, noise, poaching may harm the aquatic lives in the nallahs/khads of subproject area	(i) Avoid introduction of invasive alien species. (ii) Prohibit cleaning of construction vehicles/equipment within 300 m of waterways/drains. (iii) Maintain natural courses of rivers and streams. (iv) Prohibit siting of construction camps and disposal of construction waste within 500 m of waterways. (v) Install silt fencing at the construction site (vi) Store chemicals and oils in secure, impermeable containers. (vii) Equip construction camps with sanitary latrines that do not pollute surface waters. (viii) Restrict construction works to the dry season in order to limit hydrological changes, erosion and runoff from construction areas (ix) Install low noise pump set and proper maintenance to avoid excessive noise generation. (x) Fishing in rivers will be prohibited for workforce (xi) Avoid borrow pits in areas of Natural Habitat and within 200 m of waterways.	Construction Contractor	PIU/Consultants to monitor such activities which can harm to aquatic species and fishes



Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(xii) Avoid piling and blasting during construction. (xiii) Prohibit hunting and fishing of endangered fish species by staff and contractor, with heavy penalties applied. (xiv) Train staff and contractor in good environmental practice, and prohibited activities (i)		
Chlorine usage as disinfectant at WTP	Chlorine handling & application risk – health & safety risk to workers and general public	Provide the following measure at the chlorine application unit: (i) Chlorine neutralization pit with a lime slurry feeder (ii) Chlorine absorption and neutralization facility (iii) Proper ventilation, lighting, entry and exit facilities (iv) Visible and audible alarm facilities to alert chlorine gas leak (v) Facility for isolation in the event of major chlorine leakage (vi) Eye wash & shower facility (vii) Personal protection and safety equipment for the operators in the chlorine plant (masks, oxygen cylinders, gloves, etc.,) (viii) Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier (ix) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Bengali Languages	DBO Contractor / PIU	Project Costs
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 (iv) Prepare spoils management plan	DBO Contractor and DSC (for ACM plan)	Approval of plans by PIU

**Table 30: 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
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
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	<p>(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</p> <p>(ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services.</p> <p>(iii) inform the local community in advance if utilities are likely to be disrupted during construction).</p> <p>(iv) Require contractors to prepare spoils management plan (Appendix 11) and traffic management plan (Appendix 12)</p>	DBO Contractor in collaboration with PIU and with approval of PMU	<p>(i) List of affected utilities and operators;</p> <p>(ii) Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is more than 24 hours), spoil management plan (Appendix 11), and traffic management plan (Appendix 12)</p>	Project Cost
Construction works on hills and removal of trees and vegetation at	Removal of trees and vegetation, and erosion.	(i) Minimize removal of trees, vegetation on Dugdugi hill; undertake replantation of the sites	DBO Contractor in collaboration with PIU and with approval of PMU	Contractor to follow PIU/ PMU to ensure compliance.	Project Cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
work sites.		<p>as far as possible immediately after the construction;</p> <p>(ii) All the cut and open surfaces shall be properly consolidated and protected with surface pitching /grass turfing, etc., as appropriate to avoid any surface erosion in the hill slopes;</p> <p>(iii) Conduct census of trees to be removed, obtain permission, and undertake compensatory tree plantation at the rate of 10 trees for 1 tree removed;</p> <p>(iv) Avoid removal of trees and vegetation along the roads of pipeline alignments and layout planning of reservoirs and facilities, however, if this cannot be avoided fully, undertake compensatory tree plantation (10 trees to 1 tree removed).</p>			
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	<p>No cost required.</p> <p>Mitigation measures are part of TOR of PIU and Consultant</p>

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		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	<p>(i) Prioritize areas within or nearest possible vacant space in the project location;</p> <p>(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;</p> <p>(iii) Do not consider residential areas;</p> <p>(iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community.</p> <p>(v) For excess spoil disposal, ensure</p> <p>(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;</p> <p>(b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located</p>	Contractor to finalize locations in consultation and approval of PIU	<p>(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.</p> <p>(ii) Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land</p>	<p>No cost required.</p> <p>Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms</p>

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		within 100 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water 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
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 (including CTE for WTP from HPSPCB), 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- HPSPCB Sand mining, quarries,	DBO 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 measures are part of TOR of PIU and

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		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			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
EMP Implementation Training	Irreversible impact to the environment, workers, and	Project manager and all key workers of contractors will be	Contractor, DSC	PIU/PMU	Cost of EMP Implementation Orientation

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
	community.	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.			Training to contractor is responsibility of PMU.

**Table 31: 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.	Construction Contractor	PIU	Contractor, Project cost
Air Quality	Emissions from construction vehicles, equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon	(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	Construction Contractor	PIU	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
	monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.	<p>(vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly and limit idling time (3-5 minutes) of construction vehicles to minimize local air pollution. Contractor's vehicles and equipment should compulsorily have PUC and submit to PIU before deployment at site</p> <p>(vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers etc. if specifically established for this project.</p> <p>(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 HPSPCB, 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</p> <p>(ix) Conduct air quality monitoring according to the Environmental Management Plan (EMP).</p>			
Surface water quality	Works in rains/ Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during installation of pipelines, and discharge of drilling fluid/mud during water well drilling can contaminate	<p>(i) Prepare and implement a spoils management plan</p> <p>(ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;</p> <p>(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;</p> <p>(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</p> <p>(v) As for a possible avoid trench works and</p>	Construction Contractor	PIU	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
	nearby surface water quality.	<p>excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it</p> <p>(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.</p> <p>(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</p> <p>(ix) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;</p> <p>(x) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;</p> <p>(xi) Dispose any wastes generated by construction activities in designated sites; and</p> <p>(xii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).</p> <p>(xiii) Drilling fluid/mud including cuttings from well drilling shall be contained and properly disposed by the drilling contractor, to avoid affecting the quality of nearby surface water.</p>			
Ground Water Quality	Contamination of ground water quality due to spillage of oil and lubricants	<ul style="list-style-type: none"> <li>• Prepare and implement a spills management plan;</li> <li>• 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;</li> <li>• Dispose any oil contaminated wastes generated by construction activities in scientific manner; and</li> </ul>	Contractor	PIU	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
		<ul style="list-style-type: none"> <li>Conduct ground water quality monitoring according to the Environmental Management Plan (EMP).</li> </ul>			
Noise and Vibration Levels	Increase in noise and vibration levels due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	<p>(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;</p> <p>(ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;</p> <p>(iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor;</p> <p>(iv) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity</p> <p>(v) Ensure proper training of construction workers on the safe usage of pneumatic drills and exposure limits per day; provide appropriate personnel protection requirement - safety glasses or goggles/face shield, helmets, safety shoes or boots, hearing protection aids etc.,. Set up screens or shields in areas where nearby workers or community may be exposed to flying fragments, chips, dust and excessive noise.</p> <p>(vi) Consult 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.</p> <p>(vii) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s.</p> <p>(viii) Periodical monitoring of noise levels as per</p>	Construction Contractor	PIU	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
		EMP to ensure they are within local and/or international maximum levels, whichever is lower			
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) Prevent generation of solid waste by adopting practices and methods (such as avoiding the use of disposable, single use items in the workers' camp if reusable items are practical and affordable); manage generated solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (vi) Removal and proper disposal of 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.	Construction Contractor	PIU	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	PIU	Cost for implementation of mitigation measures responsibility of contractor.
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 ten native trees for every one that is removed.	Construction Contractor	PIU	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 – Faunal	Hunting, fishing or harm to animals and hindrance to fish movement within construction zone	(i) Prohibit workers from poaching and fishing in river and make awareness among workers (ii) Monitor water flow during construction and maintain the minimum ecological requirement for all rivers to ensure water is available downstream all the time iv) Minimize activities to areas of construction and initiate habitat restoration immediately after construction works are through; and Restore disturbed areas to near-to-nature to blend with the immediate environment. vi) Shorten the periods of temporary diversions as far as feasible. vii) If any animal or fish is entrapped during construction works, provide safe passage for them, and do not harm them	Construction Contractor	PIU	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;	Construction Contractor	PIU	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
		<p>(vii) Drive vehicles in a considerate manner;</p> <p>(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;</p> <p>(ix) Notify affected sensitive receptors 1-week in advance by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.</p> <p>(x) Plan and execute the work in such a way that the period of disturbance/ loss of access are minimum.</p> <p>(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.</p>			
Socio-Economic Income.	Impede the access of residents and customers to nearby shops	<p>(i) Prepare and implement spoils management plan (Appendix 11). Contractor to Implement RP and to follow mitigation measures prescribed</p> <p>(ii) Leave spaces for access between mounds of soil;</p> <p>(ii) Provide walkways and metal sheets where required for people;</p> <p>(iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools;</p> <p>(iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and</p> <p>(v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</p>	Construction Contractor	PIU	Cost for implementation of mitigation measures responsibility of contractor.
Socio-Economic Employment	Generation of temporary employment and increase in local revenue	<p>(i) Employ local labour force, or to the maximum extent possible</p> <p>(ii) Comply with labor laws</p>	Construction Contractor	PIU	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
Occupational Health and Safety	Occupational hazards which can arise during work	<p>(i) Comply with all national, state and local core labor laws (see Appendix 5 of this IEE); Following best practice health and safety guidelines: IFC's General EHS Guidelines<sup>22</sup> and Sector Specific (Sanitation) Guidelines<sup>23</sup></p> <p>(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;</p> <p>(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;</p> <p>(iv) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;</p> <p>(v) Provide medical insurance coverage for workers;</p> <p>(vi) Secure all installations from unauthorized intrusion and accident risks;</p> <p>(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:</p> <p>(a) work schedule should be adjusted to avoid peak</p>	Construction Contractor	PIU	Cost for implementation of mitigation measures responsibility of contractor.

<sup>22</sup><https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

<sup>23</sup> <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
		<p>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</p> <p>(viii) Provide supplies of potable drinking water;</p> <p>(vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;</p> <p>(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;</p> <p>(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;</p> <p>(xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(xii) Ensure moving equipment is outfitted with audible back-up alarms;</p> <p>(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;</p> <p>(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.</p> <p>(xv) Conduct regular health check-ups for workers</p> <p>(xvi) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites</p> <p>(xviii) Provide proper solid and liquid waste</p>			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		management system in workers' campsite, separate from spoils and debris disposal, as their presence can add to existing waste volume at the project sites.			
	Health risk of construction workers due to COVID-19. • Prepare the health and safety guidance for COVID-19 at work sites and get approval of PMU;	<p>Prepare the health and safety guidance for COVID-19 at work sites and get approval of PMU</p> <ul style="list-style-type: none"> <li>• Strictly follow and implement the H&amp;S guidance for COVID-19 at worksite;</li> <li>• Everyone entering the worksite must wear a mask, gloves and hard shoes.</li> <li>• 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;</li> <li>• 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.</li> <li>• Discourage site personnel to gather and gossip at any time, rather encourage physical distance while chatting/discussing.</li> <li>• Ensure sufficient stock of soap, sanitizer, washing facility and safe water at the workers' dwelling (both camp site and home).</li> <li>• Encourage frequent hand washing and social distancing at campsite.</li> <li>• Ensure personal distance at least 1 meter (3 feet), preferably 2m (6ft) during lunch, dinner and prayer.</li> <li>• 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.</li> </ul>	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
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	<p>(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</p> <p>(ii) All trenches deeper than 1.0 m shall be provided with safety shoring/braces;</p> <p>(iii) Survey the surrounding vulnerable buildings for likely issues in structural stability / differential settlement during the excavation works</p> <p>(iv) Provide prior information to the local people about the</p> <p>(v) Plan routes to avoid times of peak-pedestrian activities.</p> <p>(vi) Liaise with PIU/ULB in identifying high-risk areas on route cards/maps.</p> <p>(vii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.</p> <p>(viii) Provide road signs and flag persons to warn of on-going trenching activities.</p>	Construction Contractor	PIU	Cost for implementation of mitigation measures responsibility of contractor.
Safety of sensitive groups (children, elders etc.) and other pedestrians in narrow streets	Trench excavation in narrow streets will pose high risk to children and elders in the locality	<p>(i) Provide prior information to the local people about the nature and duration of work</p> <p>(ii) Conduct awareness program on safety during the construction work</p> <p>(iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day</p> <p>(iv) Provide barricades, and deploy security</p>	Construction Contractor	PIU	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
		personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches			
Night Works	Public inconvenience due to traffic diversion, disturbance due to excessive noise and access loss, occupational health and safety issues etc.	<p>(i) Prepare a night work protocol and obtain prior approval from PIU, and strictly implement and report on implementation of protocol during the workers;</p> <p>(ii) Contractors should have handheld noise level meter for measurement of noise during night hours</p> <p>(iii) Contractors should have handheld lux meter for the measurement of illumination during night hours</p> <p>(iv) Preferably electrical connection is available for running equipment otherwise soundproof/super silent Diesel Generator set should be available</p> <p>(v) Sound level should not increase as prescribe by CPCB</p> <p>(vi) Illumination should be as prescribed in protocol</p> <p>(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</p> <p>(viii) All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime</p> <p>(ix) Workers engaged in night works should have adequate rest/sleep in daytime before start of night works</p> <p>(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</p> <p>(xi) All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should</p>	Contractor	PIU	Contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		<p>be available with fluorescent/retro-reflective arrangements</p> <p>(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</p> <p>(xiii) Horns should not be permitted by equipment and vehicles</p> <p>(xiv) Workers should not shout and create noise</p> <p>(xv) First aid and emergency vehicles should be available at site</p> <p>(xvi) Emergency preparedness plan should be operative during night works</p> <p>(xvii) Old persons and pregnant women and women having small kids should not work in night-time</p> <p>(xviii) All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise</p> <p>(xix) All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works</p> <p>(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.</p> <p>(xxi) Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement</p> <p>(xxii) After completion of night works all the site should be cleaned and maintained obstruction free for daytime movement of vehicles and pedestrians</p> <p>(xxiii) Drivers and workers should be alert and responsive during night works</p>			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(xxiv) All the wages to workers working in night hours should be as per the applicable labour acts (xxv) Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours (xxvi) 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.
Construction camps and worker facilities	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils,	(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 facilities for employees; (iv) Provided temporary rest and eating area at all work sites	Construction Contractor	PIU	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
	<p>solvents, and lubricants</p> <p>Unsanitary and poor living conditions for workers</p>	<p>(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 15)</p> <p>(vi) Train employees in the storage and handling of materials which can potentially cause soil contamination;</p> <p>(vii) Recover used oil and lubricants and reuse or remove from the site;</p> <p>(viii) Manage solid waste according to the preference hierarchy: reuse, recycling and disposal to designated areas;</p> <p>(ix) Ensure unauthorized persons specially children are not allowed in any worksite at any given time.</p>			
Groundwater exploitation	Uncontrolled extraction of water may affect availability of water to locals.	To avoid over exploitation of groundwater resources, judicious use and proper scientific planning is required for further developments by the Government. Prevent pollutants from contaminating the soil and the ground water. • All tube wells, test	Construction Contractor	PIU	Cost for implementation of mitigation measures responsibility

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	Contamination of groundwater from construction related sources such a fuel and liquid wastes.	holes, monitoring wells that are no longer in use or needed shall be properly decommissioned; • Storage of lubricants and fuel at least 100 m from water bodies • 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%. • Daily control of machinery and vehicles for leakages Collection of waste during construction activities • Provide uncontaminated water for dust suppression • Monitor groundwater quality according to the environmental monitoring plan.			of 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 to ensure its removal or protection in situ	Construction Contractor	PIU	Cost for implementation of mitigation measures responsibility of contractor.
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	PIU	Cost for implementation of mitigation measures responsibility of contractor.
Submission of EMP	Unsatisfactory compliance to	(i) Appointment of supervisor to ensure EMP implementation	Construction contractor	PIU	Cost for implementation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
implementation report	EMP	(ii) Timely submission of monitoring reports including pictures			of mitigation measures responsibility of contractor.
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove and safely dispose 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	Cost for implementation of mitigation measures responsibility of contractor.

**Table 32: 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
Water supply system operation	Supply of water not meeting drinking water standards, health and environment	(i) Ensure that water supplied to the consumers at all times meet the drinking water standards; carry out regular sampling and testing, and disseminative	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	issues	<p>information;</p> <p>(ii) Undertake regular monitoring and maintenance of water supply infrastructure. Ensure zero wastewater discharge from the water treatment process via collection and recirculation of process wastewater / backwash water;</p> <p>(iii) Ensure that all conditions/standards prescribed by UEPCB are complied duly</p> <p>(iv) 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</p> <p>(v) Implement Emergency Response System (ERS) for the chlorine leakage;</p> <p>(vi) Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 16.</p> <p>(vii) Ensure proper labelling of treatment and disinfection chemicals</p>			
Check for blockage and leakage problems reducing the water losses	It may affect the water supply system	<p>1. Effectiveness of leak detection and water auditing to reduce the water losses</p> <p>Implementation of regular O&amp;M schedules</p>	O&M contractor for 5 years and then JSV-	JSV- PIU/PMU	O & M cost of contractor
Routine maintenance of Main Balancing Reservoirs , Service Level Reservoirs and OHTs and other facilities to ensure delivery of safe	Health impact due to supply of unsafe drinking water in the system	<p>2. Ensure periodical maintenance of pumps and cleaning of OHRs, to ensure delivery of safe drinking water</p> <p>Periodical testing of treated water to ensure treated water quality meets the required standards</p>	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	O and M cost of contractor



Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
drinking water					
Occupational health and safety	Health, social and economic impacts on the workers	3. (i) Provide appropriate PPE and training on its proper use and maintenance. 4. (ii) Use fall protection equipment when working at heights. 5. (iii) Maintain work areas to minimize slipping and tripping hazards. 6. (iv) Implement a training program for operators who work with chlorine regarding safe handling practices and emergency response procedures. 7. Prepare escape plans from areas where there might be a chlorine emission. 8. (v) Install safety showers and eye wash stations near the chlorine equipment and other areas where hazardous chemicals are stored or used. 9. (vi) Install low noise pump set and proper maintenance to avoid excessive noise generation 10. (vii) Prohibit eating, smoking, and drinking except in designated areas.	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	Operating costs
Occupational Health and Safety	Health risk of workers due to COVID-19.	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	O and M cost of contractor
Repair and	All work sites	Implementation of dust control, noise	O and M	JSV- PIU/PMU	O and M

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
maintenance activities of Water Supply Construction disturbances, nuisances, public and worker safety,		control, traffic management, and safety measures. Site inspection checklist to review implementation is appended at Appendix 19	contractor for 5 years and then JSV		cost of contractor
Leakage and Overflows	It may affect the water supply and sewer systems, contaminate land, water and create public health issues	Effective operation to avoid and/or immediate clearance of such leaks, blockages; • Implementation of regular O&M schedules.	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	O and M cost of contractor
Water contamination – raw water contamination at source and treated water during transmission.	Impacts on public health.	(i) Contamination of treated water during transmission and distribution should be prevented by quickly identifying, isolating and repairing the leak section. Develop a system of leak detection and rectification;  (ii) Ensure protection of water source quality any entry of wastewater into the river upstream of Rajghat Dam sites should be prevented;  (iii) Prepare and implement a water quality surveillance program including development of a water quality laboratory;  (iv) Conduct regular monitoring of raw & treated water and ensure that water supplied always meets the drinking water standards (Appendix 2).	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Discharge the impurities and other solids collected due to filtration and back wash.	Pollution of streams /drains.	<ul style="list-style-type: none"> <li>▶ Backwash water will be recirculating, so no wastewater generated from WTP;</li> <li>▶ Maintain the mechanical parts as per the maintenance plan to avoid any hazards.</li> </ul>	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	Operating costs
Sludge generation	Land and water pollution, impacts on health & environment	<ul style="list-style-type: none"> <li>▶ Collect the sludge from WTP units, dry in sludge drying beds, and reuse / dispose safely as per the design;</li> </ul>	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	Operating costs
Solar PV panels	Environment and health impacts due to improper handling and disposal of discarded / end-of-life solar panels	(i) Remove end-of-life / discard solar panels from site and store temporarily in an identified place; ensure no contact with soil or water (i) Use appropriate personal protection equipment (ii) Dispose material for reuse as per the rules/regulations in force at the time of disposal (iii) If there are no specific regulations, follow waste management rules, 2016. (iv) Maintain records of discarded/end-of-life solar panels	O and M contractor for 5 years and then JSV	JSV- PIU/PMU	O and M cost of DBO 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 JSV	JSV- PIU/PMU	O and M cost of DBO contractor

**Table 33: Possible impacts and mitigation measures for Critical Habitat-qualifying biodiversity**

Environmental Component	Aspect	subproject phase	Impact	Mitigation action	Responsibility	
					Development/ implementation	Control
Endangered fish species (Tor putitora)	Habitat	D, C	Degradation of habitat from aggregate extraction for construction.	Use only existing licensed quarries outside of rivers and streams for sourcing aggregates.	Contractor	JSV
				Avoid borrow pits in areas of Natural Habitat and within 200 m of waterways.	Contractor	JSV
		C	Degradation of habitat by introduction of invasive alien species.	Avoid introduction of new invasive species to, and spread of existing invasive species within, the subproject area through: -barricade the construction site with controlled entry and exit from construction workers -washing of vehicles, equipment and supplies before entry to the Project area; - monitoring for invasive species; and - control/eradication of invasive species where found.	Contractor	JSV
				Prohibit cleaning of construction vehicles/equipment within 300 m of waterways/drains.	Contractor	JSV
		D, C	Degradation of habitat from hydrological changes.	Maintain natural courses of rivers and streams.	Contractor	JSV
				Restrict intake well construction works to the dry season or lean season in order to limit hydrological changes, erosion and runoff from construction sites.	Contractor	JSV
				Restore temporary diversions to their natural courses as soon as possible, if put any.	Contractor	JSV
		C	Degradation of habitat during construction from sedimentation, dust, sewage, or other construction waste.	Restrict construction works to the dry season or lean season in order to limit hydrological changes, erosion and runoff from construction sites.	Contractor	JSV
				Store chemicals and oils in secure, impermeable containers.	Contractor	JSV
				Equip construction camps with sanitary latrines that do not pollute surface waters.	Contractor	JSV
				Barricade construction site and control on entry and exit of workers in river water	Contractor	JSV
				Installation of slit fencing at the construction site to avoid siltation in river water	Contractor	JSV
				Prohibit siting of construction camps and disposal of construction waste within 500 m of waterways.	Contractor	JSV

Environmental Component	Aspect	subproject phase	Impact	Mitigation action	Responsibility	
					Development/ Implementation	Control
		C, O	Degradation of habitat from accidentally spilled fuel/oil or surface runoff,	Store chemicals and oils in secure, impermeable containers.	Contractor & JSV	JSV
				Prohibit cleaning of construction vehicles/equipment within 300 m of waterways/drains.	Contractor & JSV	JSV
	Distribution	C, O	Displacement of species due to noise from presence of machinery and pump.	Restrict construction works to the dry season in order to limit hydrological changes, erosion and runoff from construction areas.	Contractor	JSV
				Avoid piling and blasting during construction.	Contractor	JSV
				Install low noise pump set and proper maintenance to avoid excessive noise generation.	Contractor & PMU	JSV/PIU
				Install mechanical barrier/screen for fish in water at a radius of 2m		
	Mortality	C	Injury and mortality due to underwater construction noise.	Restrict construction works to the dry season.	Contractor	JSV
				Avoid piling and blasting during construction.	Contractor	JSV
				Avoid column casting at site or use of pre-fabricated column	Contractor	JSV
				Install screen to barricade construction site in water	Contractor	JSV
		C	Mortality of individuals due to unsustainable exploitation by construction workers.	Prohibit hunting and fishing of endangered fish species by staff and contractor, with heavy penalties applied.	Contractor & PMU	JSV/PIU
				Train staff and contractor in good environmental practice, and prohibited activities.	Contractor & PMU	JSV/PIU
				Ensure contractors supply all necessary food, cooking fuel and appropriate housing.	Contractor	JSV

Notes: Project Phase = D-Design, C-Construction, O-Operation.

**Table 34: 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	Weekly during construction	Supervising staff and safeguards specialist	No costs required

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
		review implementation is appended at Appendix 19.			
Tree cutting and plantation	WTP/MBR/SR and water pipe laying sites if required after finalisation of detailed design	Obtain permission from concerned authority for any tree cutting and plant trees in the ratio of 1:10	Weekly during construction	Supervising staff and safeguards specialist	Contractors cost
Ambient air quality	At 5 locations to be decided by the Environment Specialist of PDMSC. Monitoring sites to be changed as per the ongoing work sites.	PM10, PM2.5 NO2, SO2, CO.	Once before start of construction and yearly 3 times excluding monsoon season during construction period (2-year period considered).	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (35 samples @ Rs.8000/= per sample = Rs 280,000/=).
Ambient noise	At 5 locations to be decided by the Environment Specialist of PDMSC. Monitoring sites to be changed as per the ongoing work sites.	Day time and night time noise levels (24 hours).	Once before start of construction and yearly 3 times excluding monsoon season during construction period (2-year period considered).	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (35 samples @ Rs.2000/= per Sample= Rs.70,000/=).
Surface water quality	One sample from intake location in SS1 grid	pH, Oil & Grease, Cl, F, NO <sub>3</sub> , TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity.	Once before start of construction and yearly 3 times excluding monsoon season) during construction (2-year period considered).	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor 7 samples x 8000 per sample = 56,000/=).
Ground water quality	At two locations from SS 9 grid to be decided by the Environment Specialist of PDMSC.	Colour, ordour, Turbidity, pH, total dissolved solids, electrical conductivity, total alkalinity, total hardness, Ammonia, Barium. Iron, calcium, chromium, zinc,	Once before start of construction and yearly 4 times excluding monsoon season) during construction	DBO Contractor	Cost for implementation of monitoring measure responsibility of contractor (13 samples x 8000 per

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
	Monitoring sites to be changed as per the ongoing work sites.	manganese, Sulphate, Nitrite, Nitrate, Chloride, Fluoride, Phosphate, Total arsenic, Mercury, Cadmium, Total Chromium, Copper, Cynide, lead, Aluminium, nickel			sample = 104,000/=)

**Table 35: Environmental Monitoring Plan for Operations Stage**

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Monitoring of plantations	Plantations locations	Number. of tree survived	Monthly	O and M contractor (DBO Contractor) for 5 years and then JSV	Contract O and M cost / JSV
Monitoring of raw water quality of at Surface Source	Near intake Location in SS1 Grid	pH, TDS, Oil & grease, Cl, F, NO <sub>3</sub> , TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity pesticides, heavy metals	Yearly twice (pre & post monsoon)	O and M contractor (DBO Contractor) for 5 years and then JSV	O&M costs
Monitoring of quality of water supplied to consumers	Consumer end- random sampling in all wards	pH, Nitrite, Nitrate, Turbidity BOD, Total Alkalinity, Total coliform and Faecal coliform	Monthly once	O and M contractor (DBO Contractor) for 5 years and then JSV	Contract O and M cost
Raw water quality of Tube well	Tube wells	Parameters as per drinking water standards (IS 10500:2012)	Monthly once	O and M contractor (DBO-Hybrid Contractor) for 5 years and then JSV	Contract O and M cost / JSV
Sludge quality and suitability as manure	WTP	Analysis for concentration of heavy metals and confirm that value are within the following limits (all units are in mg/kg dry basis except pH)	Yearly once	O and M contractor (DBO Contractor) for 5	Contract O and M cost

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
		<ul style="list-style-type: none"> <li>• Arsenic - 10.00</li> <li>• Cadmium - 5.00</li> <li>• Chromium - 50.00</li> <li>• Copper - 300.00</li> <li>• Lead - 100.00</li> <li>• Mercury - 0.15</li> <li>• Nickel - 50.00</li> <li>• Zinc - 1000.00</li> <li>• PH - 5.5-8.5</li> </ul>		years and then JSV	
Water supply system operation	Supply of water not meeting drinking water standards, health and environment issues	<p>(i) Ensure that water supplied to the consumers at all times meet the drinking water standards; carry out regular sampling and testing, and disseminative information;</p> <p>(ii) Undertake regular monitoring and maintenance of water supply infrastructure. Ensure zero wastewater discharge from the water treatment process via collection and recirculation of process wastewater / backwash water;</p> <p>(vi) Ensure that all conditions/standards prescribed by HPSPCB are complied duly</p> <p>(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</p> <p>Implement Emergency Response System (ERS) for the chlorine leakage; (vii) Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 18.</p>	O and M contractor for 5 years and then JSV	JSV	O and M cost of contractor



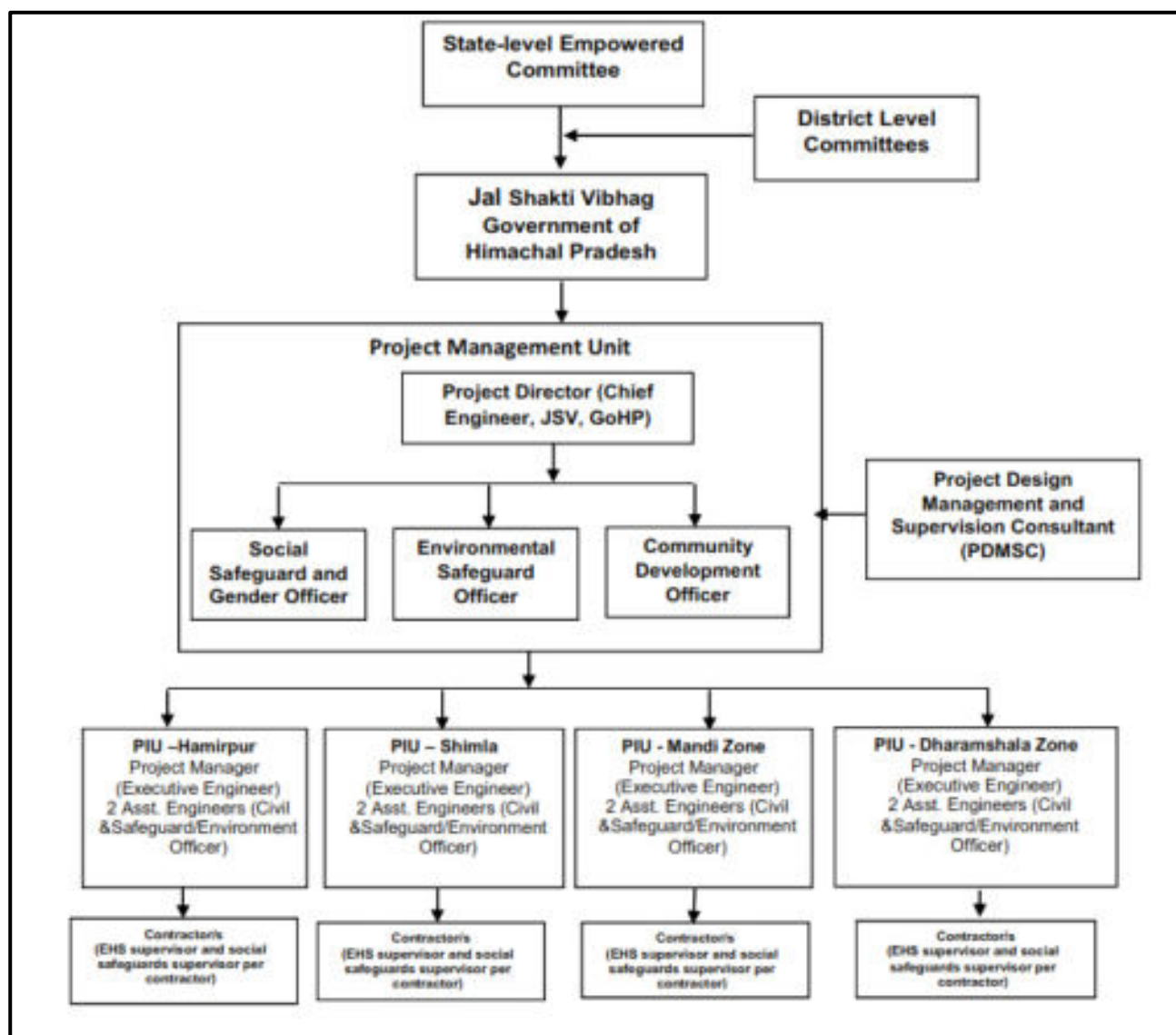
## **B. Implementation Arrangements**

341. Jal Shakti Vibhag (JSV) of the Government of Himachal Pradesh will be the Executing and Implementing Agency for the Program, responsible for management, coordination and execution of all activities funded under the loan. Jal Shakti Vibhag (JSV) will establish a central Project Management Unit (PMU) headed by a Project Director (PD) and will be supported by three Deputy Project Directors (DPD I, II and III). DPD-I and II will be responsible for procurement and contract management in two zones each (DPD-I -Hamirpur and Dharamshala, and DPD-II - Shimla and Mandi). DPD-III will be responsible for finance management of the project. PMU will be staffed with technical, administrative, finance, procurement, safeguards, gender, etc., Under the PMU, four Project Implementation Units (PIUs) will be established at zonal level (Hamirpur, Dharamshala, Shimla and Mandi), and each PIU will be headed by a Project Manager. PMU and PIUs will be supported by Project Design, Management and Supervision Consultant (PDMSC) team.

### **1. Safeguard Implementation Arrangement**

342. PMU will be staffed with three safeguard officers: (i) Environment Safeguard Officer (ESO) (ii) Social Safeguard and Gender Officer (SSGO), and (iii) Community Development Officer (CDO) who will be responsible for compliance with the environmental, social safeguards and community related issues in program implementation respectively. Environment Safeguard Officer and Social Safeguard and Gender Officer will have overall responsibility of safeguard implementation in compliance with ADB SPS 2009. At individual subproject level, Environment Safeguard Officer and Social Safeguard and Gender Officer will ensure that environmental assessment and social impact assessment is conducted, and IEE reports and corresponding EMPs and Social Management Plan (SMP) and Resettlement Plans (RP), due diligence reports (DDRs) are prepared and implemented, and the compliance, and corrective actions, are undertaken. Environmental Safeguard Specialist and Social Safeguards and Gender Specialist of the PDMSC will have primary responsibility of preparing the safeguard documents and supervising the EMP and resettlement plan implementation, while the Safeguards Officers at PMU will review, approve and oversee the compliance. At each PIU, a Safeguard/Environment Officer of Assistant Engineer rank, AE (SEO), will be responsible for safeguard implementation. AE(SEO) will oversee the safeguards implementation at PIU level and will be responsible for reporting to Environment Safeguard Officer and Social Safeguard and Gender Officer at PMU. The AE(SEO) will coordinate public consultation, information disclosure, regulatory clearances and approvals, EMP and resettlement plan implementation and grievance redress. Contractor will appoint an Environment, Health and Safety (EHS) supervisor to implement EMP; EHS supervisor of DBO Contractor will have responsibilities related to environmental and social safeguards compliance and grievance redress and management at field level.

**Figure 18: Implementation Arrangement for Safeguard Implementation**



## 1. Environmental Safeguards Compliance Responsibilities

343. **Project Management Unit (PMU).** The PMU will be responsible for planning, management, coordination, supervision and progress monitoring. PMU has the responsibility of fulfilling environmental requirements of the government and ensuring effective implementation of the environmental management provisions in the EARF, IEEs, EMPs and civil works contracts. The following are the key environmental safeguard tasks and responsibilities of the ESO at the PMU:

- (i) ensure subproject compliance with the statutory environmental requirements, ADB SPS 2009, EARF and loan covenants
- (ii) ensure new and amended subprojects confirm with EARF exclusion criteria and subproject selection guidelines; review and approve subproject category

- (iii) ensure that necessary environmental assessment studies are conducted, and IEEs including EMPs are prepared and submitted to ADB for approval and disclosure
- (iv) ensure that IEEs including EMPs are included in bidding documents and contracts
- (v) ensure that Health and Safety Plans including COVID-19 H&S Plans are included in bidding documents and civil works contracts
- (vi) ensure that draft IEEs prepared based on preliminary designs are updated to reflect the final subproject detailed designs, and are approved by ADB and disclosed prior to commencement of works
- (vii) coordinate with design engineers, to consider measures to avoid potential environmental impacts; ensure amended subproject designs/locations, if any, confirm with the subproject selection criteria
- (viii) review and provide recommendations on the approval of site-specific EMPs (SEMPs) of contractors; ensure that no construction works are commenced until SEMP are approved by PIU/PMU
- (ix) ensure overall compliance with all national, state, and local government rules and regulations; ensure that approvals/permits/licenses are obtained in a timely manner
- (x) ensure that construction works are not commenced until all applicable government clearances are obtained
- (xi) oversee and ensure that contractors and their subcontractors comply with labour legislations
- (xii) provide oversight on environmental management aspects of the project; establish a system to monitor environmental safeguards including monitoring the indicators set out in the monitoring plan of the EMP
- (xiii) review, monitor and evaluate effectiveness with which the SEMP, EMP, and Health and Safety Plans are implemented, and recommend necessary corrective actions
- (xiv) ensure that the IEEs including EMPs are updated in case of changes in detailed design that may occur during implementation phase
- (xv) confirm compliance with all measures and requirements set forth in the IEEs, the EMPs and any corrective or preventive actions set forth in safeguard monitoring reports
- (xvi) with support from PMDSC, consolidate quarterly monitoring reports from the PIUs and submit semi-annual environmental monitoring reports (SEMRs) to ADB during construction and annually during operation
- (xvii) ensure availability of budget for safeguards activities
- (xviii) ensure adequate awareness campaigns, information disclosure among affected communities and timely disclosure of final IEEs/EMP and SEMRs, including corrective action plans, if any, in project website and in a form accessible to the public
- (xix) assist in setting up of grievance redress mechanism (GRM), identifying grievance redressal committee (GRC) members and developing capacity of GRC members, PIUs, consultants, and contractors in addressing environmental safeguards-related issues/concerns/complaints
- (xx) ensure any grievances brought about through the GRM are redressed in a timely manner
- (xxi) ensure timely disclosure of draft/updated IEEs/EMP and SEMRs, including corrective action plans, if any, in project website and in a form accessible to the public

- (xxii) organize periodic capacity building and training programs on safeguards for PMU, PIUs and contractors

344. **Project Implementation Units (PIU).** The PIUs will be responsible for the day-to-day activities of project implementation in the field and will have direct supervision of all contractors. Each PIU will be headed by a Project Manager, and assisted by a Safeguards Officer, will oversee, and monitor the day-to-day progress and implementation including environmental safeguards. PMDSC will place one environmental engineer in each PIU, With the support of PMDSC, Safeguards Officer will:

- (i) Ensure compliance with government regulations and ADB requirements set forth in EARF, IEEs, including corresponding EMPs, and ADB SPS
- (ii) confirm to ESO/PMU that IEEs and EMPs are up-to-date and reflect detailed engineering designs, or any change in location, alignment, or components
- (iii) inform ESO/PMU promptly of any change in project locations / designs
- (iv) Liaise with local offices of regulatory agencies in obtaining clearances /approvals; assist PMU for clearances obtained at town/city level; prior to award of contract; confirm PMU that all statutory clearances are in place
- (v) Take necessary action for obtaining right of way prior to start of works
- (vi) Review and approve contractor SEMP
- (vii) Oversee day-to-day implementation of SEMP by contractors, including compliance with all government rules and regulations, and conduct regular site visits/inspections
- (viii) ensure that contractors and their subcontractors comply with labour legislations cited in IEEs and ADB's SPS Prohibited list requirements; ensure that workers are paid and treated according to the labor legislations
- (ix) ensure contractors and subcontractors (a) comply with the measures forth in the IEEs, the EMPs, and any corrective or preventative actions set forth in a Semiannual Environmental Monitoring Report; (b) make available a budget for all such environmental and social measures; (c) provide the PIU and PMU with a written notice of any unanticipated environmental, impacts that arise during construction, implementation or operation of the Project that were not considered in the IEE, the EMP; (d) adequately record the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction; and (e) reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction
- (x) ensure all workers are provided with OSH training prior to start of works and on a regular basis
- (xi) ensure strict implementation of OSH requirements including but not limited to contractors' no personal protective equipment (PPE), no work policy
- (xii) Recommend issuance of work construction work completion certification to the contractor upon verification of satisfactory post-construction clean-up.
- (xiii) Review monthly reports from contractors on SEMR implementation
- (xiv) Prepare quarterly reports on all aspects concerning environmental assessment, management, and monitoring, and submit to ESO/PMU
- (xv) Ensure continuous public consultation and awareness
- (xvi) Coordinate grievance redress process and ensure timely actions by all parties; and
- (xvii) Support all other environmental safeguards-related activities and tasks of the PMU as may be needed

345. **Project Management, Design and Supervision Consultants (PMDSC).** The PMU and PIUs will be supported by PMDSC's Environmental Expert at PMU level, and one environmental engineer in each PIU. Environmental Expert will assist in preparing, updating, reviewing, implementing, monitoring, and reporting of all tasks related to environmental safeguards. Environmental Engineer will assist in day-to-day monitoring of EMP implementation, regulatory compliance, grievance redress, reporting etc., Key tasks of Environmental Expert, assisted by Environmental Engineers at PIU level will include, but not limited to, the following:

- (i) Ensure that subprojects comply with key exclusion criteria and subproject selection guidelines stipulated in this EARF
- (ii) Conduct environmental categorization of subprojects per EARF, and validate when necessary to reflect project changes based on the final detailed design
- (iii) Work closely with design teams to include environmental considerations in subproject location, design and technical specifications
- (iv) Carry out environmental assessment (IEE) for the proposed subprojects and formulating environmental management plans (EMPs) for the different components of the civil works in line with ADB and national requirements
- (v) 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
- (vi) Ensure that the relevant provisions of EMPs, including costs of implementing the EMPs, are fully included in bid and contract documents, particularly in the bill of quantities and cost line items
- (vii) Identify statutory clearance / permissions / approvals required and assist the PMU and PIU in obtaining them
- (viii) Assist in including standards/conditions of regulatory clearances and consents, if any, in the project design
- (ix) Review designs, bidding documents, BOQ, and safeguard documents to ensure environment, health and safety considerations including issues related to COVID 19 pandemic, are adequately covered and costed
- (x) Calculate and provide the indicative cost estimate to implement EMPs, environmental monitoring programs, awareness programs, etc.
- (xi) Update the subproject IEE studies and reports and EMPs to reflect any changes in subproject detailed design or implementation.; the IEE shall reflect the final subproject design; the IEE shall also be updated in case of any unanticipated impacts
- (xii) Assisting with awareness campaigns for and meaningful consultations with affected communities
- (xiii) Identify and conduct capacity building activities for PMU, PIU and contractors
- (xiv) Ensure compliance with ADB's disclosure requirements as per the SPS
- (xv) Assist PMU/PIUs in reviewing and approving contractor SEMP, health and safety plan including Health and Safety COVID-19 Plan, and any other associated plans as required
- (xvi) Carry out site verification of EMP/SEMP implementation on a regular basis, and monitor the implementation and ensure compliance by the Contractors including subcontractors
- (xvii) Conduct regular monitoring and ensure that contractors and their subcontractors comply with labour legislations and ADB SPS Prohibited list requirements; ensure that workers are paid and treated according to the labor legislations

- (xviii) 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
- (xix) Assist the PIU in the preparation of environmental safeguards compliance/EMP implementation updates in the quarterly reports to PMU
- (xx) Monitor required environmental parameters and prepare semi-annual environmental monitoring report per the requirement of ADB
- (xxi) Identify training needs and implement capacity building activities on environmental safeguards for the PMU, PIU, contractors, and other stakeholders
- (xxii) Assist PIU in establishing GRM for the Project
- (xxiii) Assist PIU in grievance redress, advise the contractor on appropriate actions on grievances, ensure timely resolution and proper documentation
- (xxiv) Support all other environmental safeguards-related activities and tasks of the PMU and PIUs as may be needed.

346. **Design, Build and Operate (DBO) contractor.** The approved draft IEEs and EMPs are to be included in bidding and contract documents and verified by the PIUs and PMU. The PMU and PIUs will ensure that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable laws and regulations relating to environment, health and safety; (ii) reinstate pathways, other local infrastructure, and agricultural land to at least to their pre-project condition upon the completion of construction; and (iii) 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; (c) no discrimination in respect of employment and occupation; (d) allow freedom of association and effectively recognize the right to collective bargaining, and (e) 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.

347. The contractor will be required to appoint a full-time Environment, Health and Safety (EHS) supervisor on-site to implement the EMP. Prior to start of construction, Contractor will be required to prepare and submit to PMU and PIU, for review and approval. a Site-specific EMP (SEMP) No works can commence until SEMP is approved by PMU/PIU. Contractors will carry out all environmental mitigation and monitoring measures outlined in EMP, approved SEMP and their contracts. The contractor will be required to undertake day-to-day monitoring of the SEMP implementation and submit reports to the PIU on a monthly basis. A copy of the EMP/approved SEMP will always be 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. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work 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 the EARF, and ADB SPS
- (iii) Ensure that necessary pre-construction and construction permits are obtained
- (iv) Conduct orientation and daily briefing sessions to workers on environment, health and safety

- (v) Ensure that appropriate worker facilities are provided at the workplace and labor camps as per the contractual provisions
- (vi) Carry out site inspections on a regular basis and prepare site-inspection checklists/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) Comply with labour legislations, and ensure that subcontractors also implement labor legislations requirements, through cascading of requirements to subcontractors—HR policy, labor management requirements, any worksite specific grievance redress mechanism.
- (xi) Work closely with PIU Safeguards Officer and PMDSC Environmental Engineer to ensure communities are aware of project-related impacts, mitigation measures, and GRM; and
- (xii) Coordinate with the PIU and PMDSC on any grievances received and ensure that those are addressed in an effective and timely manner.

### C. Capacity Building and Training

348. **Capacity Development.** Executing and implementing agencies need to have a sustained capacity to manage and monitor environmental safeguards. Although specialist consultants support will be available to PMU and PIUs, it is necessary to mainstream safeguards in day-to-day working. Therefore, PMU and PIUs require capacity building measures for (i) a better understanding of the project-related environmental issues; and (ii) to strengthen their role in preparation of IEE, implementation of mitigation measures, and subsequent monitoring. Trainings and awareness workshops are included in the project with the primary focus of enabling the PMU and PIU staff to understand impact assessments and carry out environmental monitoring and implement EMPs. After participating in such activities, the participants will be able to review environmental assessments, conduct monitoring of EMPs, understand government and ADB requirements for environmental assessment, management, and monitoring (short- and long-term), and incorporate environmental features into future project designs, specifications, and tender documents and carry out necessary checks and balances during project implementation.

349. The PMDSC will facilitate the implementation of capacity building program for the PMU, PIU, and contractors, with specific topics on environmental safeguards such as but not limited to the list below. The contractors will be responsible for conducting site-specific/work-specific orientation on environmental safeguards for their workers prior to deployment to work sites. Typical modules would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in water supply projects; (iii) review of IEEs and integration into the project detailed design; (iv) improved coordination within nodal departments; (v) monitoring and reporting system; and (vi) project GRM. Specific modules customized for the available skill set will be devised after assessing the capabilities of the target participants and the requirements of the project. The proposed training program along with the frequency of sessions, is presented in Table 36. The capacity building program will be participatory to the extent possible and will employ variety approaches to be more effective (such as learning by doing, role playing, group exercises, on-the-job training, etc). A pre- and post-training assessment will be undertaken to measure the effectiveness of the program.

**Table 36: Capacity Building Program on EMP Implementation**

Description	Suggested Training Method	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
<b>1.Introduction and Sensitization to Environmental Issues (1 day)</b> - ADB Safeguards Policy Statement -EARF, subproject selection criteria, categorization etc., - Government of India and Government of Himachal Pradesh applicable environmental safeguard laws, regulations and policies including but not limited to core labor standards, OH and S, Covid -19 safety etc. - IEE preparation and EMP formulation -Incorporation of EMP into the project design and contracts -Monitoring, reporting and corrective	Lecture and group activities	All staff and consultants involved in the project  At PMU, Shimla	<b>200,000</b>  <b>(Lump sum)</b>	PMU cost



Description	Suggested Training Method	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
action planning				
<b>2.Preparing and implementing SEMP (1/2 day - once at the beginning and at a frequency of once in six months during implementation)</b> - site-specific 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 - Traffic management plan - Waste management plan - Site clean-up & restoration	Group activities, role play and case studies	All staff and consultants involved in the subproject  All contractors immediately after mobilization of the contractor  At four PIUs	<b>200,000 (Lump sum)</b>	PMU cost
<b>3.Contractors Orientation to Workers (1/2 day)</b> - Environment, health and safety in project construction (OHS, Covid-19 safety, core labor laws, spoils management, etc.)	Orientation via audio visual presentations, and on-job training	Once before the start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work  All workers (including unskilled laborers)	<b>100,000 (Lump sum)</b>	DBO Contractor s cost
<b>4. Implementation and Monitoring of O&amp;M phase EMP</b> -Occupational health and safety -Pollution control -sludge management -Any others	Lecture, hands-on trainings	After completion of construction	200,000 (Lump sum)	PMU cost

#### Summary of Capacity Building cost for EMP Implementation

Contractor Cost - INR 100,000  
 PMU Cost - INR 400,000  
 Total Cost - INR 500,000

## D. Monitoring and Reporting

350. 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.

351. 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 contractors for corrective actions if necessary.

352. Quarterly report shall be prepared PMDSC and PIU and submitted to PMU for review and further actions.

353. Based on monthly & quarterly reports and measurements, PMU (assisted by PMDSC) will submit Semi-Annual Environmental Monitoring Report (Appendix 20). Once concurrence from the ADB is received the report will be disclosed on JSV/PMU websites.

354. 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

355. Most of the mitigation measures require 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 compliance of 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/JSV will be provided as part of their management of the project, Cost for the capacity building program is included as part of the project. Cost of environmental management is given in Table 37.

**Table 37: Cost Estimates to Implement the EMP**

Sr. No.	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
A.	Implementation staff						
1	EHS Supervisor	Construction	per month	24	60,000	14,40,000	Civil works contract

Sr. No.	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
	<b>Subtotal (A)</b>					<b>14,40,000</b>	
<b>B.</b>	<b>Mitigation Measures</b>						
1	Consent for establishments & consent for operation from HPPCB.	Pre-construction	Lump sum	-	-	1,00,000	Project costs
2	Provision for tree cutting & compensatory plantation measures.	Construction	Per tree	500	3,000	15,00,000	Civil works contract
3	Traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Flags / Lights)	Construction	Lump sum	-	-	-	Cost included in civil works under Civil works contract
4	Civil Works (Water Sprinkling for dust suppression; Barricading; etc)	Construction	Lump sum	-	-	9,00,000	Civil works contract
5	Cost estimates for specific Biodiversity Mitigation Measures	Pre-Construction / Construction	Lump sum	=	=	26,00,000	Civil works contract
	<b>Subtotal (B)</b>					<b>51,00,000</b>	

Sr. No.	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
<b>C.</b>	<b>Monitoring Measures</b>						
1	Air quality monitoring	Construction	per sample	35	8,000	280,000	Civil works contract
2	Noise levels monitoring	Construction	Per sample	35	2,000	70,000	Civil works contract
3	Surface water monitoring	Construction	Per sample	7	8,000	56,000	Civil works contract
4	Ground water monitoring	Construction	Per sample	13	8000	104,000	
	<b>Subtotal (C)</b>					<b>510,000</b>	
<b>D.</b>	<b>Capacity Building</b>						
1	Training on EMP Implementation and COVID-19 protocol	Preconstruction	lump sum	-	-	4,00,000	PMU
2	Preparation of plans and protocols (traffic management plan, waste (spoils) management plan etc., chance find protocol	Preconstruction	Lump sum	-	-	2,00,000	Civil works contract
5	Contractors Orientation to Workers on EMP implementation & COVID-19 protocol	Prior to dispatch to worksite	Lump sum			1,00,000	Civil works contract
	<b>Subtotal (D)</b>					<b>5.00,000</b>	
	<b>Total (A+B+C+D)</b>				<b>INR</b>	<b>75,50,000.00</b>	

## **X. CONCLUSION AND RECOMMENDATION**

356. The process described in this document has assessed the environmental impacts of all elements of the proposed water supply subproject for SZ03 (District Solan) of Shimla zone. 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 resulting from project design or location were not considered significant.

357. Since the water supply system is in deteriorating condition, new water source and pipeline network have been included in the scope of this project with consumer connections. The project involves development of new water sources on Giri river and development of tubewells to augment the water scarcity, and these new sources have adequate water to meet the project demand. The Quality of raw water is good and is suitable for drinking water supply after conventional treatment and disinfection. All sources were duly selected keeping in mind the downstream conditions and water requirements and in this package, less than 1% of total available discharge will be utilised to serve a particular command area or scheme. For the new WTPs - backwash water & sludge management and chlorine safety facilities these facilities are included in the designs. Consent to Establish (CTE) followed by Consent for Operation (CFO) from the Himachal Pradesh State Pollution Control Board (HPSPCB), shall be obtained.

358. 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, occupational health and safety aspects. During the construction phase of pipeline work along the public roads, impacts will arise from the construction dust and noise; disturbance to residents, businesses, traffic by the construction work, and from the need to dispose of large quantities of waste soil. The social impacts (access disruptions) due to construction activities are minimal. These are the general impacts of construction in semi-urban, rural and habitation areas, and there are well developed methods of mitigation that are suggested in the EMP. Other specific measures include safe handling of wastes, minimize tree cutting and vegetation removal at various sites, and at hill sides proper erosion control measures.

359. The subproject area primarily a rural area and no subproject component is located in protected or sensitive environmental areas such as wildlife sanctuaries, eco sensitive zones, wetlands or archeologically protected areas. In Solan district two Wildlife Sanctuaries namely Chail and Majathal are located. Chail Wildlife Sanctuary in Solan district has also been notified as an Eco Sensitive zone. The proposed intake on Giri River at Grid SS-1 is at about 6 km from Chail Wildlife Sanctuary. Proposed SR Bawasni is at an aerial distance of ~31km from Majathal wildlife, Proposed intake structure on Giri river in Grid SS-1 is about 17 KM from Churdhar WLS in Sirmaur district and is about 23 KM from Shimla water cantonment WLS in Shimla District. The construction of these small components will not have any impact on the protected areas. There are no endangered terrestrial, avifauna or migratory species. Aquatic life is observed in Giri river which also act as the breeding and spanning area of Tor tor (Mahasheer) and other aquatic life.

360. Nearest proposed component from designated Ramsar site Renukaji lake in Shimla zone, of Package SZ-03 (Solan district) is proposed Intake structure on Giri River in Grid SS 1 which is about 37 KM (areal distance) from Renukaji lake.

361. None of the project components like intake, WTP, reservoirs are located in forest areas. However, at various locations, water pipelines will traverse forests areas but mostly along trails / earthen roads where there are no notable trees. Forest department has exempted from clearance procedure for laying of drinking water pipelines. The water pipelines will be laid along the roads and within the existing right of way with no notable tree felling envisaged as per preliminary design. However, it will be finalised during detailed design period and if any tree felling is required, compensatory tree plantation will be carried out in 1:10 ratio. No Protected Forest land needs to be diverted for this subproject.

362. Source sustainability is assessed for all ground and surface water sources. Water abstraction is within the safe withdrawal levels. From Giri Riever proposed abstraction is just 0.75% of the lean season flow. Water quality is good and can be supplied for potable purpose within minimal and conventional treatment.

363. Based on Integrated Biodiversity Assessment Tools (IBAT) and biodiversity assessment report prepared for SZ 03 subproject (Appendix 6B), the potential impacts arise because the presence of protected fish species Golden Mahseer (*Tor putitora*) in Giri river section. In the process of avoidance of potential impacts on the aquatic habitat, a small RCC Open frame intake structure has been designed near the river bank water where water is available even during lean seasons. Construction in river bed will be minimal to 2-4 RCC columns to support the structures which will be primarily located on the bank outside the water course. The water will be drawn via a intake pipe and submersible pump suspended to the open frame. The water requirement for rural water supply subproject is just about 0.75% of total volume of water during lean period. Thus; the extraction of water will not change hydrological flow of the Giri river.

364. Most impacts of HPRDWILP will result from considerable construction activities. Water pipelines will be laid along the public roads within rural habitations, access roads, and some through forest areas. Construction activities of other components like storage tanks, WTP etc., will be confined to the selected sites, and the interference with the public and community around is minimal. Some components are located in forests. 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. It may be noted that due to hilly terrain, some sites are not accessible by motorable roads, and in such cases, material will be transported manually, and work will be conducted with minimal tools and mostly manually. During the construction phase of pipeline, impacts arise from the invasive nature of excavation and trenching work mostly along the roads. However as most of the individual elements are relatively small and involve straightforward construction, the potential environmental impacts (i) will be mainly localized, temporary and not greatly significant; (ii) will not cause direct impact on biodiversity values and (iii) are common impacts of construction, and there are well-developed methods for their mitigation. Given the hilly terrain, cuts and fills can promote instability and erosion although proposed excavation will not be significant, necessary measures will be put in place to avoid construction during rains, and cuts, fills and sloped surfaces in construction sites will be properly stabilized to avoid erosion. Site clearance will be strictly confined to actual work area, no clearance of topsoil or vegetation will be done outside the site. Temporary containment drains, silt fences will be used to contain silt laden run off from sites. Various measures will be put in place for work in forest lands to avoid any impacts or damage / disturbance to flora and fauna.

In the entire project area, about 186 km distribution network of Galvanised Iron (GI) with diameter ranges from 25 mm to 125 mm; will be laid at a depth of 1m depending on topography and 5403 numbers new house service connections will be provided from the newly laid mains. If

the existing water pipes (MS ERW and GI pipes) are in the same lining of new water supply pipes, a contractor through a detailed survey will establish the requirement of old pipes removal for giving way to new pipelines. Those pipes shall be removed and disposed in a controlled manner so as not to harm the environment. During pipe laying works tree cutting is not envisaged as per preliminary design, however If any tree is required to be cut, compensatory tree plantation will be carried out in 1:10 ratio. There are no AC pipes in the existing water supply system.

365. Anticipated impacts of water supply during operation and maintenance will be related to operation of WTP, handling and application of chlorine, operation of pump houses, and repair and maintenance activities. Various provisions have already been made in the design to: recirculate wastewater from WTP; collect, thicken and dispose of sludge; chlorine safety; use energy efficient equipment, etc. Water supply system will be operated using the standard operating procedures following an operating manual, which will be prepared by the DBO contractor. Thus, considering the design and proposed operational procedures, it is unlikely that there will be any significant negative impacts due to operation of water supply system. It is important that proper O&M system as per the SOPs is must. Application and handling of chlorine gas will involve certain risks, and appropriate measures are suggested for safe application including PPEs, awareness programs and mock drills. The DBO Contractor will implement the operation stage EMP. There may be requirement of repairs in pipelines due to leaks and pipe bursts. Proper design and selection of good quality pipe material will mean that leaks are minimal. Leak repair work will be similar to the pipe-laying work.

366. 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. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

367. During the design and construction period of 24 months, the contractor will have the responsibility of maintaining the existing water supply levels and provide good quality water to consumers at least for the duration and adequate pressure being maintained presently. Operation and Maintenance of the all-project facilities will be carried out by DBO contractor for 5 years and then JSV or through an external operator. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only. Improved system operation will comply with the operation and maintenance manual and standard operating procedures to be developed for all the activities.

368. Stakeholders were involved in developing the IEE through face-to-face discussions, on site meetings, and a Town 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 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.

369. 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 EMP is approximately 75,50,000.00/= (Seventy-five lakhs fifty thousand only).

370. The draft 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 down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP.

371. 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. 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

372. The sub-project will benefit the general public by contributing to the long-term improvement of water supply, system and community livability in the project coverage area. 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. The successful implementation of the water supply project will result in better control over the NRW management, improved monitoring system and overall demand management along with energy reduction.

373. The potential adverse environmental impacts are mainly related to the construction period, which can be minimized by the mitigation measures and environmentally sound engineering and construction practices. Therefore, as per ADB SPS, the project is classified as environmental Category B and does not require further environmental impact assessment. However, to conform with government guidelines all necessary permissions and NOCs are to be obtained from the concerned departments prior to start of construction.

374. This IEE shall be updated by PMU during the detailed design phase to reflect any changes, amendments and will be reviewed and approved by ADB and disclosed. As exact nature of rehabilitation works will be known during detailed design, a detailed audit of existing facilities will be conducted as part of the updated IEE. Draft IEE recommends engaging an aquatic fauna/fishery expert during the detailed design phase to (i) confirm that there is no breeding/spawning ground within 1 km (upstream and downstream) of the proposed intake location, (ii) the intake screen in Giri river in SS 1 Grid is considered in the design to avoid entry of fish into pipe, and (iii) design pumping equipment near Giri river is with minimal noise levels.



## Appendix 1: Rapid Environmental Assessment Checklist

### WATER SUPPLY

#### Instructions:

- ❑ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- ❑ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
  - ❑ This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
  - ❑ Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

**Country/Project: India / Himachal Pradesh: Himachal Pradesh Rural Drinking Water Improvement and Livelihood Project Schemes- SZ03 Solan district (Shimla zone)**

**Sector/Division:** Urban Development

Screening Question	Yes	No	Remarks
<b>A. Project Siting</b>			
Is the project area			
Densely populated?		√	Sub-project area is sparsely populated. Subproject activities are extended to 16 villages panchayats comprising of 80 villages comprising of 95 habitations which is mainly rural and are enough away from habitations.
Heavy with development activities?		√	Most of the subproject area is spread across hilly rural area and is heavy development activity is not noticed.
Adjacent to or within any environmentally sensitive areas?		√	No, subproject area is not adjacent to or within any environmentally sensitive area. No Protected Forest land is involved in this subproject.
Cultural heritage site		√	Many religious places (temples) are in the subproject area but no ASI protected cultural heritage site is located nearby subproject sites.
Protected Area		√	No protected area is nearby
Wetland		√	
Mangrove		√	

Screening Question	Yes	No	Remarks
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	No special area for protecting biodiversity is adjacent to subproject area
Bay		√	
<b>B. Potential Environmental Impacts</b>		√	
Will the Project cause...			
Pollution of raw water supply from upstream wastewater discharge from Communities, industries, agriculture, and soil erosion runoff?		√	Not anticipated.
<ul style="list-style-type: none"> <li>▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?</li> </ul>		√	No Impairment of historical/cultural monuments/areas and loss/damage is anticipated as no such site is near to any project component.
<ul style="list-style-type: none"> <li>▪ Hazard of land subsidence caused by excessive ground water pumping?</li> </ul>		√	Groundwater abstraction is proposed within the sustainable limits; no excessive water pumping is envisaged
<ul style="list-style-type: none"> <li>▪ Social conflicts arising from displacement of communities?</li> </ul>		√	No land acquisition / displacement is involved. Social conflicts are not anticipated.
<ul style="list-style-type: none"> <li>▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?</li> </ul>		√	No such conflicts are anticipated. Adequate surface water is available in the project area and project envisages to use new and old surface water source which are perennial in nature.
<ul style="list-style-type: none"> <li>▪ Unsatisfactory raw water supply (e.g., excessive pathogens or mineral constituents)?</li> </ul>		√	Raw water is tested and found that it is suitable for potable purposes after conventional treatment. Periodic water testing pre- and post-treatment should be done.
<ul style="list-style-type: none"> <li>▪ Delivery of unsafe water to distribution system?</li> </ul>		√	Treated water meeting CPCB prescribed standards for drinking water at WTP will be delivered to distribution system.
<ul style="list-style-type: none"> <li>▪ Inadequate protection of intake works or wells, leading to pollution of water supply?</li> </ul>		√	Proper protection of intake works should be ensured and monitoring of raw water source will be ensured during O&M phase.
<ul style="list-style-type: none"> <li>▪ Over pumping of ground water, leading to salinization and ground subsidence?</li> </ul>		√	Not anticipated.
<ul style="list-style-type: none"> <li>▪ Excessive algal growth in storage reservoir?</li> </ul>		√	Proper treatment, post chlorination and regular cleaning of storage reservoirs will be conducted during operation
<ul style="list-style-type: none"> <li>▪ Increase in production of sewage beyond capabilities of community facilities?</li> </ul>		√	Sewerage and sanitation system are required to be developed in the project area.
<ul style="list-style-type: none"> <li>▪ Inadequate disposal of sludge from water treatment plants?</li> </ul>		√	Project design has appropriate provision for sludge drying and disposal.

Screening Question	Yes	No	Remarks
<ul style="list-style-type: none"> <li>Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?</li> </ul>		√	The subproject area is in sparsely located hilly terrain and adequate buffer is available; all pumping stations and treatment plants will be in enclosed campuses. Pumping stations will be enclosed with noise control walls to minimize noise propagation.
<ul style="list-style-type: none"> <li>Impairments associated with transmission lines and access roads?</li> </ul>	√		During lying of transmission lines, temporary impairments are expected along the routes. The impact is temporary and reversible and would be mitigated following mitigation measures per EMP.
<ul style="list-style-type: none"> <li>Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.</li> </ul>		√	Measures for safe handling, storage and usage of chlorine are included to avoid any health hazards. No other hazardous chemicals are expected to be used during construction phase.
<ul style="list-style-type: none"> <li>Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?</li> </ul>		√	To avoid health hazards, measures of safe handling, storage and usage of chlorine will be ensured, and Operation and Maintenance recommended by the manufacturer, and the existing norms and guidelines for ensuring the safety of workers will be followed.
<ul style="list-style-type: none"> <li>Dislocation or involuntary resettlement of people</li> </ul>		√	No dislocation or involuntary resettlement of people is anticipated.
<ul style="list-style-type: none"> <li>Social conflicts between construction workers from other areas and community workers?</li> </ul>		√	No such conflicts are envisaged. Preference will be given to local labour force as far as possible; in case it is unavoidable, labour camps and facilities will be provided appropriately,
<ul style="list-style-type: none"> <li>Noise and dust from construction activities?</li> </ul>	√		Noise and dust suppression measures shall be taking. All construction machineries employed will comply with noise emission standards of CPCB. Appropriate arrangements of water sprinkling, etc. for dust suppression shall be made.
<ul style="list-style-type: none"> <li>Increased road traffic due to interference of construction activities?</li> </ul>	√		During excavation and pipeline laying along roads temporary interference in traffic is expected. More so, transportation of construction material will also result in increase in traffic. Proper traffic management and construction planning will be ensured to minimize the interference.
<ul style="list-style-type: none"> <li>Continuing soil erosion/silt runoff from construction operations?</li> </ul>		√	All measures to ensure silt run off due to construction operation shall be employed. No construction will be allowed during rainy days.
Delivery of unsafe water due to poor O&M treatment processes (especially mud		√	The Contractor shall prepare an O&M manual for approval of the Employer and

Screening Question	Yes	No	Remarks
accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?			training will be given to the staff operating the plant to ensure proper O&M.
Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	Not anticipated. Proper monitoring of process water shall be ensured. Care should be taken during O&M period to ensure that corrosive chemicals are not entering in the distribution system.
Accidental leakage of chlorine gas?		√	Measures for safe handling of chlorine are included in EMP.
Excessive abstraction of water affecting downstream water users?		√	The surface water sources identified for subproject area has enough flow and abstraction for the project is negligible, hence will not affect the downstream users.
Competing uses of water?		√	Development of new sources is envisaged in the project. Adequate capacity of raw water sources is available for the project.
Increased sewage flow due to increased water supply	√		Sewerage system is also required to be planned for project area.
Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	√		Sanitation and Sewerage system is also required to be planned for project area.
<ul style="list-style-type: none"> <li>Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?</li> </ul>		√	Preference shall be given to the local work force for the execution of the project. Most of the unskilled workers will be hired locally, some of skilled workers will be brought from outside but numbers will not so large to have impact on the social infrastructure and services.
<ul style="list-style-type: none"> <li>Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel, and other chemicals during operation and construction?</li> </ul>		√	Not anticipated: No such explosives and chemicals are proposed to be used during operation and construction.
<ul style="list-style-type: none"> <li>Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation, and decommissioning?</li> </ul>	√		Community safety risk may be there during construction during excavation for pipe laying, equipment and vehicle operation. for which mitigation measures will be adopted by the contractor

### A Checklist for Preliminary Climate Risk Screening

**Country/Project Title:** India / Himachal Pradesh: Himachal Pradesh Rural Drinking Water Improvement and Livelihood Project Schemes- SZ03 (Solan district, Shimla zone)

**Sector:** Urban Development

**Subsector:** Water Supply

**Division:** SARD/SAUW

Screening Questions		Score	Remarks <sup>24</sup>
<b>Location and Design of project</b>	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	As per local enquiries carried out during field visits and from the vulnerability mapping of the district for flood prone areas indicates that the subproject components are not located in the flood prone/tropical cyclone areas. However, WTP sites adjacent to source/river/khud are flood prone.
	Would the project design (e.g., the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	0	
<b>Materials and Maintenance</b>	Would weather, current, and likely future climate conditions (e.g., prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current, and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
<b>Performance of project outputs</b>	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) throughout their design lifetime?	0	

<sup>24</sup> If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

Response	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, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a 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**

Other Comments: The anticipated environmental impacts are very marginal and the construction activity does not impose any threat to the existing climatic condition

**Appendix 2: Drinking Water Standards, Surface Water Quality Classification 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 <sup>a</sup>			WHO Guidelines for Drinking-Water Quality, 4 <sup>th</sup> Edition, 2011 <sup>b</sup>	Applicable Per ADB SPS <sup>c, d</sup>
	Parameter	Unit	Max. Concentration Limits <sup>d</sup>		
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			

<sup>a</sup> Bureau of India Standard 10200: 2012.

<sup>b</sup> Health-based guideline values.

<sup>c</sup> 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.

<sup>d</sup> 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 be 50 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 less
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 <sup>a</sup>	India Ambient Air Quality Standard ( $\mu\text{g}/\text{m}^3$ ) <sup>b</sup>	WHO Air Quality Guidelines ( $\mu\text{g}/\text{m}^3$ )		Applicable Per ADB SPS <sup>e</sup> ( $\mu\text{g}/\text{m}^3$ )
			Global Update <sup>c</sup> 2005	Second Edition 2000	
PM <sub>10</sub>	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)
PM <sub>25</sub>	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 <sub>2</sub>	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 <sub>2</sub>	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 <sub>3</sub> )	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 <sub>3</sub> )	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)
Benzene (C <sub>6</sub> H <sub>6</sub> )	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)

<sup>a</sup> Sensitive area refers to such areas notified by the India Central Government.

<sup>b</sup> Notification by Ministry of Environment and Forests, Government of India Environment (Protection) Seventh Amendment Rules, 2009

<sup>c</sup> WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006

<sup>d</sup> Air Quality Guidelines for Europe Second Edition. WHO 2000.

<sup>e</sup> 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

**Table 4: Vehicle Exhaust Emission Norms****1. Passenger Cars**

<b>Norms</b>	<b>CO(g/km)</b>	<b>HC+ NOx(g/km)</b>
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**

<b>Norms</b>	<b>CO( g/kmhr)</b>	<b>HC (g/kmhr)</b>	<b>NOx (g/kmhr)</b>	<b>PM(g/kmhr)</b>
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 Monoxide; 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 <sup>-1</sup> )
	NO <sub>x</sub> +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<sub>x</sub> – 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 :

$$H = h + 0.2 \times \sqrt{\text{KVA}}$$

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 Noise Level Standards

Receptor/ Source	India National Noise Level Standards <sup>a</sup> (dBA)		WHO Guidelines Value for Noise Levels Measured Out of Doors <sup>b</sup> (One Hour LA <sub>q</sub> in dBA)		Applicable Per ADB SPS <sup>c</sup> (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 17<sup>th</sup> May 2002 at serial no.94 and its amendments vide GSR No 520(E) dated 1<sup>st</sup> July 2003; GSR 448(E), dated 12<sup>th</sup> July 2004; GSR 315(E) dated 16<sup>th</sup> May 2005; GSR 464(E) dated 7<sup>th</sup> August 2006; GSR 566(E) dated 29<sup>th</sup> August 2007 and GSR 752(E) dated 24<sup>th</sup> October 2008; G.S.R. 215 (E), dated 15<sup>th</sup> 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 1<sup>st</sup> 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 1<sup>st</sup> 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 1<sup>st</sup> 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 1<sup>st</sup> 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 1<sup>st</sup> 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: 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 29<sup>th</sup> 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 25<sup>th</sup> 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), dated the 3<sup>rd</sup> 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 of 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 devise 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 31<sup>st</sup> 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 30<sup>th</sup> August for each financial year based on reports given by State Pollution Control Boards or 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 5: 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 Labor (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.3500/- per month or less. The bonus to be paid to employees getting Rs.2500/- per month or above up to Rs.3500/- per month shall be worked out by taking wages as Rs.2500/- 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 remodeling 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 biodegradable, 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 bury 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 and appoint competent person to drive or operate such vehicles and equipment
- 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 than 1.6 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 6: Status of Land Records

#### Details of Proposed Components under Shimla Zone: SZ03- District Solan

Scheme Name	Village	Proposed Components	Coordinates	Area Required (Sqm)/ Dimensions	Ownership	Khasara No	Availability of Land Records/ No Objection Certificate (For Private Land)	Present Land Use of the Plot	Involuntary Resettlement Impact
LWSS Sunaradi Anji  LWSS Satyana Shiva  LWSS Garkhal Larah  WSS Kasauli  LWSS Gorthi  LWSS Seri Thana  WSS Jhanger  LWSS Jangeshu  LWSS Hurang Kotla  LWSS Bhaguri	Kotla Barog	Proposed Intake Structure on Giri river	30°52'28.02"N 77°13'7.01"E	Length- 2.5 m and Breadth- 2 m	Revenue Department	6	Yes	Unused Vacant Land	Nil
	Kotla Barog	Proposed Water Treatment Plant	30°52'28.02"N 77°13'7.01"E	6300	Revenue Department	6	Yes	Unused Vacant Land	Nil
	Kotla Barog	Proposed PH Stage-I At Giri River	30°52'28.02"N 77°13'7.01"E	63.15	Revenue Department	6	Yes	Unused Vacant Land	Nil
	Shamlhech	Proposed PH Stage-II Bigad	30°51'38.03"N 77° 4'53.09"E	63.15	Revenue Department	90/1	Yes	Unused Vacant Land	Nil
	Dharampur	Proposed PH Dharampur	NA	63.15	Revenue Department	24	Yes	Unused Vacant Land	Nil
	Oria	Proposed MBR Oria	30°55'25.31"N 76°58'35.79"E	81	Revenue Department	10	Yes	Unused Vacant Land	Nil
	Dharampur	Proposed MBR Dharampur	NA	81	Revenue Department	24	Yes	Unused Vacant Land	Nil
	Kasuali	Proposed MBR Kasuali	30°53'52.99"N 76°58'8.16"E	81	Cantonment Board	84	Yes	Unused Vacant Land	Nil
	Garkhal	Proposed MBR Garkhal Larah	30°54'17.83"N 76°58'59.33"E	169	Revenue Department	1413/1228	Yes	Unused Vacant Land	Nil
	Badeha	Proposed MBR Badeha	30°54'49.63"N 76°58'47.95"E	64	Revenue Department	566	Yes	Existing Tank	Nil
	Chabal	Proposed MBR Chabal	30°55'25.31"N 76°58'35.79"E	81	Revenue Department	1	Yes	Existing Tank	Nil
	Jhanger	Proposed MBR Jhanger	30°54'10.68"N 76°55'38.79"E	64	Revenue Department	604	Yes	Unused Vacant Land	Nil

Scheme Name	Village	Proposed Components	Coordinates	Area Required (Sqm)/ Dimensions	Ownership	Khasara No	Availability of Land Records/ No Objection Certificate (For Private Land)	Present Land Use of the Plot	Involuntary Resettlement Impact
	Upmohal Nalhog	Proposed SR Seri Thana	30°51'27.80"N 76°59'2.21"E	81	Revenue Department	239	Yes	Existing Tank	Nil
	Kasuali	Proposed SR Kasauli	30°54'29.60"N 76°58'17.05"E	81	Revenue Department	1	Yes	Existing Tank	Nil
	Nichli Gaongri	Proposed SR Sunaradi Anji	30°56'12.33"N 76°59'5.95"E	81	Revenue Department	1	Yes	Existing Tank	Nil
	Banti	Proposed SR Satyna Shiva	30°56'14.78"N 76°57'13.70"E	121	Private	383	Yes	Existing Tank	Nil
	Ahni	Proposed SR Shilar	30°54'20.34"N 76°59'26.94"E	64	Revenue Department	220/218/49	Yes	Existing Tank	Nil
	Hurang	Proposed SR Hurang Combined	30°55'24.72"N 76°59'53.99"E	81	Revenue Department	573	Yes	Unused Vacant Land	Nil
	Jangeshu	Proposed SR Jangeshu	30°53'17.94"N 76°56'59.93"E	81	Revenue Department	178	Yes	Existing Tank	Nil
	Jhanger	Proposed SR Jhanger-2	30°54'18.80"N 76°55'27.33"E	81	Revenue Department	604	Yes	Unused Vacant Land	Nil
	Jhanger	Proposed SR Jhanger-3	30°54'28.77"N 76°55'24.66"E	81	Revenue Department	458	Yes	Unused Vacant Land	Nil
	Tamber Nagar	Proposed SR Bhaguri	30°57'3.08"N 76°54'57.24"E	81	Revenue Department	109	Yes	Unused Vacant Land	Nil
	Shamlhech	Proposed Sumpwell Stage-2 Bigad	30°51'38.03"N 77° 4'53.09"E	Dia 6.5 m and depth 5.5 m	Revenue Department	90/1	Yes	Unused Vacant Land	Nil
LWSS Dumanwala	Baddi	Proposed Tubewell	30°59'16.62"N 76°46'12.09"E	200 mm dia and 125m deep	Revenue Department	328/322/280	Yes	Unused Vacant Land	Nil
	Baddi	Proposed WTP Dumanwala	30°59'18.00"N 76°46'12.70"E	675	Revenue Department	328/322/281	Yes	Unused Vacant Land	Nil
	Baddi	Proposed PH Dumanwala	Same campus of WTP		Revenue Department	328/322/282	Yes	Unused Vacant Land	Nil

Scheme Name	Village	Proposed Components	Coordinates	Area Required (Sqm)/ Dimensions	Ownership	Khasara No	Availability of Land Records/ No Objection Certificate (For Private Land)	Present Land Use of the Plot	Involuntary Resettlement Impact
	Baddi	Proposed SR Dumanwala	31° 0'3.38"N 76°46'54.08"E	64	Revenue Department	515/505/280	Yes	Unused Vacant Land	Nil
	Raipur	Proposed SR Jatti Majra	31° 0'25.43"N 76°46'58.80"E	100	Revenue Department	61	Yes	Unused Vacant Land	Nil
	Haliara	Proposed SR Basolan	31° 0'57.87"N 76°46'50.43"E	81	Revenue Department	46	Yes	Unused Vacant Land	Nil
LWSS Landeywall	Chakjangi	Proposed Tubewell	30°55'18.70"N 76°47'19.00"E	200 mm dia and 90 m deep	Revenue Department	63	Yes	Unused Vacant Land	Nil
	Chakjangi	Proposed WTP Landeywall	30°55'18.64"N 76°47'18.77"E	325	Revenue Department	63	Yes	Unused Vacant Land	Nil
	Chakjangi	Proposed PH Landeywall near WTP	Same campus of WTP		Revenue Department	63	Yes	Unused Vacant Land	Nil
	Landeywall	Proposed PH Stage 2	30°55'27.99"N 76°46'40.09"E	63.15	Revenue Department	1699/1119/362	Yes	Unused Vacant Land	Nil
	Chakjangi	Proposed SR Sitalpur (Staging - 15 m)	30°55'8.15"N 76°46'45.40"E	81	Revenue Department	217	Yes	Unused Vacant Land	Nil
	Landeywall	Proposed SR Landeywall	30°55'24.94"N 76°46'26.36"E	81	Revenue Department	63	Yes	Unused Vacant Land	Nil
LWSS Amroo Bawasni	Bagbania	Proposed Tubewell Amroo Bawasni	31° 00' 11.8"N 76°44' 08.07E	200 mm dia and 125m deep	Revenue Department	223	Yes	Unused Vacant Land	Nil
	Bagbania	Proposed WTP Amroo Bawasni	30°59'59.23"N 76°44'23.94"E	445	Revenue Department	223	Yes	Unused Vacant Land	Nil
	Bagbania	Proposed PH Amroo Bawasni	Same campus of WTP		Revenue Department	223	Yes	Unused Vacant Land	Nil
	Jaman Da	Proposed PH Stage-1	31° 2'26.73"N 76°47'26.40"E	48	Revenue Department	509	Yes	Unused Vacant Land	Nil
	Banera	Proposed PH Stage-2	31° 2'24.47"N 76°48'2.48"E	48	Revenue Department	509	Yes	Existing PH	Nil

Scheme Name	Village	Proposed Components	Coordinates	Area Required (Sqm)/ Dimensions	Ownership	Khasara No	Availability of Land Records/ No Objection Certificate (For Private Land)	Present Land Use of the Plot	Involuntary Resettlement Impact
	Bavasani	Proposed MBR Amroo	31° 2'12.56"N 76°48'38.74"E	64	Revenue Department	304	Yes	Unused Vacant Land	Nil
	Banera	Proposed MBR Banera	31° 1'42.23"N 76°48'23.86"E	64	Revenue Department	272	Yes	Unused Vacant Land	Nil
	Amru	Proposed SR Amroo	31° 2'17.21"N 76°48'33.56"E	81	Revenue Department	373	Yes	Unused Vacant Land	Nil
	Bavasani	Proposed SR Bavasni (Staging - 20 m)	31° 2'13.03"N 76°48'49.19"E	81	Revenue Department	376	Yes	Unused Vacant Land	Nil
	Kolka	Proposed SR Kolka	31° 1'39.18"N 76°47'6.79"E	64	Revenue Department	248	Yes	Unused Vacant Land	Nil
LWSS Barotiwala	Barotiwala	Proposed WTP Barotiwala	30°54'14.38"N 76°50'26.95"E	885	Revenue Department	154/198	Yes	Unused Vacant Land	Nil
	Bated	Proposed SR Damuwala (Staging - 15 m)	30°55'13.67"N 76°51'34.36"E	144	Revenue Department	890	Yes	Unused Vacant Land	Nil
LWSS Mandhala	Mandhala	Proposed T/well	30°53'54.53"N 76°52'14.64"E	200 mm dia and 125m deep	Revenue Department	1324/1	Yes	Unused Vacant Land	Nil
	Mandhala	Proposed SSF-Mandhala	30°53'50.13"N 76°52'23.09"E	485	Revenue Department	1324/1	Yes	Unused Vacant Land	Nil
	Mandhala	Proposed PH-Mandhala			Revenue Department	743	Yes	Unused Vacant Land	Nil
	Mandhala	Proposed SR Mandhala	30°54'6.76"N 76°52'45.37"E	100	Revenue Department	1713/1697	Yes	Existing Tank	Nil
	Brotiwala	Proposed PH Mandhala-2	30°54'40.76"N 76°51'28.97"E	48	Revenue Department	459	Yes	Unused Vacant Land	Nil
	Surajpur	Proposed SR Surajpur	30°55'2.43"N 76°52'38.21"E	81	Revenue Department	723	Yes	Unused Vacant Land	Nil

## Appendix 6A: Information of aquatic life / fish species

Information on aquatic life / Fish Species						
Grid No.	Proposed Source	Discharge in cusec.	Location	Fish Species found in the stream	Migrant / Resident Fish	Breeding and Spawning area of Fish
SS1	Proposed intake structure at Gini river.	20	31°46'20.5N 76°19'0.0E	(i) <u>Shizothorax</u> <u>sp.</u> (Gugli). (ii) <u>Tor</u> <u>tor</u> (Mahseer). (iii) <u>Cyprinus</u> <u>carpio</u> (Common Carp).	Resident.	(i) For Mahseer breeding shallow water areas with stone pitching are favoured. (ii) For Common Carp breeding shallow water areas with sticky substratum such as Hydrilla grass are favoured.

  
 Dr. Som Nath  
 Assistant Director Fisheries  
 Solan, Dist. Solan (H.P.)

**Appendix 6B: Biodiversity Report**

## Initial Environmental Examination

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Document Stage: Draft

Project Number:

November 2021

IND: Himachal Pradesh Rural Drinking Water  
Improvement and Livelihood Project

Package No. SZ03

Appendix 6B: Biodiversity Report

Prepared by Jal Shakti Viibhag, Government of Himachal Pradesh for the Asian Development Bank.

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## EXECUTIVE SUMMARY

This document is a Biodiversity Report for renovation and remodelling of water supply in 2 Grids of Package (SZ03) Shimla Zone in District Solan Himachal Pradesh, India (hereafter “the subproject”). This Biodiversity Report is a supplement to the draft subproject Initial Environmental Examination Report.

The subproject components under 2 Grids include Total 5 intakes, 16 Water Treatment Plants (WTPs), 11 pump houses, 9 Main Balancing Reservoirs (MBRs) and 21 Service Reservoirs (SRs) are located in Giri River Catchment in hilly terrain with landuse of habitation, water bodies and forest. Project is proposed for financing by the Asian Development Bank (ADB) and has been identified as a Category B project owing to the potential for adverse environmental impacts that are irreversible, site -specific and can be lower down by application of mitigation measures.

The potential impacts arise because the presence of protected fish species Golden Mahseer (*Tor putitora*) in Grid SS-1 on Bank of Giri River. There is very little information on the status and distribution of endangered fish species in the subproject landscape, so this Biodiversity study has taken a precautionary approach.

There are total 22 species of threatened category and 4 restricted range species are found in 50km radius in subproject components area as result of IBAT analysis. The species presence has been mapped from Kargnoo to Sataun of approx. 70km section of Giri River in Solan and Sirmaur district. The investigations as part of EIA study by EIA Division, ICFRE, Dehradun under the project Renuka Multipurpose Project in Giri River reveals that the population of the Golden Mahseer contributes significantly to the fishery in the main river (main stream of Giri river) where it comprises 37-40% of the total catch. The field assessment as part of IEE report preparation, as per the consultation with fishery department and local community, GiriPul a location on 2km upstream of subproject component is a recognized breeding ground for the fish species of Golden Masheer (*Tor putitora*).

The subproject components for Grids, SS-1 are located largely in the proximity of aquatic habitat for freshwater fish species of *Tor putitora*. In the process of avoidance of potential impacts on the aquatic habitats due to construction and operations, small intake well on bank of Giri River is proposed for water source under SS-1. No loss of aquatic habitat for fish species is anticipated due to abstraction of water from Giri River as water demand for SS-1 is 11.5 LPS, whereas the Lean period of the Giri River is 2320 LPS.

Some disturbance to aquatic habitat from construction of water intake structure for SS-1, as it will take place on the bank of river away from River water. The potential impacts on fish habitat are mainly due to construction activities i.e., increase in water pollution, noise from construction machinery. The water will draw through submersible pump from Giri River. The noise from submersible pump and change in pressure of water natural flow upto 2m radius due to intake operation are potential impacts during operational stage. The overall significance of potential impacts (before mitigation) on aquatic species in Giri River assessed as *Medium* significant.

In this report a small number of additional/specific mitigation and management measures necessary to reduce residual impacts on Critical Habitat-qualifying biodiversity are mentioned. Total additional mitigation costs are thus anticipated to be \$,35000 USD.

After the general and specific mitigation measures, the subprojects are expected to have only negligible residual impacts. In summary, this subproject will be compliant with ADB biodiversity safeguards (ADB 2009) after application of mitigation measures; as there will be:



- no measurable adverse impacts on critical habitat that could impair its ability to function; and
- no reduction in the population of any recognized endangered or critically endangered species.

## **Biodiversity Report – MZ01**

### **A. Introduction**

1. The ADB Safeguard Policy Statement (ADB 2009) requires assessment of whether the project is planned in an area that may qualify as Critical Habitat or Natural Habitat. This assessment followed more detailed guidance in International Finance Corporation Performance Standard 6 and its accompanying guidance note (IFC 2012, 2019).

2. This biodiversity assessment was rapidly developed through a desktop review of existing Project documentation and other existing grey and published literature supported by the results of the proximity report generated by the Integrated Biodiversity Assessment Tool (IBAT). Except where necessary, this document does not repeat information available in the Project IEE. There is very limited recent information available on the presence, status or distribution of biodiversity in the subproject component area; while some field surveys and stakeholder consultations were conducted while preparing the IEE. Most available information used in this assessment is necessarily from the document on fish species in catchment area of Beas river or broad-scale species distribution maps (IUCN 2020).

### **B. Purpose and objectives**

3. This document is Critical and Natural Habitat Assessment for the proposed Package-1 of Rural Water Supply Scheme at District Solan under India: Himachal Pradesh of Rural drinking Water Supply Improvement Project (HPRWSP). This subproject is included in HPRWSP to be financed by ADB. The assessment has been carried out to identify critical habitats and anticipated impacts from the subproject implementation. As outcome of the assessment identify the recommended next steps for the subproject.

#### **B.1 The subproject components under Package-SZ03**

4. This subproject is for renovation and remodelling of 15 Schemes under 2 Grids of Package SZ 03, Shimla Zone (District : Solan) to supply @70lpcd water for 24X7 with the automation of pumps and real-time monitoring of water quality at water treatment plants. The project area of CW-SZ03 comprises of 16 village panchayats covering 80 villages and 132 habitations. Total 5 intakes, 6 Water Treatment Plants (WTPs), 11 pump houses, 9 Main Balancing Reservoirs (MBRs) and 21 Service Reservoirs (SRs) have been proposed in total 2 grids (SS-1, & SS-9) under package-SZ03. The proposed rising mains or raw water transmission mains of 68 km are used to either lift the water from source / intakes to WTPs / sump wells or transport the water from source to WTPs. The proposed length of the pipe for Gravity Main is about 49 Km of diameter range from 65 to 80mm. The details of subproject component area given in Table-1 and location of project area in Figure 1.

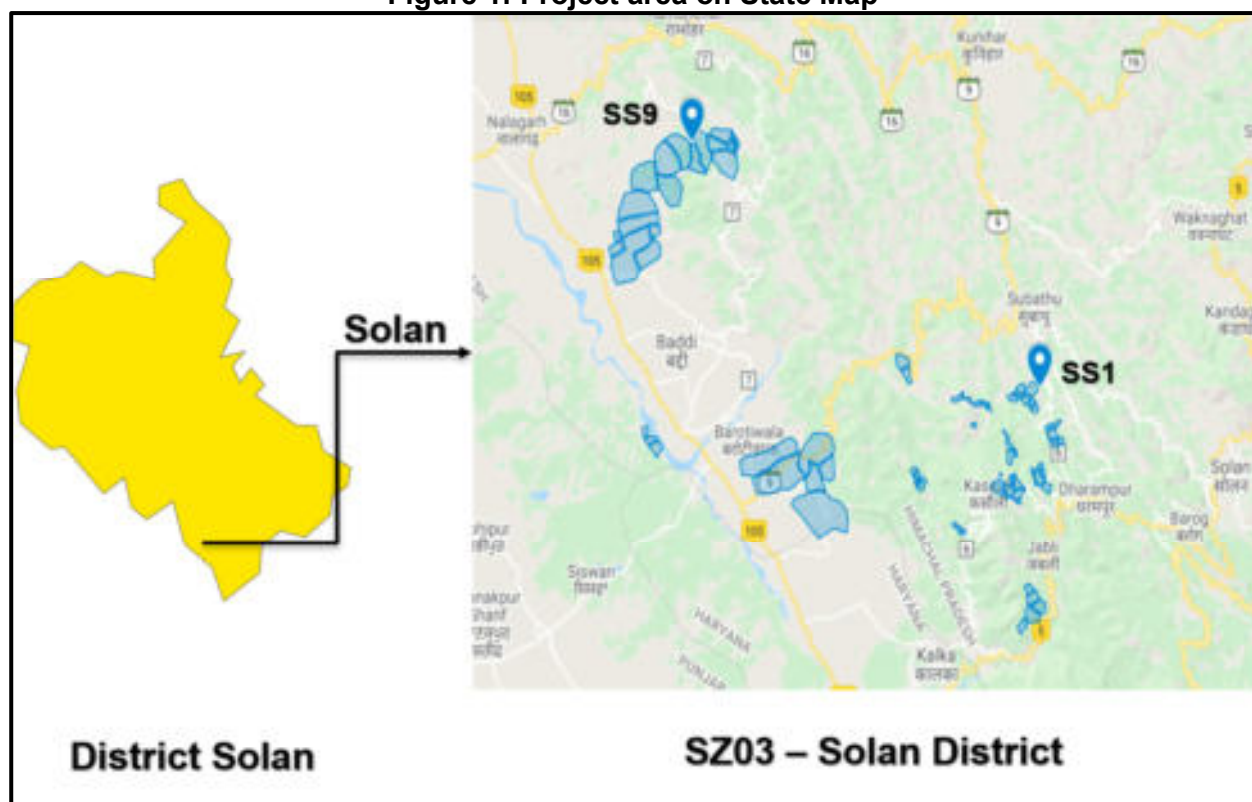
**Table 1: Details of Proposed Infrastructure Under SZ 03 of Solan District**

<b>Grid No</b>	<b>Infrastructure</b>	<b>Description</b>
SS-1	Proposed Water Source	Proposed one (1) intake structure (30°87'49.56"N 77°21'77.56"E) at Giri River
	WTPs	WTP of 2.3 MLD at Giri River

Grid No	Infrastructure	Description
	Pump houses	3 Pump houses 4. At Giri River 5. At Bigad 6. At Dharampur
	MBR	7 Nos. MBR (65 KL, 65 KL, 65 KL, 215 KL, 20 KL, 40 KL, and 20 KL)
	SR	7 Nos. SRs (40 KL, 40 KL, 40 KL, 130 KL, 25 KL, 40 KL, 45 KL, 60 KL, 40 KL, 60 KL)
	Rising Main	34.4 KMs (Día 200 mm)
	Gravity Main	42 KM (Día 50-150 mm)
	Distribution Main	68.4 KM (Día 25 mm to 125 mm)
SS-9	Proposed Water Source	Proposed four 4 Borewells sources at <ul style="list-style-type: none"> <li>Proposed Tube Well Amroo Bawasni (6 LPS) at 30°59'16.62"N 76°46'12.09"E</li> <li>Proposed Tube Well Dumanwala (8 LPS) at 30°55'18.70"N 76°47'19.00"E</li> <li>Proposed Tube Well Landeywall (3 LPS) at 31° 00' 11.8"N 76°44' 08.07E</li> <li>Proposed Tube Well Mandhala (7 LPS) at 30°53'54.53"N 76°52'14.64"E</li> </ul>
	WTPs	Construction of five WTPS : <ul style="list-style-type: none"> <li>Proposed Slow Sand Filter Amroo Bawasni (208 KLD)</li> <li>Proposed Slow Sand Filter Dumanwala (355 KLD)</li> <li>Proposed Slow Sand Filter Barotiwala (669 KLD)</li> <li>Proposed Slow Sand Filter Mandhala (320 KLD)</li> <li>Proposed Slow Sand Filter Landeywall (63.37 KLD)</li> </ul>
	Pump houses	Construction of eight PHs: <ul style="list-style-type: none"> <li>Pump House near Proposed WTP AmrooBawasni</li> <li>Pump House near Proposed WTP Dumanwala</li> <li>Pump House near Proposed Sumpwell Stage-1</li> <li>Pump House near Proposed Sumpwell Stage-2</li> <li>Pump House near Proposed Slow Sand Filter Landeywall</li> <li>Pump House near Existing Sumpwell in Village Landeywall</li> <li>Pump House near Proposed WTP Mandhala</li> <li>Pump House in Mandhala village</li> </ul>
	MBR	2 Nos. MBRs (20 KL, 20 KL)

Grid No	Infrastructure	Description
	SR	11 Nos. SRs (245 KL, 65 KL, 30 KL, 100 KL, 40 KL, 25 KL, 40 KL, 50 KL, 70 KL, 80 KL and 35 KL)
	Rising Main	38.14 KM (Dia 50 mm to 125 mm)
	Gravity Main	7.13 KM (Dia 50 and 80 mm)
	Distribution Main	117.6 KM (Dia 25 mm to 125 mm)

**Figure 1: Project area on State Map**



5. An Initial Environmental Examination (IEE) has been drafted following ADB Safeguard Policy Statement (SPS: ADB 2009), this has been identified as a Category B project owing to the potential for adverse environmental impacts that are irreversible, site -specific and can be lower down by application of mitigation measures.

6. The ADB SPS requires projects in Natural Habitat to design mitigation measures to achieve at least no net loss of biodiversity. It requires projects in Critical Habitat to demonstrate *'no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its high biodiversity value or the ability to function'*, no *'reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be*

*compromised*, and mitigation of any lesser impacts. This study assesses the risks and presents the Project's strategy for alignment with the ADB SPS.

7. Following the draft ADB *Environmental Safeguards Good Practice Sourcebook* (ADB 2012), this assessment report the presence of Critical and Natural Habitat in the Project area, evaluates potential impacts on priority biodiversity, outlines Project commitments to mitigation and management measures to achieve at least no net loss for Critical and Natural Habitat, and summarizes an approach to monitoring and evaluation to give assurance of Project performance. It is a living document and can be adapted during the Project life in response to new information on the scale or significance of Project impacts or mitigation and management measures.

### **C. Critical Habitat Assessment Process**

8. Habitats that are critical to the survival of International Union for the Conservation of Nature (IUCN) designated Critically Endangered or Endangered species, migratory species, congregatory species and endemic or restricted range species are classified as critical habitats.

9. The screening of Critical Habitat in the area has been conducted based on species which enlisted in redlist of IUCN. The presence of habitat of these species in the area will designate Critical Habitat. There are five criterion set out in updated Performance Standard No 6 Guidance note (IFC 2019) to consider the area as Critical Habitat. The five criterion for Critical Habitat determination is:

- Criterion 1: Critically Endangered and Endangered Species
- Criterion 2: Endemic and Restricted range Species
- Criterion 3: Migratory and Congregatory Species
- Criterion 4: Highly Threatened or Unique Ecosystems
- Criterion 5: Key Evolutionary Processes

10. Out of these five criteria, first three criteria are related to species and threshold of species enlisted in the IUCN Redlist representing the risk of extinction of species at global level. While the criterion 4 & 5 are related to ecosystems and evolutionary processes. The brief description of criteria is mentioned in below sections.

#### **C.1 Criterion 1: Critically Endangered and Endangered Species**

11. Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species shall be considered as part of Criterion 1. Critically Endangered species face an extremely high risk of extinction in the wild. Endangered species face a very high risk of extinction in the wild.

12. As described in footnote 11 of Performance Standard 6, the inclusion in Criterion 1 of species that are listed nationally/regionally as CR or EN in countries that adhere to IUCN guidance shall be determined on a project-by-project basis in consultation with competent professionals.

13. Thresholds for Criterion 1 are the following:

- a) Areas that support globally important concentrations of an IUCN Red-listed EN or CR species ( $\geq 0.5\%$  of the global population AND  $\geq 5$  reproductive units of a CR or EN species).
- b) Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds.
- c) As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.

## **C.2 Criterion 2: Endemic and Restricted range Species**

14. For purposes of this Guidance Note, the term endemic is defined as restricted range. Restricted range refers to a limited extent of occurrence (EOO).

- For terrestrial vertebrates and plants, restricted range species are defined as those species that have an EOO less than 50,000 km<sup>2</sup>.
- For marine systems, restricted range species are provisionally being considered those with an EOO of less than 100,000 km<sup>2</sup>.
- For coastal, riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (for example, rivers), restricted range is defined as having a global range of less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations furthest apart).

15. The threshold for Criterion 2 is the following:

- a) Areas that regularly hold  $\geq 10\%$  of the global population size and  $\geq 10$  reproductive units of a species.

## **C.3 Criterion 3: Migratory and Congregatory Species**

16. Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem).

17. Congregatory species are defined as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis. Examples include the following:

- Species that form colonies.
- Species that form colonies for breeding purposes and/or where large numbers of individuals of a species gather at the same time for non-breeding purposes (for example, foraging and roosting).
- Species that utilise a bottleneck site where significant numbers of individuals of a species occur in a concentrated period of time (for example, for migration).
- Species with large but clumped distributions where a large number of individuals may be concentrated in a single or a few sites while the rest of the species is largely dispersed (for example, wildebeest distributions).
- Source populations where certain sites hold populations of species that make an inordinate contribution to recruitment of the species elsewhere (especially important for marine species).

18. Thresholds for Criterion 3 are the following:

- a) Areas known to sustain, on a cyclical or otherwise regular basis,  $\geq 1$  percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.
- b) Areas that predictably support  $\geq 10$  percent of the global population of a species during periods of environmental stress.

#### **C.4 Criterion 4: Highly Threatened or Unique Ecosystems**

19. The IUCN is developing a Red List of Ecosystems, following an approach similar to the Red List for Threatened Species. The client should use the Red List of Ecosystems where formal IUCN assessments have been performed. Where formal IUCN assessments have not been performed, the client may use assessments using systematic methods at the national/regional level, carried out by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally recognized Non-Government Organizations (NGOs)).

20. The thresholds for Criterion 4 are the following:

- a) Areas representing  $\geq 5\%$  of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.
- b) Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.

#### **C.5 Criterion 5: Key Evolutionary Processes**

21. The structural attributes of a region, such as its topography, geology, soil, temperature, and vegetation, and combinations of these variables, can influence the evolutionary processes that give rise to regional configurations of species and ecological properties. In some cases, spatial features that are unique or idiosyncratic of the landscape have been associated with genetically unique populations or subpopulations of plant and animal species. Physical or spatial features have been described as surrogates or spatial catalysts for evolutionary and ecological processes, and such features are often associated with species diversification. Maintaining these key evolutionary processes inherent in a landscape as well as the resulting species (or subpopulations of species) has become a major focus of biodiversity conservation in recent decades, particularly the conservation of genetic diversity. By conserving species diversity within a landscape, the processes that drive speciation, as well as the genetic diversity within species, ensures the evolutionary flexibility in a system, which is especially important in a rapidly changing climate.

22. For illustrative purposes, some potential examples of spatial features associated with evolutionary processes are as follows:

- Landscapes with high spatial heterogeneity are a driving force in speciation, as species are naturally selected based on their ability to adapt and diversify.
- Environmental gradients, also known as ecotones, produce transitional habitat, which has been associated with the process of speciation and high species and genetic diversity.
- Edaphic interfaces are specific juxtapositions of soil types (for example, serpentine outcrops, limestone, and gypsum deposits), which have led to the formation of unique plant communities characterized by both rarity and endemism.

- Connectivity between habitats (for example, biological corridors) ensures species migration and gene flow, which is especially important in fragmented habitats and for the conservation of metapopulations. This also includes biological corridors across altitudinal and climatic gradients and from “crest to coast.”
- Sites of demonstrated importance to climate change adaptation for either species or ecosystems are also included within this criterion.

#### **D. Areas of analysis**

23. Critical Habitat and Natural Habitat assessment ideally takes place across sensible ecological or political units that are sufficiently large to encompass all direct and indirect impacts from the components of the project. These areas of analysis (AoAs) are thus often much broader than the direct project footprint. AoAs may be separate or combined, depending on the ecology of the biodiversity concerned.

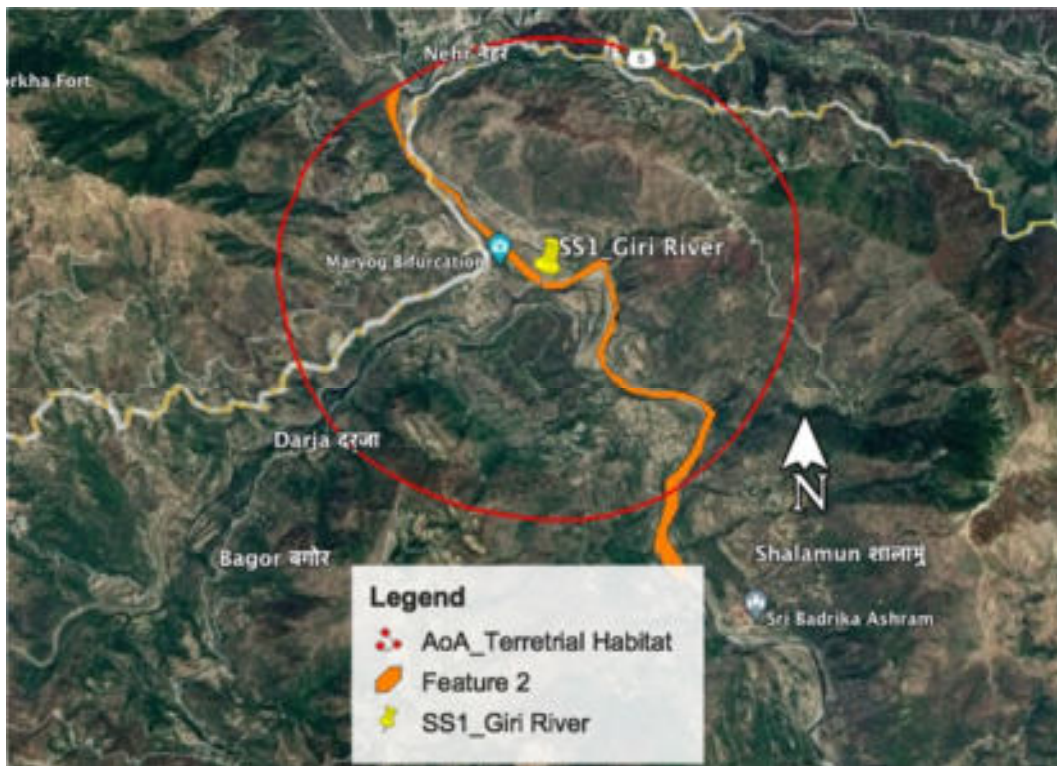
24. Given the rapid desktop nature of this assessment, and limited information available on biodiversity, AoA for all Grids of the subproject components was defined to encompass the subproject component located on various seasonal streams, a precautionary 2 km buffer for terrestrial habitat and 2 km in both downstream and upstream from the proposed component location for aquatic habitat to encompass any likely significant impacts. The buffer is an arbitrary distance, but chosen to be sufficiently precautionary to ensure capture of impacts such as edge effects, fishing or disturbance by construction workers, and noise/vibration /pollution impacts during construction.

25. AoA does not mean that the project has any obligations across it. The aim of this Critical and Natural Habitat Assessment is to identify whether the broad unit qualifies as Critical Habitat and, if so, for which biodiversity features. This information helps to prioritize impact assessment and to focus mitigation efforts.

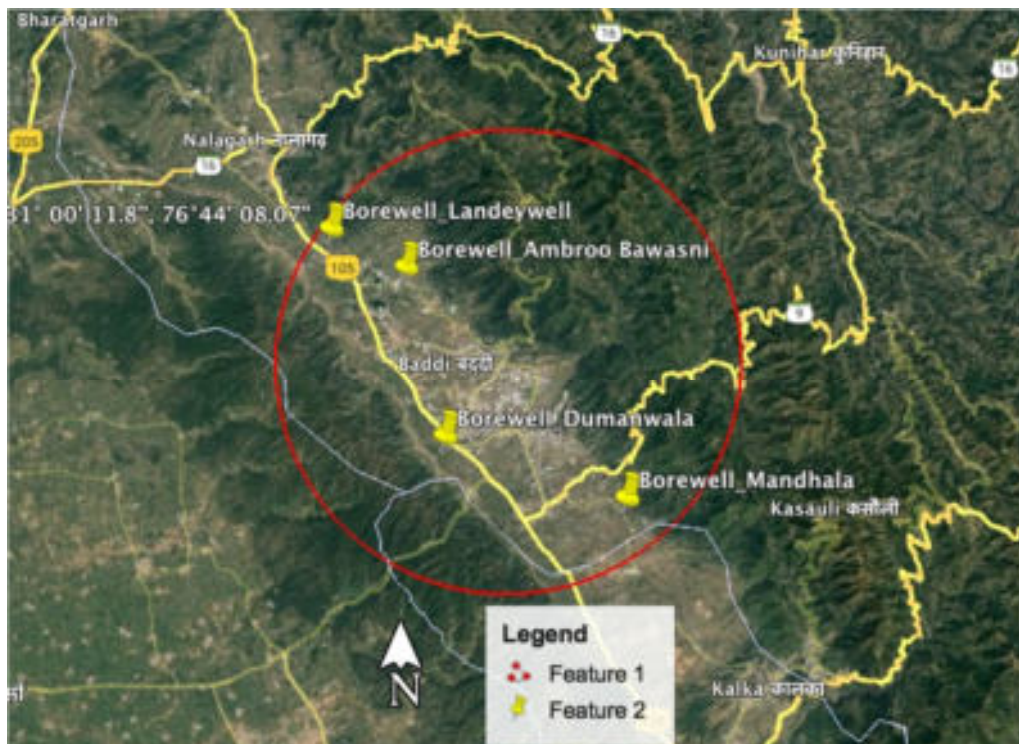
26. The boundaries of AoA for subproject components has been established on the basis of physical/topographical features surrounding the proposed location of intake structures on various streams/khad/pool. The established AoA for subproject component is given in Figure -2.



Figure 2: Map showing Study area for the subproject components (SZ-03)  
(SS1 Subproject Component)



SS9 Subproject Component



27. The boundaries of AoA for terrestrial habitat in subproject area has been established on the basis of physical/topographical features surrounding 10 km radius of SS-9 to cover all the subproject components. There is hilly terrain in SS-9 with major landuse of habitation followed by barren or open forest type. Hill ridge and valley act as natural barriers for wildlife on terrestrial habitat. For SS-1, aquatic habitat of 2km downstream and upstream each direction of subproject component location in Giri River is considered as boundary of AoA. A radius of 2km from subproject location is taken for terrestrial biodiversity. The flow rate of water due to high slope gradient is acting as natural barrier.

#### **E. Assessment of biodiversity which may qualify the area as Critical Habitat**

28. Biodiversity assessment in the project influence area has been conducted as per the International Finance Corporation's (IFC) Performance Standard No 6 of 2012, within updated version in June 2019 on the Guidance Note for the Performance Standard. The process of biodiversity assessment based on presence of protected or designated areas and the potential presence of Critical Habitat in the study area. The Critical Habitat assessment is based on presence of Threatened species (Critically Endangered (CR), Endangered (EN) species, and to a lesser extent Vulnerable (VU) species as defined by the IUCN.

29. Each of the following sections considers candidate Critical Habitat-qualifying biodiversity identified within the IEE, the Integrated Biodiversity Assessment Tool (IBAT: [www.ibat-alliance.org](http://www.ibat-alliance.org)), or other literature as actually or potentially present. The species reported from IBAT analysis for the project were assessed against IFC criteria for Critical Habitat Assessment.

#### **D.1 Critically Endangered and Endangered species**

30. Critically Endangered, Endangered, and (per IFC 2019) Vulnerable species and relevant subspecies were included in an initial screening if they were found during surveys, or there is indication of their presence in the Project area of influence or subproject Component site from literature. Threat status is taken from the global IUCN Red List (IUCN 2020). Comparison with IUCN Red List Extent of Occurrence maps identified the potential for Critically Endangered, Endangered, and Vulnerable species to occur in each Project component AoA. Review of other available project documents and grey literature.

31. Out of total candidate species recorded using IBAT analysis in 50km of the project influence area or subproject components area, a screening was done using IUCN distribution maps against quantitative thresholds for Critical Habitat (IFC 2019). The species based on the extremely limited extent of their global distribution known or likely to be within the AoA those would meet these thresholds were further studied. The IBAT analysis report for subproject component done and is present as Annex-1.

32. Total 22 species of threatened category and 4 restricted range species are listed in Table –2 are found in subproject component area as result of IBAT analysis for 50 km.

**Table 2: Species occurrence in the 50 km radius of subproject components**

Biodiversity	Scientific name	Common name	IUCN Category
<b>Threatened Category Species</b>			
1. Bird	<i>Gyps bengalensis</i>	White-rumped Vulture	CR
2. Bird	<i>Vanellus gregarius</i>	Sociable Lapwing	CR
3. Bird	<i>Sarcogyps calvus</i>	Red-headed Vulture	CR

Biodiversity	Scientific name	Common name	IUCN Category
4. Bird	<i>Gyps tenuirostris</i>	Slender-billed Vulture	CR
5. Bird	<i>Emberiza aureola</i>	Yellow-breasted Bunting	CR
6. Bird	<i>Oxyura leucocephala</i>	White-headed Duck	EN
7. Bird	<i>Rynchops albicollis</i>	Indian Skimmer	EN
8. Bird	<i>Sterna acuticauda</i>	Black-bellied Tern	EN
9. Bird	<i>Haliaeetus leucoryphus</i>	Pallas's Fish Eagle	EN
10. Bird	<i>Neophron percnopterus</i>	Egyptian Vulture	EN
11. Bird	<i>Falco cherrug</i>	Saker Falcon	EN
12. Bird	<i>Aquila nipalensis</i>	Steppe Eagle	EN
13. Fish	<i>Amblyceps arunchalensis</i>		EN
14. Fish	<i>Tor putitora</i>		EN
15. Fish	<i>Glyptothorax punjabensis</i>		EN
16. Mammal	<i>Manis crassicaudata</i>	Indian Pangolin	EN
17. Reptile	<i>Geoclemys hamiltonii</i>	Spotted Pond Turtle	EN
18. Reptile	<i>Hardella thurjii</i>	Crowned River Turtle	EN
19. Reptile	<i>Nilssonia gangetica</i>	Indian Softshell Turtle	EN
20. Reptile	<i>Nilssonia hurum</i>	Indian Peacock Softshell Turtle	EN
21. Reptile	<i>Varanus flavescens</i>	Yellow Monitor	EN
22. Plant	<i>Trillium govanianum</i>	Himalayan Trillium	EN
<b>Restricted Range Species</b>			
1. Fish	<i>Schistura multifasciata</i>		LC
2. Bird	<i>Acrocephalus orinus</i>	Large-billed Reed warbler	DD
3. Malacostraca	<i>Macrobrachium rosenbergii</i>	Giant River Prawn	LC
4. Insecta	<i>Incertana himalayana</i>	Himalayan Decorated Bushcricket	DD

33. A habitat analysis carried out for the Critically Endangered (CR) and Endangered species reported in the project area of influence (50km) shows that it is likely that the 22 species identified in IBAT are mostly located inside the ecological areas and not within the project area of influence (PAI).

**1. White-rumped Vulture (*Gyps bengalensis*)**

This species is considered globally Critically Endangered. It occurs in South Asia including India and may be extinct in Malaysia (BirdLife International 2001). Declines in India between 2000 and 2007 averaged 43.9% per year (Prakash et al. 2007). There may be some local increases in India (D. L. Bohra in litt. 2016) has been noticed after banning of veterinary diclofenac in 2006. It occurs mostly in plains and less frequently in hilly regions where it utilises light woodland, villages, cities, and open areas. It breeds in colonies in tall trees (e.g., in Himanchal Pradesh it is restricted to pine forest/plantations [Thakur 2015, M. Thakur in litt. 2016]). As such, it is very unlikely that the species qualifies the Project area as Critical Habitat.

**2. Sociable Lapwing (*Vanellus gregarius*)**

This species is considered globally Critically Endangered. The habitat for this migratory bird species is in Siberia and Kazakhstan (Johnsgard 1981, R. Sheldon in litt. 2007, 2008). The species migration usually occurs in small groups of 15-20 birds (Johnsgard 1981, del Hoyo *et al.* 1996). It is known to occur in the north-west part of India in the Rann of Kutch [Deomurari, J. Tiwari *in litt.*, Sheldon). The project area in the flyzone of the migratory bird and rarely visited by large flocks of the birds. As such, this species does not qualify the Project area as Critical Habitat.

**3. Red-headed Vulture (*Sarcogyps calvus*)**

This species is considered globally Critically Endangered. It sparsely distributed and declining in India, now rare or absent from some areas, e.g. parts of Gujarat and the north-eastern states, but still fairly common in the west Himalayan foothills and reported in the Western Ghats between 2006 and 2010 [Ramesh *et al.* 2011]. It frequents open country usually away from human habitation, well-wooded hills and dry deciduous forest with rivers. Hence, this species does not qualify the Project area as Critical Habitat.

**4. Slender-billed Vulture (*Gyps tenuirostris*)**

This species is considered globally Critically Endangered. It is found in India north of, and including, the Gangetic plain, west to at least Himachal Pradesh and Haryana, south to southern West Bengal (and possibly northern Orissa), east through the plains of Assam (BirdLife International 2001). It inhabits dry open country and forested areas usually away from human habitation. It has only been recorded nesting in trees, usually large ones, usually at a height of 7-25 m. The habitat is mostly in the forest areas. Hence, it is very unlikely that the species qualifies the Project area as Critical Habitat.

**5. Yellow-breasted Bunting (*Emberiza aureola*)**

This species is considered globally Critically Endangered. The Yellow-breasted Bunting is a passage migrant and winter visitor in Nepal and north-eastern India, with an estimated population range of 250–2,000 (Inskipp *et al.* 2016). The species winters in cultivated areas, rice fields, and grasslands, preferring scrubby dry-water rice fields for foraging, and reed beds for roosting (BirdLife International 2020). The bird species is fully migratory in nature and visit from early October to end of November as non-breeding season. In India mainly recorded from bordering areas of Nepal including West Bengal and Assam. There is no study record of bird species from Himachal Pradesh. Hence, it is very unlikely that the species qualifies the Project area as Critical Habitat.

**6. Oxyura leucocephala (*White-headed Duck*)**

This globally Critically Endangered species is resident to Spain, Algeria and Tunisia. The non-breeding habitat extended in India during winter season but now only rarely recorded in India (Li and Mundkur 1993). There is no presence in the project area also reported. Thus, unlikely that this species qualifies the Project area as Critical Habitat.



**7. Indian Skimmer (*Rynchops albicollis*)**

Indian Skimmer (*Rynchops albicollis*) is now almost completely restricted to India as a breeding bird. The species remains widely distributed, but breeding areas are now highly restricted. Most colonies now occur along the Rivers Chambal, Ganges, Yamuna, Mahanadi and Son (eBird 2020, Debata et al. 2019, Dilawar and Shama 2016, Mital et al. 2019, Rajguru 2017, Shaikh et al. 2018, Shaikh and Mendis 2019, T. K. Roy in litt. 2020). It has additional breeding records from Pong Dam in Himachal Pradesh (Fernandes and Besten 2013). As such, this species does not qualify the Project area as Critical Habitat.

**8. Black-bellied Tern (*Sterna acuticauda*)**

The species is Endangered category as per IUCN redlist. The species in Northern India are rare and very local visitor in the lowlands, with a diverse population. It is found on large rivers (usually breeding on sandspits and islands) and marshes, occasionally on smaller pools and ditches, in lowlands (but not on the coast), up to 730 m. Hence, this species does not qualify the Project area as Critical Habitat.

**9. Pallas's Fish Eagle (*Haliaeetus leucoryphus*)**

The species breed only in northern India with strongholds in Assam and Uttarakhand. The resident habitat is extended in Hilly areas of Himachal Pradesh. It is closely associated with wetlands, principally large lakes and rivers, from the lowlands to 5,000 m. It generally nests in trees near water (BirdLife International 2001). Hence, this species does not qualify the Project area as Critical Habitat.

**10. Egyptian Vulture (*Neophron percnopterus*)**

The species is Endangered category as per IUCN redlist. The extend of migratory bird species breeding habitat during winter in South Asia including North India. The species has undergone a catastrophic decline (>35% per year) since 1999 in India. The numbers detected on road transects declined by 68% between 2000 and 2003 (Cuthbert et al. 2006). The species typically nests on ledges or in caves on cliffs (Sarà and Di Vittorio 2003), crags and rocky outcrops, but occasionally also in large trees, buildings. As such, this species does not qualify the Project area as Critical Habitat.

**11. Saker Falcon (*Falco cherrug*)**

This species occurs in a wide range across the Palearctic region from eastern Europe, breeding in possibly India (Ladakh). The project area in the flyzone of the migratory bird and rarely visited by large flocks of the birds. As such, this species does not qualify the Project area as Critical Habitat. Species qualifies the Project area as Critical Habitat.

**12. Steppe Eagle (*Aquila nipalensis*)**

The species is Endangered category as per IUCN redlist. The extend of migratory bird species non-breeding habitat during winter in South Asia and Southeast Asia India including India. It inhabits areas of steppe and semi-desert and is recorded breeding up to 2,300 m in mountainous regions (del Hoyo et al. 1994). As such, this species does not qualify the Project area as Critical Habitat.

### 13. Golden Masheer (*Tor putitora*)

This fish species is considered globally Endangered (Jha *et al.* 2018). It occurs in montane and submontane streams and rivers throughout the Himalayan region, but is under severe threat from overfishing, loss and degradation of habitat, and dam development. It is reported from the Giri river and its tributary streams in the Solan district. The species presence has been mapped from Kargnoo to Sataun of approx. 70km section<sup>25</sup> of Giri River in Solan and Sirmaur district. It is possible the species actually occurs in the Project area. **Thus, this species is likely to qualify the Project area as Critical Habitat.**

### 14. *Glyptothorax punjabensis*

This fish species is considered globally Endangered. This species is native to Pakistan and it has also been recorded in Jammu and Punjab, north-western India (Dua and Parkash 2009, Dutta 2015). This carnivorous species occurs in fast flowing, clear and shallow hilly freshwater streams and rivers with rocky, stony, gravel and sandy beds (Iqbal *et al.* 2013, M. Rafique and J.A. Johnson pers. comm. 2020). There is no record of presence of fish species in streams of Himachal Pradesh. It is not possible the species actually occurs in the Project area. As such, this species does not qualify the Project area as Critical Habitat.

### 15. *Amblyceps arunchalensis*

The fish species is considered as Endangered species. It refers fast-flowing streams and rivers with a sandy or rocky bottom for habitat. This species is reported from two rivers in the Brahmaputra River drainage, northeastern India (Vishwanath and Linthoingambi 2007). It is at present thought to be restricted to the Dikrong River. It is not possible the species actually occurs in the Project area. As such, this species does not qualify the Project area as Critical Habitat.

### 16. Indian Pangolin (*Manis crassicaudata*)

This species is distributed in South Asia including India south of the Himalayas. There are no records of species occurrence from Himachal Pradesh. As such, this species does not qualify the Project area as Critical Habitat.

### 17. Spotted Pond Turtle (*Geoclemys hamiltonii*)

This species occurs in the lowlands of the Indus, Ganga and Brahmaputra River basins. It prefers shallow, densely vegetated standing waterbodies, but may also occur in rivers, ponds and reservoirs and basks preferentially in reed beds (Das 1991). In India mainly reported from Assam, Bihar, Jammu, Meghalaya, Punjab, Rajasthan, Uttar Pradesh and West Bengal. The species is unlikely to be present in the project area. Thus, this species does not qualify the Project area as Critical Habitat.

### 18. Crowned River Turtle (*Hardella thurjii*)

This species inhabits the Ganga-Brahmaputra basin of northern India and Bangladesh, and the Indus basin of Pakistan and northern India (Iverson 1992; P. Praschag pers. comm. Sept 2005). The species is more or less restricted to still or slow-moving water bodies, including pools, ponds, canals and oxbow lakes (Shrestha 1997). The species has been reported from the Siwaliks of Himachal Pradesh (Prasad and Satsangi 1967). The presence of

<sup>25</sup> Deepjyoti Baruah and Debajit Sarma. 2016. Mahseer in recreational fisheries and ecotourism in India, ICAR-DCFR Bulletin No. 26, pp. 40

the species in the project area is not recorded or studied. Thus, unlikely that this species qualifies the Project area as Critical Habitat.

**19. Indian Softshell Turtle (*Nilssonina gangetica*)**

It occurs throughout the northern plains of the Indian Subcontinent, in the Indus, Ganga, Narmada and Mahanadi basins and most tributaries and intervening drainages of Bangladesh, India, Nepal, Pakistan and Afghanistan (Schneider and Djalal 1970). It inhabits mostly rivers, and large canals, preferably with turbid water, muddy bottom and some current. Lakes, oxbows, ponds and temporary waterbodies are used occasionally. The species is reported from the Siwaliks area of the state. Thus, unlikely that this species qualifies the Project area as Critical Habitat.

**20. Indian Peacock Softshell Turtle (*Nilssonina hurum*)**

This species occurs throughout the Indus, Ganga and Brahmaputra basins of Bangladesh, northern India, southern Nepal and Pakistan (Iverson 1992, Das 1995, Praschag and Gemel 2002, Das et al. 2010). It inhabits rivers, lakes and ponds (Das 1991, 1995). The species has been reported from Renuka Lake in Himachal Pradesh in 2015. The habitat limited to natural lake area in the state. Thus, unlikely that this species qualifies the Project area as Critical Habitat.

**21. Yellow Monitor (*Varanus flavescens*)**

This species is confined to, and has a wide range on, the Indo-Gangetic Plain south of the Himalayas in mainly follows the major river systems of the Indus, Ganges and Brahmaputra (Visser 2004). The species inhabits in a number of humid habitats, including riverbanks, canals and rice fields, but predominantly in marshland (Visser 2004). The species has been reported from various parts of the state. The habitat range is very wide and found mainly in humid areas. Thus; the species does not qualify the Project area as Critical Habitat.

**22. *Trillium govanianum* (Himalayan Trillium)**

It is distributed in temperate and sub-alpine zones of the Himalayas at altitudes ranging from 2,400-3,500 metres above sea level. The species occurs within the Himalayan range of India, (Fukuda 2001, Roskov et al. 2018). It is known from forest area of Kullu, Shimla, in Himachal Pradesh. The plant species is not likely to present in the forest area of Solan District. The species does not qualify the Project area as Critical Habitat.

## **I. D.2 Endemic or restricted-range species**

34. Following the IFC PS6 Guidance Note (IFC 2019), species were considered restricted-range if their global extent of occurrence was 50,000 km<sup>2</sup> or less (for terrestrial vertebrates) or, for riverine species, if their global range had less than 500 km linear geographic span. Species were included in an initial screening if they were found during surveys, or there is indication of their presence from literature or IBAT analysis. An initial list of 4 such species, including many species also considered threatened, was reduced to nil after a quick screen against quantitative thresholds in the subproject area for Critical Habitat (IFC 2019).

**1. Schistura multifasciata**

The fish species is considered as Least Concern species. It inhabits gravel bottom of hill streams. Mostly distributed in eastern Himalaya, from Tista, through the base of the Nepal Himalaya, as far as the Ghaghra and Kali drainages (Menon 1987). In the state mainly reported from the drainage of Satluj river. It is not possible the species actually occurs in the Project area. As such, this species does not qualify the Project area as Critical Habitat on the basis of restricted range species for the project area.

**2. Giant River Prawn (*Macrobrachium rosenbergii*)**

The species is listed as Least Concern in IUCN status. The natural range of this species is eastwards from eastern Pakistan up to Borneo and Java (Wowor and Ng 2007, as *M. dacqueti*). The species is widely cultured both within its natural range and far beyond. The species lives in large rivers and stream with a connection to the sea. The species is cultured in natural freshwater habitat and wide range of distribution. Thus as such, this species does not qualify the Project area as Critical Habitat.

**3. Large-billed Reedwarbler (*Acrocephalus orinus*)**

The bird species as known until relatively recently from only one specimen, collected in the Sutlej Valley near Rampoor, Himachal Pradesh, India in November 1867. The estimated extent of occurrence is 39100 sq.km. In April 2007 a bird apparently of this species was observed and photographed near Chintamani Kar Bird Sanctuary, Narendrapur, West Bengal, India (Round and Kennerley 2007) with a further sighting in mangroves in the Sundarbans in West Bengal (K.S. Ray and B. Das in litt. 2009). its breeding distribution in the larger valleys of the western Pamir mountains in both Afghanistan and Tajikistan (Timmins et al. 2009, Ayé et al. 2010, Kvartalnov et al. 2013). Thus, the species is unlikely to qualify the project area as Critical Habitat.

**4. Himalayan Decorated Bushcricket (*Incertana himalayana*)**

The species is listed as Data Deficient in IUCN status. It is endemic to India, from where it is only known from Shimla, Himachal Pradesh (Ramme 1933). After its description, based on a single female, the species has not been reported again. This species presence is unlikely in the Project area. Thus; it does not qualify the project area for as Critical Habitat.

## II. **D.3 Migratory or Congregatory species**

35. North India is within a broad migratory flyway for birds moving between breeding grounds to the north and wintering grounds to the south. Some sites within the region are seasonally important for these migratory birds, and may represent Critical Habitat owing to globally-significant concentrations of migratory/congregatory species – such as Pong Dam (BirdLife International 2020b). No such sites have yet been identified in the subproject Area of Analysis.

36. Species of bird or mammal which regularly migrate or congregate in large numbers were identified from IBAT. There are 12 migratory bird species were identified. While thus potentially on a flyway, there is no current indication that the subproject AoA holds any particular concentrations of migratory or congregatory species – for example, there are no topographic features or water bodies in the subproject area that are likely to stimulate such concentrations.



There is thus no reason to believe, following global good practice, that the subproject area would represent “critical habitat” for any migrant birds.

### III. D.4 Unique assemblages of species that are associated with key evolutionary processes

37. The subproject area falls within the Western Himalayan broadleaf forests ecoregion (Wikramanayake *et al.* 2002). This harbors some endemism, notably in flora and birds (Wikramanayake *et al.* 2002; BirdLife International 2020a), but the subproject area is not spread on large landscape to be considered at all unique in the context of tropical and subtropical mountains.

38. From an aquatic perspective, the Project area falls within the Ganges-Himalayan Foothill freshwater ecoregion (Abell *et al.* 2008). It is with 11 fish species endemic to the area. This was believed to be an area of only moderate aquatic species endemism for 11 fish species. This suggests the potential presence of key evolutionary processes, but the distribution of species in the region remains too poorly understood to have high confidence in current estimates of endemism.

39. Unique assemblages of species associated with key evolutionary processes thus do not qualify the Project area as Critical Habitat.

### IV. D.6 Legally protected areas and international recognized areas

40. The project components are not located in any of the protected areas. According to IEE report nearest protected area is Chail Wildlife Sanctuary located 6 km away from the proposed Grid SS-1. Chail Wildlife Sanctuary is located in Solan District, Himachal Pradesh with protected area of 16 sq.km. The area is protected habitat for mainly Barking deer, Sambar Leopard, Black bear, Goral, rhesus monkey, Languor, porcupine and five species of pheasants (S. Sathyakumar pers. comm. 2002). The WLS area comprises part of the catchment area of a tributary of the Giri River. This site is designated an IBA based<sup>26</sup> on the presence of the globally threatened Cheer Pheasant. The protected area is approx. 6km away from project component located mainly in habitation area. Further, the two (project location and protected area) areas are separated by physical barriers of river, hill and valley topography. It does not qualify the Project area as Critical Habitat.

### D.7 Summary

41. The conclusion on the biodiversity assessment on the basis of available information, and acting on a precautionary basis, out of total 2 Grids (SS-1 & SS-9) for the subproject components, AoA for Grid SS-1 qualifies as Critical Habitat, owing to the presence of a globally-threatened fish species (*Tor putitora*) known or suspected to occur at globally significant levels.

<sup>26</sup> BirdLife International (2021) Important Bird Areas factsheet: Chail Wildlife Sanctuary. Downloaded from <http://www.birdlife.org> on 06/12/2021

## F. Biodiversity

42. The project area is located in Western Himalayan broadleaf forests (Wikramanayake et al. 2002) with hilly terrain of mainly agriculture and forest landuse. The forest area transverse by subproject components are classified as protected forest with shrubs and tree species. There no wildlife species of threatened category has been reported in the project area. As such, the area is associated with very high species richness. It also harbors some endemism, notably in flora and birds (Wikramanayake *et al.* 2002; BirdLife International 2020a).

43. From an aquatic perspective, the Project area falls within the Ganges-Himalayan Foothill freshwater ecoregion (Abell et al. 2008). As with terrestrial species, it is an area of very high aquatic species richness, and was believed to be an area of only moderate aquatic species endemism. It is with 11 fish species endemic to the region though the distribution of species in the region remains too poorly understood to have high confidence in this.

44. For aquatic species, freshwater habitat is the most important parameter to consider in the selection of an ecologically contiguous area. Giri River is the primary river in the catchment where the subproject infrastructure will be located. The river Giri, a major tributary of river Yamuna, has an approximate stretch of 150 km to its confluence with Yamuna at Paonta Sahib.

45. In Himachal Pradesh 61 species of fish observed, belongs into 13 families<sup>27</sup> in general waters and trout waters, with estimated length of 600 and 2400 kms; respectively. The major fishes available in these streams are Trout, Mahseer (*Tor putitora*), *Nemacheilus* spp, *Barilus* sp, *Schizothoracids* *Crossocheilus* sp. *Glyptothorax* spp. etc.

46. Rainbow trout and Mahsheer are the important fishes in Himachal Pradesh. The trout being the focal fish, the seed of brown and rainbow trout used to be produced in three trout farms located at Chirgoan, Mahli/ Patlikuhl and Barot. Giri River and other waters in the Solan District is habitat for *Channa* ssp., *Glyptothorax* ssp., *Bagarius* ssp., *Barilius* ssp., *Puntius* ssp., *Mastecemblus* ssp. and *Noemacheilus* sp. as well as known for Golden Mahseer. The fish species recorded from freshwater in Solan district are given in Table -3 below:

**Table 3: Fish Species from freshwater in Solan district**

S.No.	Species Name	Common Name	IUCN status
1	<i>Tor putitora</i> (Hamilton)	Putitor Mahseer	EN
2	<i>Oreinus richardsonii</i> (Gray)	Gugali	VU
3	<i>Schistura horai</i> (Menon)	Horai Loach	VU
4	<i>Paraschistura montana</i> (Hamilton)	Mountain Loach	NE
5	<i>Botia lohachata</i> Chaudhuri	Y-Loach	NE
6	<i>Barilius bendelisis</i>	Hamilton's barila	LC
7	<i>Barilius barila</i> (Hamilton)	Barred barila	LC
8	<i>Danio rerio</i> (Hamilton)	Zebra Fish	LC
9	<i>Rasbora daniconius</i> (Hamilton)	Blackline rasbora	LC
10	<i>Chagunius chagunio</i> (Hamilton)	Chaguni	LC
11	<i>Pethia ticto</i>	Two-spot barb	LC

<sup>27</sup> Fish Fauna of Himachal Pradesh: A Case Study, Department of Zoology, (Aquaculture Laboratory), Shri Shivaji College, Parbhani, July 2013

12	<i>Pethia conchonius</i> (Hamilton)	Rosy Barb	LC
13	<i>Puntius sophore</i>	Spot fin swamp Barb	LC
14	<i>Puntius chola</i> (Hamilton)	Chola barb	LC
15	<i>Systomus sarana</i> (Hamilton)	Olive Barb	LC
16	<i>Labeo rohita</i> (Hamilton)	Rohu	LC
17	<i>Crossocheilus latius latius</i> (Hamilton)	Gangetic latia	LC
18	<i>Garra gotyla gotyla</i> (Gray)	Gotyla	LC
19	<i>Garra lamta</i> (Hamilton)	Lamta Garra	LC
20	<i>Acanthocobitis botia</i> (Hamilton)	Botia Loach	LC
21	<i>Schistura rupecula</i> (McClelland)	Hill Loach	LC
22	<i>Glyptothorax pectinopterus</i> (McClelland)	Glyptothorax	LC
23	<i>Macrogathus pancalus</i> Hamilton	Striped Spiny eel	LC
24	<i>Mastacembelus armatus</i> (Lacepede)	Tire-trackspiny eel	LC
25	<i>Badis badis</i> (Hamilton)	Dwarf Chamelon Fish	LC
26	<i>Channa gachua</i> (Schneider)	Snake Headed Fish	LC
27	<i>Devario devario</i> (Hamilton)	Devario danio	DD
28	<i>Glyptothorax conirostrae</i> (Steindachner)	Glyptothorax	DD
29	<i>Hypophthalmichthys molitrix</i> (Valenciennes)	Silver Carp	INTR
30	<i>Carassius auratus</i> (Linnaeus)	Golden Carp	INTR
31	<i>Carassius carassius</i> (Linnaeus)	Crucian Carp	INTR
32	<i>Ctenopharyngodon idella</i> (Valenciennes)	Grass Carp	INTR
33	<i>Cyprinus carpio communis</i> Linnaeus	Scale Carp	INTR
34	<i>Cyprinus carpio specularis</i> Lacepede	Mirror Carp	INTR
35	<i>Cyprinus carpio nudus</i> Bloch	Mirror Carp	INTR

Note: EN-Endangered, LC-Least Concern, DD- Data Deficient, INTR-Introduced

47. The possible extended habitat for the fish species (*Tor putitora*) is in subproject component area. The fish species population data is not available for individual river system. However, as per investigations<sup>28</sup> in Giri River reveals that the population of the Golden Mahseer contributes significantly to the fishery in the main river where it comprises 37-40% of the total catch. Further, as per the consultation with fishery department and local community, GiriPul a location on 2km upstream of subproject component is a recognized breeding ground for the fish species of Golden Masheer (*Tor putitora*).

<sup>28</sup> Impact of the Low Head Dam/Barrage on Fisheries – A Case Study of Giri River of Yamuna Basin (India), 2015, Harcharan Singh RUMANA, Veliachamy JEEVA and Sudhir KUMAR.

48. Mahseer lives and grows to maturity in large rivers, migrate to headwater, stream, creeks to spawn during the wet season from May to September. The fish species ascend streams to breed over gravel and stones and returns to perennial ponds after breeding. A mature mahseer produces 45,800 to 75,000 eggs and are reported to deposit their spawn<sup>29</sup> in several batches in a period of several months. They forage in large groups over open gravel bed and their profound habitat are snowfed or rainfed running water broken into pools and rapids with moderate depth of water. The decline in fish species is induced by various causes due to pollution, habitat loss and over-fishing.

49. In the Critical Habitat Assessment, the Area of Analysis (AoA) for aquatic biodiversity in Giri river is used to assess risks from all components under Grid SS-1 subproject. This assessment identified the AoA on a precautionary basis to be possible or actual Critical Habitat one freshwater fish species of global significance. The subproject components to avoid, mitigate and – if necessary – offset impacts upon identified fish species qualifying for Critical Habitat.

50. In general, this will not pose challenges to the subproject as most the fish species habitat is in main water course of the River and outside of the direct subproject footprint.

## **G. Impacts & Mitigation Measures**

### **V. F.1 Habitats**

51. The vegetation clearing for the subproject components required is mostly from Government land with no recognized forest only with thin vegetation of shrubs and trees. There is no protected wildlife species has been reported from the area of proposed subproject components under both the Grid. Most disturbance from construction and operations will take place in areas of already Modified Habitat. Impacts of vegetation loss and habitat fragmentation are thus assessed to be of *Low significance*.

52. Degradation of forest through collection of timber or firewood by construction workers. The potential indirect impacts has been considered a *Low risk*.

53. Conversely, a potentially significant indirect project impact on terrestrial and aquatic habitat is the introduction of invasive alien species (IAS). There is potential for construction machinery, equipment or materials to introduce IAS to the subproject site, particularly plants – e.g., as seeds within soil on machinery. These potential indirect impacts has also been considered a *Medium risk*.

54. In the process of avoidance of potential impacts on the aquatic habitats due to construction and operations, small intake well on bank of Giri River is proposed for water source under SS-1. Under Grid SS-9, 4 tube wells are proposed for water source located near Bawasni spring. No loss of aquatic habitat for fish species is anticipated due to abstraction of water from Giri River as water demand for SS-1 is 11.5 LPS, whereas the Lean period of the Giri River is 2320 LPS. Some disturbance from construction of water intake structure for SS-1, as it will take place on the bank of river away from River water. The potential impacts on fish habitat are mainly due to construction activities i.e. increase in water pollution, noise from construction machinery. The overall significance of potential impacts (before mitigation) on aquatic species in Giri River is assessed as *Medium*.

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<sup>29</sup> Beavan, 1877

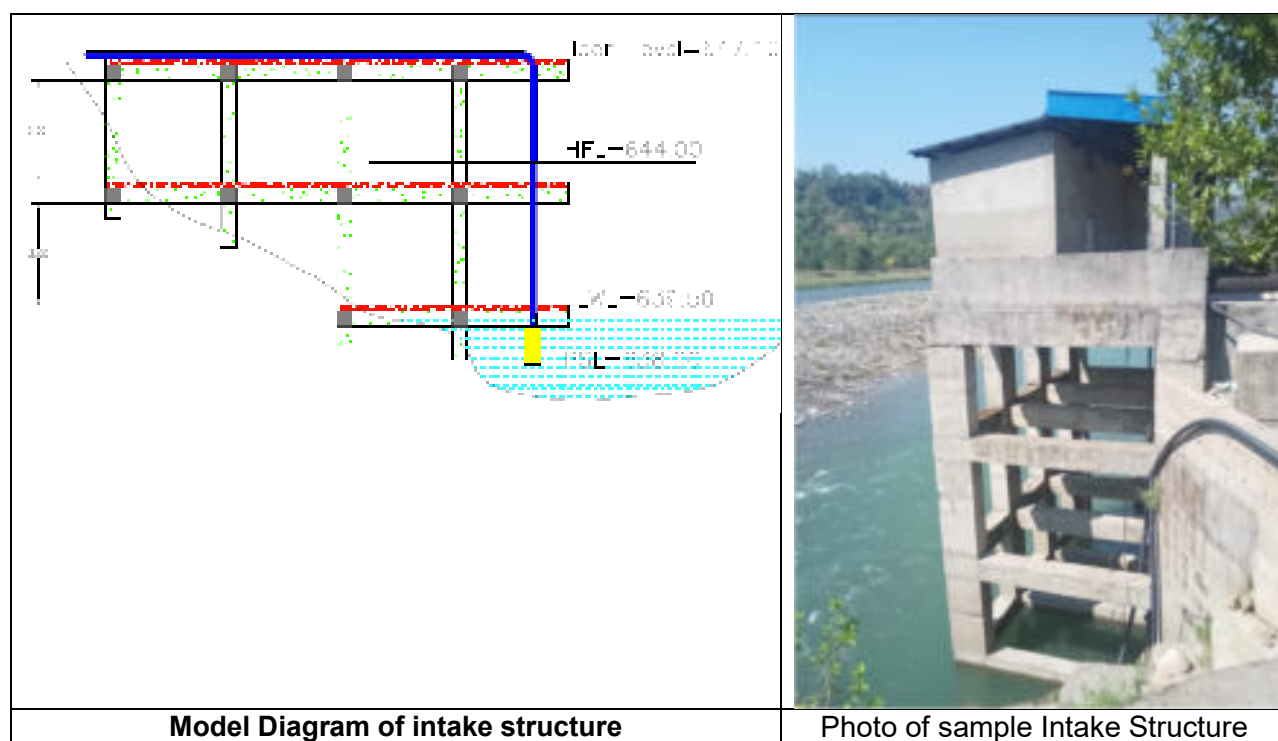
## VI. F.2 Species

55. The AoA for Gird SS-1 is possibly represent aquatic Critical Habitat for one threatened category fish species (*Tor putitora*). The fish species have good food value and medium in size and likely targets for extensive fishing by construction workers, meaning that potential impact (before mitigation) is considered of *Low Significance*.

56. The construction work of small intake well on the bank of river have potential for localized disturbance impacts on aquatic species. There will be no underwater construction involve for intake structure and no change in the habitat strata is anticipated. Casting of footing for the intake structure in water on the riverbank will cause disturbance to fish species at the proposed location and upto 2m radius. The model diagram of intake structure is given in Figure-3.

57. The water will draw through submersible pump from Giri River. The noise from submersible pump and change in pressure of water flow upto 2m radius due to intake operation are potential impacts during operational stage. On this basis, the potential *construction work and noise from induced fish mortality is considered of Medium Significance*.

**Figure 3: Typical design of intake structure**



**Table 4: Possible impacts and mitigation measures for Critical Habitat-qualifying biodiversity**

Environmental Component	Aspect	subproject phase	Impact	Mitigation action	Responsibility	
					Development/ implementation	Control
Endangered fish species (Tor putitora)	Habitat	D, C	Degradation of habitat from aggregate extraction for construction.	Use only existing licensed quarries outside of rivers and streams for sourcing aggregates.	Contractor	JSV
				Avoid borrow pits in areas of Natural Habitat and within 200 m of waterways.	Contractor	JSV
		C	Degradation of habitat by introduction of invasive alien species.	Avoid introduction of new invasive species to, and spread of existing invasive species within, the subproject area through: -barricade the construction site with controlled entry and exit from construction workers -washing of vehicles, equipment and supplies before entry to the Project area; - monitoring for invasive species; and - control/eradication of invasive species where found.	Contractor	JSV
				Prohibit cleaning of construction vehicles/equipment within 300 m of waterways/drains.	Contractor	JSV
		D, C	Degradation of habitat from hydrological changes.	Maintain natural courses of rivers and streams.	Contractor	JSV
				Restrict intake well construction works to the dry season or lean season in order to limit hydrological changes, erosion and runoff from construction sites.	Contractor	JSV
		C	Degradation of habitat during construction from sedimentation, dust, sewage, or other construction waste.	Restore temporary diversions to their natural courses as soon as possible, if put any.	Contractor	JSV
				Restrict construction works to the dry season or lean season in order to limit hydrological changes, erosion and runoff from construction sites.	Contractor	JSV
				Store chemicals and oils in secure, impermeable containers.	Contractor	JSV
				Equip construction camps with sanitary latrines that do not pollute surface waters.	Contractor	JSV
				Barricade construction site and control on entry and exit of workers in river water	Contractor	JSV
				Installation of slit fencing at the construction site to avoid siltation in river water	Contractor	JSV
				Prohibit siting of construction camps and disposal of construction waste within 500 m of waterways.	Contractor	JSV
		C, O	Degradation of habitat from accidentally spilled fuel/oil or	Store chemicals and oils in secure, impermeable containers.	Contractor & JSV	JSV

Environmental Component	Aspect	subproject phase	Impact	Mitigation action	Responsibility	
					Development/ implementation	Control
	Distribution	C, O	Displacement of species due to noise from presence of machinery and pump.	Prohibit cleaning of construction vehicles/equipment within 300 m of waterways/drains.	Contractor & JSV	JSV
				Restrict construction works to the dry season in order to limit hydrological changes, erosion and runoff from construction areas.	Contractor	JSV
				Avoid piling and blasting during construction.	Contractor	JSV
				Install low noise pump set and proper maintenance to avoid excessive noise generation.	Contractor & PMU	JSV/PIU
	Mortality	C	Injury and mortality due to underwater construction noise.	Install mechanical barrier/screen for fish in water at a radius of 2m		
				Restrict construction works to the dry season.	Contractor	JSV
				Avoid piling and blasting during construction.	Contractor	JSV
				Avoid column casting at site or use of pre-fabricated column	Contractor	JSV
				Install screen to barricade construction site in water	Contractor	JSV
		C	Mortality of individuals due to unsustainable exploitation by construction workers.	Prohibit hunting and fishing of endangered fish species by staff and contractor, with heavy penalties applied.	Contractor & PMU	JSV/PIU
				Train staff and contractor in good environmental practice, and prohibited activities.	Contractor & PMU	JSV/PIU
				Ensure contractors supply all necessary food, cooking fuel and appropriate housing.	Contractor	JSV

**Notes:** Project Phase = D-Design, C-Construction, O-Operation.

**Table 5: Residual impacts after mitigation for Critical Habitat-qualifying biodiversity**

Environmental Component	Aspect	Project phase	Impact	Significance of impact without mitigation	Residual impact after implementation of mitigation measures			Key Residual Impacts
					Preparation, Construction, and Worksite Closure Phases	Operation Phase		
						Day 1	Year 20	
Endangered fish Species (Tor putitora)	Habitat	C	Degradation of habitat from aggregate extraction for construction.	M	Negligible	Negligible	Negligible	n/a
		C	Degradation of habitat by introduction of invasive alien species.	M	Negligible	Negligible	Negligible	n/a
		D, C	Degradation of habitat from hydrological changes.	L	Low	Negligible	Negligible	n/a

Environmental Component	Aspect	Project phase	Impact	Significance of impact without mitigation	Residual impact after implementation of mitigation measures			Key Residual Impacts
					Preparation, Construction, and Worksite Closure Phases	Operation Phase		
						Day 1	Year 20	
		C	Degradation of habitat during construction from sedimentation, dust, sewage, or other construction waste.	M	Negligible	Negligible	Negligible	n/a
		C, O	Degradation of habitat from accidentally spilled fuel/oil or surface runoff,	M	Negligible	Negligible	Negligible	n/a
	Distribution	C, O	Displacement of species due to noise and presence of machinery.	M	Negligible	Negligible	Negligible	n/a
			Change in natural water flow due to submersible pump operation upto 2m radius	M	Negligible	Negligible	Negligible	n/a
			Install low noise pump set and proper maintenance to avoid excessive noise generation.	M	Negligible	Negligible	Negligible	n/a
	Mortality	C	Injury and mortality due to construction activity near the habitat.	L	Negligible	Negligible	Negligible	n/a
		C	Mortality due to unsustainable exploitation by construction workers.	L	Negligible	Negligible	Negligible	n/a



## H. Cost estimates for Mitigation and Management Measures

58. Table 6 provides an overview of the costs for mitigation and management measures. The Cost estimates for specific biodiversity mitigation measures additional to those mentioned in the IEE.

**Table 6: Cost estimates for specific Biodiversity Mitigation Measures**

Mitigation measure	Unit cost (\$ USD)	No.	Total cost	Remarks
1. Use only existing licensed quarries outside of rivers and streams for sourcing aggregates	0	n/a	0	No cost
2. Avoid borrow pits in areas within 200 m of waterways	0	n/a	0	No cost
3. Avoid introduction of new invasive species to, and spread of existing invasive species within, the subproject area (terrestrial and aquatic habitat)	5,000	1	5000	For wash station at construction camp site
4. Prohibit fishing and trading of endangered bird species by staff and contractors, with heavy penalties applied	0	n/a	0	No cost
5. Design, install and maintain silt fencing during construction specially in is proposed for water intake	5000	2	10000	Putting silt fencing at the construction sites of SS-1 &-9
6 Construction site barricading for control of activities	10000	1	10000	Putting silt fencing at the construction site for SS-1 near Giri River
7 Design, install and maintain of mechanical screen at a radius of 2m from the intake location	10000	1	10000	For SS-1 near Giri River
<b>Total</b>			<b>\$35,000 USD</b>	

## I. References

Abell, R., Thieme, M.L., Revenga, C., Bryer, M., Kottelat, M., Bogutskaya, N., Coad, B., Mandrak, N., Balderas, S.C., Bussing, W., Stiassny, M.L.J., Skelton, P., Allen, G.R., Unmack, P., Naseka, A., Ng, R., Sindorf, N., Robertson, J., Armijo, E., Higgins, J.V., Heibel, T.J. & Wikramanayake, E. (2008) Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation. *BioScience* 58: 403-414.

ADB (2009) Safeguard Policy Statement. Asian Development Bank, Manila, Philippines.

ADB (2012) Environmental Safeguards: A Good Practice Sourcebook. Draft Working Document. Asian Development Bank, Manila, Philippines.

Inland fishes of India and adjacent countries, Talwar, P.K. and A.G. Jhingran, 1991

Studies on Snow Trout *Schizothorax richardsonii* (Gray) in river Beas and its tributaries (Himachal Pradesh), India, Indu Sharma and U.S. Mehta, 2010

Faunal Diversity of all Vertebrates (excluding Aves) of Himachal Pradesh, Indu Sharma and Avtar Kaur Sidhu, Biological Forum – An International Journal, 2016

Fish diversity in different habitats in the streams of lower middle Western Himalayas, Polish Journal of Ecology, January 2002,

Fish Fauna of Himachal Pradesh: A Case Study, Jagtap H. S., Department of Zoology, (Aquaculture Laboratory), Shri Shivaji College, Parbhani, July 2013

Threatened freshwater fishes of India, National Bureau of Fish Genetic Resources, Lucknow, 2010

Fish and fisheries at high altitudes, Asia, FAO, Technical Paper, 1999.

Efforts of State Government succeed in saving Golden Mahseer from brink of extinction, I&PR, Government of Himachal Pradesh, December 2020

Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation, May 2008 Published Bioscience

Jha, B.R., Rayamajhi, A., Dahanukar, N., Harrison, A. & Pinder, A. (2018) *Tor putitora*. The IUCN Red List of Threatened Species 2018: e.T126319882A126322226. Available at: <https://www.iucnredlist.org/species/126319882/126322226>.

Deepjyoti Baruah and Debajit Sarma. 2016. Mahseer in recreational fisheries and ecotourism in India, ICAR-DCFR Bulletin No. 26, pp. 40

Putitor Mahseer (*Tor putitora*) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, November 2014 Revised, December 2015, May 2017, August 2017 Web Version, 6/25/2018

IFC (2012a) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation, Washington DC.

IFC (2012b) Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation, Washington DC.

IFC (2019) Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation, Washington DC.

IUCN (2016) A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. IUCN, Gland, Switzerland.

BirdLife International (2021) IUCN Red List for birds. Downloaded from <http://www.birdlife.org> on 03/12/2021.

Impact of the Low Head Dam/Barrage on Fisheries – A Case Study of Giri River of Yamuna Basin (India), 2015, Harcharan Singh RUMANA, Veliachamy JEEVA and Sudhir KUMAR.

IUCN (2020) The IUCN Red List of Threatened Species. Version 2020-1. Available at: <https://www.iucnredlist.org>.

BirdLife International (2021) Important Bird Areas factsheet: Chail Wildlife Sanctuary.  
Downloaded from <http://www.birdlife.org> on 06/12/2021

## Annex-1

# Integrated Biodiversity Assessment Tool

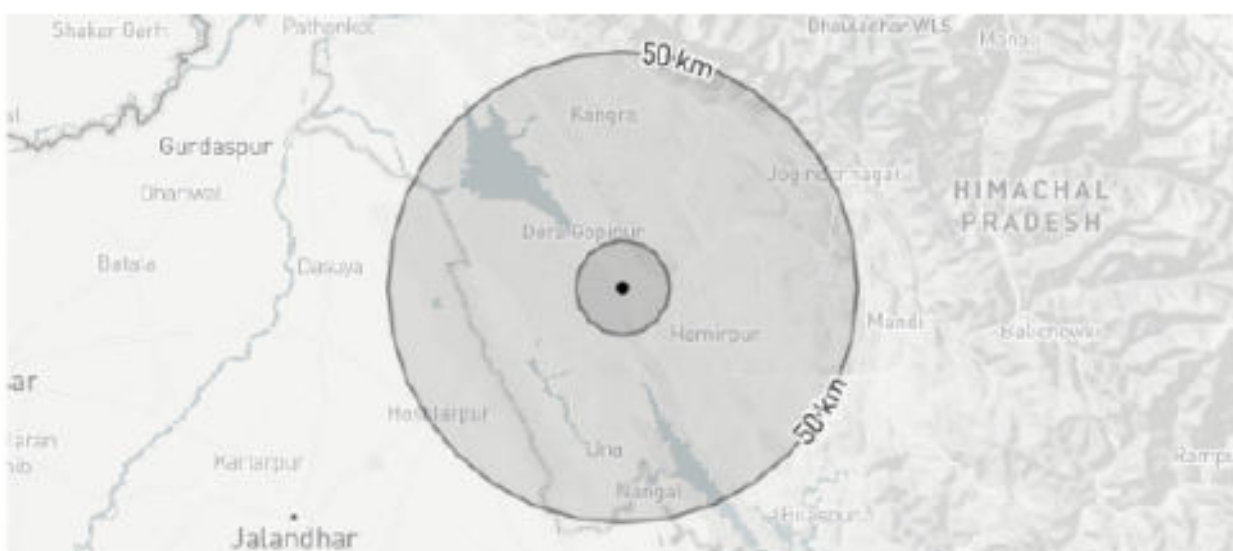
## World Bank Group Biodiversity Risk Screen

SZ03\_SS01

- **Country:** India
- **Location:** [ 31.8, 76.3 ]
- **IUCN Red List Biomes:** Freshwater, Terrestrial
- **Created by:** Achyutha Rao Aleti

Overlaps with:

Protected Areas	1 km: 0	10 km: 0	50 km: 1	1
World Heritage (WH)	1 km: 0	10 km: 0	50 km: 0	0
Key Biodiversity Areas	1 km: 0	10 km: 0	50 km: 4	4
Alliance for Zero Extinction (AZE)	1 km: 0	10 km: 0	50 km: 0	0
IUCN Red List	22			
Critical Habitat	Likely			



Displaying project location and buffers: 1 km, 10 km, 50 km

## Priority Species

Habitat of significant importance to priority species will trigger Critical Habitat status (See PS6: para 16). IBAT provides a preliminary list of priority species that could occur within the 50km buffer. This list is drawn from the IUCN Red List of Threatened Species (IUCN RL). This list should be used to guide any further assessment, with the aim of confirming known or likely occurrence of these species within the project area. It is also possible that further assessment may confirm occurrence of additional priority species not listed here. It is strongly encouraged that any new species information collected by the project be shared with species experts and/or IUCN wherever possible in order to improve IUCN datasets.

## IUCN Red List of Threatened Species - CR & EN

The following 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	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Emberiza aureola</i>	Yellow-breasted Bunting	AVES	CR	Decreasing	Terrestrial, Freshwater
<i>Geoclemys hamiltonii</i>	Spotted Pond Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Hardella thurjii</i>	Crowned River Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Nilssononia gangetica</i>	Indian Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Nilssononia hurum</i>	Indian Peacock Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
<i>Amblyceps arunchalensis</i>		ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Oxyura leucocephala</i>	White-headed Duck	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Rynchops albicollis</i>	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Sterna acuticauda</i>	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Haliaeetus leucoryphus</i>	Pallas's Fish-eagle	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Neophron percnopterus</i>	Egyptian Vulture	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Falco cherrug</i>	Saker Falcon	AVES	EN	Decreasing	Terrestrial, Marine, Freshwater
<i>Tor putitora</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Glyptothorax punjabensis</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Vanellus gregarius</i>	Sociable Lapwing	AVES	CR	Decreasing	Terrestrial
<i>Gyps bengalensis</i>	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
<i>Sarcogyps calvus</i>	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
<i>Gyps tenuirostris</i>	Slender-billed Vulture	AVES	CR	Decreasing	Terrestrial
<i>Manis crassicaudata</i>	Indian Pangolin	MAMMALIA	EN	Decreasing	Terrestrial
<i>Varanus flavescens</i>	Yellow Monitor	REPTILIA	EN	Decreasing	Terrestrial
<i>Aquila nipalensis</i>	Steppe Eagle	AVES	EN	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Trillium govanianum</i>	Himalayan Trillium	LILIOPSIDA	EN	Decreasing	Terrestrial

### Restricted Range Species

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Schistura multifasciata</i>		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
<i>Macrobrachium rosenbergii</i>	Giant River Prawn	MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
<i>Acrocephalus orinus</i>	Large-billed Reed-warbler	AVES	DD	Unknown	Freshwater
<i>Incertana himalayana</i>	Himalayan Decorated Bush-cricket	INSECTA	DD	Unknown	Terrestrial

## Protected Areas

The following protected areas are found within 1 km and 10 km and 50 km of the area of interest.  
For further details please refer to the associated csv file in the report folder.

Area name	Distance	IUCN Category	Status	Designation	Recommendation
Pong Dam Lake	50 km	Not Reported	Designated	Ramsar Site, Wetland of International Importance	 Assess for biodiversity risk

## Key Biodiversity Areas

The following key biodiversity areas are found within 1 km and 10 km and 50 km of the area of interest.  
For further details please refer to the associated csv file in the report folder.

Area name	Distance	IBA	AZE	Recommendation
Dhauludhar Wildlife Sanctuary and McLeod Gunj	50 km	Yes	No	 Assess for critical habitat
Gobind Sagar and Naina Devi Wildlife Sanctuaries	50 km	Yes	No	 Assess for critical habitat
Pong Dam Lake Wildlife Sanctuary	50 km	Yes	No	 Assess for critical habitat
Sarah Valley, Lower Dharamshala	50 km	Yes	No	 Assess for critical habitat



**Appendix 6C: Certificate from the Fisheries Department, Solan (District: Solan District)****Certificate**

It is certified that the intake structure of scheme LWSS Sunaradi Anji, Satyana Shiva, Garkhal Larah, Kasauli, Gorthi, Seri Thana, Jhanger, Jangeshu, Hurang Kotla, Bhaguri proposed under ADB as Grid SS-1 proposed at right bank of Giri River at Maryog below Training Center of Animal Husbandry Department is approximately 2 Kms downstream of bridge located at Giri Pul where fish spawning/fish breeding ground is done. Since the water requirement of the above mentioned scheme is just 11.5 LPS whereas flow of Giri River during lean period is 2320 LPS which is more than sufficient for fish breeding and thus there will be no hindrance due to construction of above scheme as far as fish breeding is concerned.

Fisheries department has no objection if Jal Shakti Vibhag constructs the above scheme from the proposed location.

Deputy Director,  
Fisheries Department,  
Solan District Solan.

# Appendix 7: Permission for Forest land Utilisation for laying of Water Supply Pipeline

109

Copy of letter No. FP-B-F(8)76/105-Loose dated 12-1-76 from Mdl. Secy. to Govt. of H.P. addressed to Pr. CCF, H.P.

Subject: Guidelines for the diversion of forest land for non forest purposes under the FCA, 1980.

I am directed to invite your attention to letter No. 11-9/90-F, dated 10-10-75 from the Asstt. Inspector General of Forests, New Delhi which was intersent to all the Secretaries Forests and endorsed to all PCCF and other concerned on the subject cited above and to say that while sending proposals for the diversion of forest land the guidelines contained therein may please be strictly adhered to.

Encl. No. 48-76/76(1) Dated. 3/11/76

Copy along-with its enclosures is forwarded to:-

1. CCF (W.L) H.P. Shivalik
2. All OFs (T) in H.P.
3. All DFCs (T) in H.P.

for information and further action as required by the Govt. of India.

Pr. Chief Conservator of Forests,  
Himachal Pradesh.

Encl. As above.

RE 7/11  
EX/7/11  
MISC 7/11

/10

Copy of letter No. 11-9-99-FC dated 16-10-2000 from Asstt. Inspector General of Forests, Govt. of India, MOEF, New Delhi addressed to Secretary (Forests) All States/UTs and copy thereof endorsed to All PCS/Model Officer (All State/UTs) and others.

Subject: Guidelines for diversion of forest land for non forest purposes under the Forest (Conservation) Act, 1980.

Detailed guidelines for submission of proposals for diversion of forest land for non-forest purposes under the Forest (Conservation) Act, 1980 were finalised and circulated to all the State Government/Union Territories on 23-10-1992. A constant review of these guidelines has been done from time to time. After a recent the Ministry has observed that in certain proposals of public importance involving laying underground telephone lines/optical fiber cable and drinking water supply pipelines the land requirement is small, the land use is temporary and usually laid along the roads.

In view of the above, the Central Government hereby conveys its general approval under Section-2 of the Forest (Conservation) Act, 1980 for diversion of forest land for underground laying of optical fiber cables, underground laying of telephone lines and underground laying of drinking water supply pipelines which involve no trees felling or outside National Parks or Wildlife Sanctuary, are laid along the roads and within the existing right of way and the maximum size of the trench is 2.00 metre depth and 1.00 metre width. Any deviation from the above category/conditions will require separate submission of proposal/permission under Forest (Conservation) Act, 1980.

This approval will be subject to the following conditions :

1. The user agency will seek permission from the State Forest Deptt. under local rules/tariffs etc.
2. The user agency agrees to make good the land after use/maintenance.
3. The user agency agrees to make good any loss to forest environment.
4. The user agency seeks permission from local Forest Deptt. for carrying out any maintenance.

The State Government/Union Territories will submit a quarterly progress report on the extent of the forest land diverted for each purpose to the Ministry as well as the concerned Regional Offices. This approval under the Forest (Conservation) Act, 1980 is being conveyed initially for a period of two years subject to review thereafter.



116

Copy of letter No. 11-9/98-FC dated 3-10/2001 from Asstt. Inspector General of Forests, Govt. of India, Ministry of Environment and Forests, FC Division, Parvavaran Bhawan, CGO Complex, Lodhi Road, New Delhi, addressed to The Secretary(Forests)-(All States/UTs) and copy endorsed to All PCCF/Modal Officers(All States/UTs)/All Regional Offices and DIO(FC)/Director(FC)/AIGs(FC)

\*\*\*

Subject: Guidelines for diversion of forest land for non-forest purposes under the Forest (Conservation) Act, 1980.

Detailed guidelines for submission of proposals for diversion of forest land for non-forestry purpose under the Forest(Conservation) Act, 1980 were finalized and circulated to all the State Government/Union Territories on 25.10.1992. A constant review of these guidelines has been done from time to time.

After a recent review the Ministry vide letter of even number dated 16/10/2000 had conveyed its general approval under Section-2 of the Forest (Conservation) Act, 1980 for diversion of forest land for underground laying of optical fiber cables, underground laying of telephone lines and underground laying of drinking water supply pipelines which involve no tree felling, are outside National Parks or Wild Life Sanctuary, are laid along the roads and within the existing right of way and the maximum size of the trench is 2.00 metre depth & 1.00 metre width. This permission has been granted subject to certain parameters/conditions.

In continuation of the above mentioned letter, it is clarified that this approval would also be applicable in case of laying of underground electricity cables, which shall be subject to all the stated parameters and conditions stipulated in the letter dated 16.10.2000. The State Government/user agency should ensure that the channels dug for underground laying are duly filled up and compacted so that these do not become source of constant soil erosion.

..

Endst.No.Ft.48-66/83(1)

Dated Shimla-1, the 24 NOV 2001

Copy is forwarded for information, guidance and further action to:-

1. CCF, Wild Life, H.P.
2. All CCFs/DFOs(T) in H.P.

In continuation to this office Endst.No. Ft.48-25/76(H) dated 9/11/2001.

3. Conservator of Forests, Environmental Cell, HPSEB, Vidyut Bhawan, Shimla, along with a copy of MOI letter dated 16/10/2000.

*For Pr. Chief Conservator of Forests,*  
Himachal Pradesh, Shimla-1.

**Appendix 8: Water Sources Discharge Measurement Certificates form JSV  
Grid SS1**

DISCHARGE CERTIFICATE

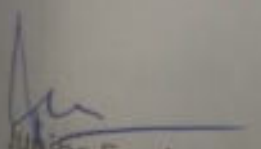
Certified that the lean period discharge of Giri River is 82.70 Cusec measured by Er. Ravi Junior Engineer IPH Section Gaura on dated 24-06-2020 Time 11.00 AM. is as under:-

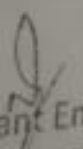
1. Source :- Giri River

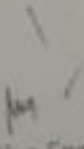
2. Type :- River

2. Discharge of Source :- 82.70 Cusec.

3. Measured by Er. Ravi

  
Junior Engineer,  
I&PH. Section, Gaura

  
Assistant Engineer,  
I&PH. Sub-Division  
~~Solan no-3 Dharampur~~

  
Executive Engineer  
I&PH. Division, Solan

## Grid SS-9

No.JSV/GWO/E-32/2020  
To

Himachal Pradesh  
Jal Shakti Vibhag

2386-90 Dated: 7-3-2020

The Executive Engineer,  
Jal Shakti Vibhag, Nalagarh.

Subject:- Regarding site selection for installation of tubewell (LWSS Dumanwala and LWSS Landewal Kalyanpur) under ADH.

Reference:- Your office letter No.IPHD-NLG-DB-Site Selection/2019/12756-58 dated: 07-02-2020.

Kindly refer to letter under reference vide which hydrogeological investigation report of Sh. Vinod Srivastava for construction of tubewells for drinking purpose was sent to this office for technical scrutiny and necessary recommendations. As per the observations made during the course of field investigation as well as the hydrogeological environment of the area and further interpretation of satellite imagery - the inferences drawn, therefrom, the sites are found feasible and following recommendations have been made:-

Sr. No.	Name of Scheme	Water requirement @ 16 hour pumping a day	Depth (b.g.L.)	Expected discharge	Site Location
1	LWSS Dumanwala	2.57 lps	125 m	6-8 lps	At the site which lies Govt. land having location coordinates Latitude N 30° 59' 16.62" Longitude E 76° 46' 12.09"
2	LWSS Landewal Kalyanpur	1.09 lps	90 m	2-3 lps	At the site which lies Govt. Land and adjoining private land of Sh. Birtal Das S/o Sh. Ram Rakha having location coordinates Latitude N 30° 55' 18.7" Longitude E 76° 47' 19.0"

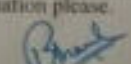
Borehole (200 mm casing dia.) with Rotary rig is recommended for carrying out the drilling. The quality of the water resource thus won be got analysed for ascertaining its suitability as per BIS norms for drinking purpose.

It is further added that since the H.P. Ground Water (Regulation & Control of Development and Management) Act, 2005 has been enacted in the State and the area where these tubewells are proposed fall in the Nalagarh valley where the stage of the ground water development is under over exploited category (as per latest Ground Water Estimation study as on 31 March 2017) and is notified under the aforesaid Act. Thus, work of the tubewell may be carried out only after obtaining necessary permission from the Member-Secretary, Himachal Pradesh Ground Water Authority-Cum-Superintending Engineer, P&I-II Unit, Shimla-9, as per provision contained under section 7 of the Act.

Minimum spacing as prescribed under section 7 sub section 5(f) of the Act between the proposed tubewells and already existing abstraction structures be maintained for sustainable development and management of the resource in the area.

  
Senior Hydrogeologist,  
Ground Water Organisation,  
Jal Shakti Vibhag, Una (HP).

Copy to the Engineer-in-Chief, Jal Shakti Vibhag, Jal Sakti Bhawan, Shimla-5 for kind information please.  
Copy to the Chief Engineer (S/Z), Jal Shakti Vibhag, Jal Sakti Bhawan, Shimla-5 for kind information please.  
Copy to the Superintending Engineer, Jal Shakti Circle, Una/Solan for kind information please.

  
Senior Hydrogeologist,  
Ground Water Organisation,  
Jal Shakti Vibhag, Una (HP).



Himachal Pradesh  
Jal Shakti Vibhag

No.JSV/GWO/E-32/2020:

132-136

Dated: 21-5-2020

To


\*The Executive Engineer,  
Jal Shakti Vibhag, Nalagarh.

Subject:- Regarding site selection /Feasibility Report for installation of tubewell site for (LWSS Dumarwala and LWSS Landewal Kalyanpur) under ADB.

Reference:- Your office letter No.JSD-NLG-DB-Site Selection/2020: 617-18 dated: 21-05-2020.

Kindly refer to letter under reference vide which hydrogeological feasibility report for construction of tubewells for LWSS Dumarwala and LWSS Landewal Kalyanpur was desired. In this connection it is submitted that these sites have been already recommended vide this office letter No.JSV/GWO/E-32/2020:2386-90 dated 07-03-2020 to meet the water requirement 2.57 lps , 1.09 lps for LWSSDumarwala and Lwss Landewal Kalyanpur respectively (Photo copy attached).

These sites have been reinvestigated by Sh. Vinod Srivastva Junior Hydrogeologist JS Division Nalagarh to meet the enhanced water requirement i.e. 6.61 lps for LWSS Dumarwala and 1.10lps for LWSS Landewal Kalyanpur @ 16 hour pumping a day. As per the observations made during the course of field investigation by him as well as the inferences drawn from the resistivity survey conducted at Dumarwala site, it is concluded that both the sites are hydrogeologically feasible to meet out the enhanced water requirement. The other recommendations are similar as recommended earlier.

  
Senior Hydrogeologist,  
Ground Water Organisation,  
Jal Shakti Vibhag, Una (HP).

Copy to the Engineer-in-Chief, Jal Shakti Vibhag, Jal Sakti Bhawan, Shimla-5 for kind information please.  
Copy to the Chief Engineer (S/Z), Jal Shakti Vibhag, Jal Sakti Bhawan, Shimla-5 for kind information please.  
Copy to the Superintending Engineer, Jal Shakti Circle, Una/Solan for kind information please.

//  
Senior Hydrogeologist,  
Ground Water Organisation,  
Jal Shakti Vibhag, Una (HP).

No.JSV/GWC/E-32/2020-21:

Himachal Pradesh  
Jal Shakti Vibhag

Dated: 22-5-2020

145-149

To

✓ The Executive Engineer,  
Jal Shakti Division, Nalagarh.

Subject:-

Site Selection/Feeability Report of Tube Well for Remodeling / Renovation of LWSS Amroo Barwasini in Tehsil Nalagarh Distt. Solan (H.P.).(Location Baghania)

Reference:-


Your office letter No. JSD-NLG-DB-Site Selection/2020-631-32 dated 21-05-2020.

Kindly refer to letter under reference vide which the hydrogeological feasibility of construction a tubewell for LWSS Amroo Barwasini was sought. The water requirement of the scheme is reported to be around 3.00 lps @ 16 hours pumping a day. In this connection the proposed site was investigated by Sh. Vinod Srivastava Junior Hydrogeologist JS Division Nalagarh alongwith Assistant Engineer, Junior Engineer concerned. As per the observations made during the course of field investigation as well as the hydrogeological set up of the area and and further interpretation of satellite imagery the inferences drawn, therefrom the site is found feasible for sufficing the water requirement of the proposed scheme and following recommendations have been made:-

A borehole (200mm casing dia.) of depth around 125 m bgl is recommended at the site which falls in the Govt. Land and situated on right bank of Tahlawal Baghania Mad having location coordinates:- Latitude N 30° 59' 58.6" & Longitude E 76° 44' 23.6". Rotary mode of drilling is recommended for carrying out the drilling and the discharge expected is around 5 to 7 lps. The quality of the water resource thus won be got analysed for ascertaining its suitability as per BIS norms for drinking purpose.

It is further added that since the H.P. Ground Water (Regulation & Control of Development and Management) Act, 2005 has been enacted in the State and is notified under the aforesaid Act. Thus, the work of the tubewell may be carried out only after obtaining necessary permission from the Member-Secretary, Himachal Pradesh Ground Water Authority-Cum-Superintending Engineer, P&I-II Unit, Shimla-9, as per provision contained under section 7 of the Act.

Minimum spacing as prescribed under section 7 sub section 5(f) of the Act between the proposed tubewell and already existing abstraction structures be maintained for sustainable development and management of the resource in the area.

  
Senior Hydrogeologist,  
Ground Water Organisation,  
Jal Shakti Vibhag, Una (HP).

Copy to the Engineer-in-Chief, Jal Shakti Vibhag, Jal Sakti Bhawan, Shimla-5 for kind information please.

Copy to the Chief Engineer (S/Z), Jal Shakti Vibhag, Shimla for kind information please.

Copy to the Superintending Engineer, Jal Shakti Circle, Una/Solan for kind information please.

//  
Senior Hydrogeologist,  
Ground Water Organisation,  
Jal Shakti Vibhag, Una (HP).



Himachal Pradesh  
Jal Shakti Vibhag

No.JSV/GWO/E-32/2020-21: -

2619-24

Dated: 03-03-2021

To The Executive Engineer,  
Jal Shakti Division, Nalagarh.

Subject:- Site Selection for Renovation and remodelling of LWSS Dunarwala, LWSS Barotiwal, LWSS Kotian Mandhala, LWSS Landwal and LWSS Amroo Bawani and adjoining villages. (at village Mandhala).


Reference:- Your office letter No. EE/2SD/IND/DB-WSS/2019/14631-33 dated 18-03-2020.

Kindly refer to letter under reference vide which the hydrogeological feasibility for the construction of Tubewell at village Mandhala for subject cited water supply scheme was desired. The water requirement of the scheme is reported to be around 5.50 l.p.s. @ 16- hours pumping a day. As per the hydrogeological environment of the area and further interpretation of satellite imagery - the inferences drawn, therefrom, the sites are found feasible and following recommendations have been made:-

A borehole (200 mm casing dia.) of depth around 125 m b.g.l. is recommended at the site which falls in the Govt. land having location co-ordinates Latitude N 30° 53' 54.05" Longitude E 76° 32' 13.31". Rotary rig is recommended for carrying out the drilling and the expected discharge is around 7-8 lps. The quality of the water resource thus won be got analysed for ascertaining its suitability as per BIS norms for drinking purpose.

It is further added that since the H.P. Ground Water (Regulation & Control of Development and Management) Act, 2005 has been enacted in the State. Thus, the work of the tubewell may be carried out only after obtaining necessary permission from the Member-Secretary, Himachal Pradesh Ground Water Authority-Cum-Superintending Engineer, P&I-II Unit, Shimla-5, as per provision contained under section 7 of the Act.

Minimum spacing as prescribed under section 7 sub section 5(f) of the Act between the proposed tubewell and already existing abstraction structures be maintained for sustainable development and management of the resource in the area.

  
Senior Hydrogeologist,  
Ground Water Organisation,  
Jal Shakti Vibhag, Una (HP).

Copy to the Engineer-in-Chief, Jal Shakti Vibhag, Jal Shakti Bhawan, Shimla-5 for kind information please.  
Copy to the Chief Engineer, Jal Shakti Vibhag, Hamirpur/Shimla for kind information please.  
Copy to the Superintending Engineer, Jal Shakti Circle, Una/ Sulan for kind information please.

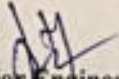
//  
Senior Hydrogeologist,  
Ground Water Organisation,  
Jal Shakti Vibhag, Una (HP).


## DISCHARGE CERTIFICATE


**Name of work:** Renovation and Re-modelling of old water supply schemes of LWSS Dhumanwala, Barotiwala, Kotian, Landeywal & Amroo Bawasni under ADB funding

It is certified that the Lean period discharge of **Barotiwala Tube-well** serving **LWSS Barotiwala** with co-ordinates **30°54'14.19"N 76°50'27.03"E** has been measured by Sh. Haridass on 6/04/2020 at 10:00 am & discharge was found to be **17.5 LPS**. The depth of the tube-well is 125m.

Dispute, if any, will be settled by this department.

  
Junior Engineer  
Jal Shakti Section  
Barotiwala


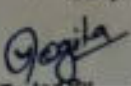
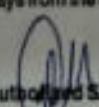
  
Assistant Engineer  
Jal Shakti Sub-Div  
Baddi

  
Executive Engineer  
Jal Shakti Division  
Nalagarh

## Appendix 9: Water Quality Reports from Proposed Sources

## Lab Reports

## SS-1 Grid

 <div style="text-align: center;"> Himachal Pradesh  Irrigation &amp; Public Health Department  Water Testing Laboratory, Nahan  <b>TEST REPORT</b> </div>					
Sample No.:		DLN-384		DATE: 26.7.19	
Test Report No: DWTL-NAHAN-2019-384					
Name & Address of customer: Sub-Division Sarnan			Condition of sample when Received: OK		
Sampling Method: N/A			Name of Source/Scheme: LSS to Mahalana		
Sample Description: Water			Name of Panchayat: Darnab		
Sample Quantity: 500 ml			Name of Habitation: Mahalana		
Collected on: 2:10 P.M			Name of Village: Mahalana		
Test Start Date: 26.7.19			Type of Source: Raw Water Tank		
Test End Date: 27.7.19					
Sr.	Test	Test Method	Result	Requirement As per IS 10500:2012	
				Acceptable Limit	Permissible limit in the absence of alternate source
<b>Physical Parameters</b>					
1.	Turbidity	APHA 23rd Edition	0.3 NTU	1 NTU Max	5 NTU Max
2.	Temperature*	APHA 23rd Edition	25°C		
3.	Colour*	APHA 23rd Edition	Agreeable	5 max	15 max
4.	Odour*	APHA 23rd Edition	Agreeable	Agreeable	Agreeable
5.	Taste*	APHA 23rd Edition	Agreeable	Agreeable	Agreeable
6.	pH*	APHA 23rd Edition	7.5	6.5-8.5	No relaxation
<b>Chemical Parameters</b>					
7.	Total Alkalinity	APHA 23rd Edition	170 mg/L	200 mg/lMax	600 mg/lMax
8.	Chloride (as Cl)	APHA 23rd Edition	Small	250 mg/lMax	1000 mg/lMax
9.	Total Hardness (as CaCO <sub>3</sub> )	APHA 23rd Edition	160 mg/L	200 mg/lMax	600 mg/lMax
10.	TDS/electrical Conductivity *	APHA 23rd Edition	270 mg/K	500 mg/lMax	2000 mg/lMax
11.	Nitrate (as NO <sub>3</sub> ) *	APHA 23rd Edition	N/D	45 mg/lMax	No relaxation
12.	Fluoride *	APHA 23rd Edition	N/D	1.0 mg/lMax	1.5 mg/lMax
13.	Sulphate *	APHA 23rd Edition	Small	200 mg/lMax	400 mg/lMax
14.	Ammonia *	APHA 23rd Edition	N/D	0.5 mg/lMax	No relaxation
15.	Iron *	APHA 23rd Edition	N/D	0.3 mg/lMax	No relaxation
16.	Manganese *	APHA 23rd Edition	N/D	0.1 mg/lMax	0.3 mg/lMax
17.	Total Arsenic *	APHA 23rd Edition	N/D	0.01 mg/lMax	0.05 mg/lMax
18.	Free residual Chlorine *	APHA 23rd Edition	0.2 mg/L	0.2 mg/lMin	1.0 mg/lMin
<b>Bacteriological Parameters</b>					
19.	Total Coliforms*	IS 1622:1981 (resfr.)	N/D	Nil	Nil
20.	E-Coli *	IS 1622:1981 (resfr.)	N/D	Nil	Nil
<b>Note:</b> <ul style="list-style-type: none"> <li>The parameters with * are not accredited by NABL</li> <li>This report should not be produced partly or full without approval of signatory authority for legal purpose</li> <li>The results refer only to tested samples and parameters tested.</li> <li>Samples will be stored for a period of 10 days from the date of issue of report.</li> </ul>					
 Tejinder Singh Authorised Signatory Water Testing Laboratory, Nahan		 Assistant Engineer I&PH Sub Division, Nahan, H.P.			



## Lab Reports

## SS-9 Grid

**WATER TESTING LABORATORY**

IPH SUB-DIVISION : NALAGARH

Lab Ref. No. 3305-06 Based Upon BIS : 10500-2012 DISTRICT : SOLAN

Name and Address of Sender-AE IPH SUB DIVISION Tihel Sub-Division Baddi Date :        /        /       

Name of District Solan Block Malagarh Sub Division Malagarh

Gram Panchayat Sandholi Village Lardewal Habitation       

Name of Scheme & Source L.H.S.S. Lardewal Kalyanpur (M.O. Dispensary) Public Tap

Date & Time of Collection 8-8-20 at 10:45 AM

Date & Time of Receipt at Laboratory 3-8-20 at 12:41 PM

Date & Time of Commencing       

Type of Sample :- 1. Raw Water 2. Filtered Water 3. Chlorinated 4. Distributed system (Pvt. tap, Public stand post) 5. Hand pump

A	PHYSICAL TEST	1	2	3
Sl. No.	TESTS	Desirable Limit	Permissible Limit	Actual Result
1.	Temperature			
2.	Colour	5	15	14° °C
3.	Odour	Agreeable	Agreeable	—
4.	Taste	Agreeable	Agreeable	—
5.	Turbidity	1 NTU	5 NTU	2.1 NTU
6.	TDS/Conductivity	500mg/l	2000mg/l	140 mg/l
B	CHEMICAL TESTS :-			
7.	pH	6.5	8.5	7.5
8.	Total Alkalinity	200mg/l	600mg/l	210 mg/l
9.	Chlorides	250mg/l	1000mg/l	145 mg/l
10.	Fluoride	1.0mg/l	1.5mg/l	— mg/l
11.	Nitrate	45mg/l	45mg/l	— mg/l
12.	Sulphate	200mg/l	400mg/l	— mg/l
13.	Total Hardness	200mg/l	600mg/l	220 mg/l
14.	Iron	0.1mg/l	0.3mg/l	— mg/l
15.	Manganese	0.1mg/l	0.3mg/l	— mg/l
16.	Total Arsenic	0.01mg/l	0.01mg/l	— mg/l
17.	Residual Chlorine	0.2mg/l	1mg/l	0.1 mg/l
C	BACTERIOLOGICAL TEST :-			
18.	Total Coli form	0 MPN	0 MPN	nil MPN
19.	E.Coli/Thermo-tolerant Coli form	0 MPN	0 MPN	nil MPN

Remarks : Sample is under surge in all above parameters performed in lab.

Assistant Chemist  
Water Testing Lab Nalagarh

Junior Engineer  
IPH Section Nalagarh

Assistant Engineer  
IPH Sub Division Nalagarh

## Appendix 10: 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.

***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.

***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.

***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)

***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.

**Reporting finds** - When finds are made these should be reported to PIU/Consultants. Photographs and record drawings should be sent.

**Discovery of historic objects** - When clearance and excavation takes place artifacts 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).

**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 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**

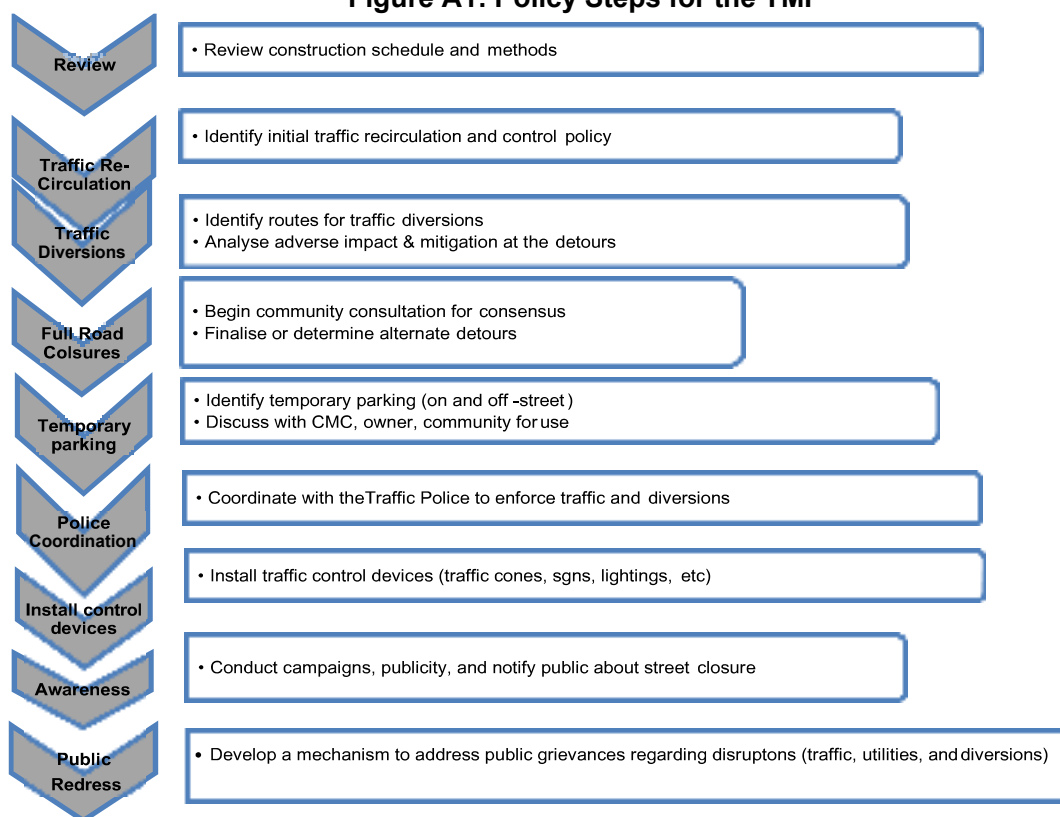
4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

- (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.

6. 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 behavior along the work zones; and
- (iii) Reduced speeds enforced at the work zones and traffic diversions.

7. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

8. 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 centers. 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:

- (i) explain why the brochure was prepared, along with a brief description of the project;
- (ii) advise the public to expect the unexpected;

- (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
- (iv) educate the public about the safe road user behavior to emulate at the work zones;
- (v) 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
- (vi) Indicate the office hours of relevant offices.

#### **E. Install traffic control devices at the work zones and traffic diversion routes**

9. 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

10. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and 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”).

11. **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

12. 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 required for 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.

13. 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.

16. 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. There should be provision for lighting beacons and illumination for night constructions.

**Figure A2 & A3: Work on shoulder or parking lane & Shoulder or parking lane closed on divided road**

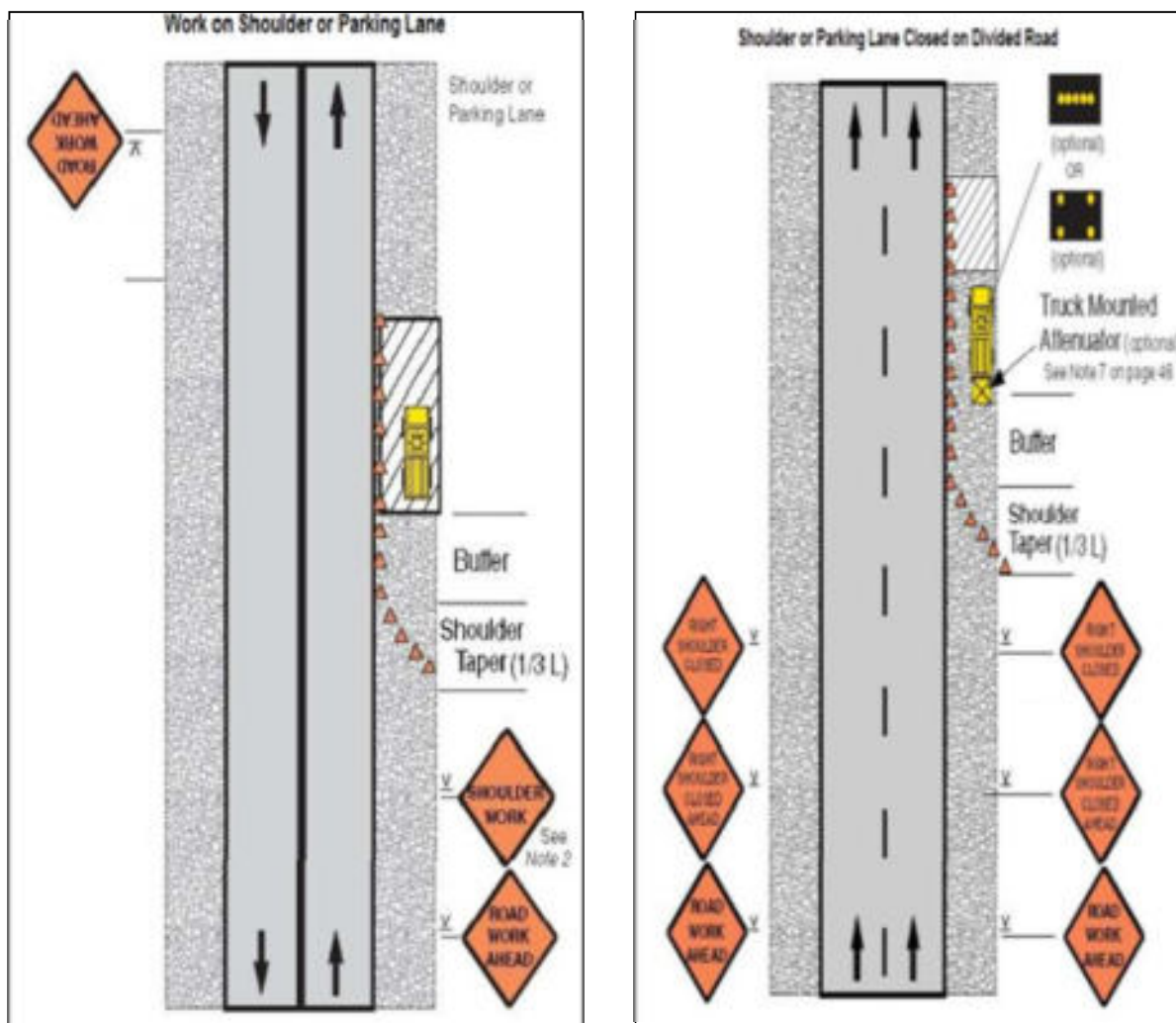
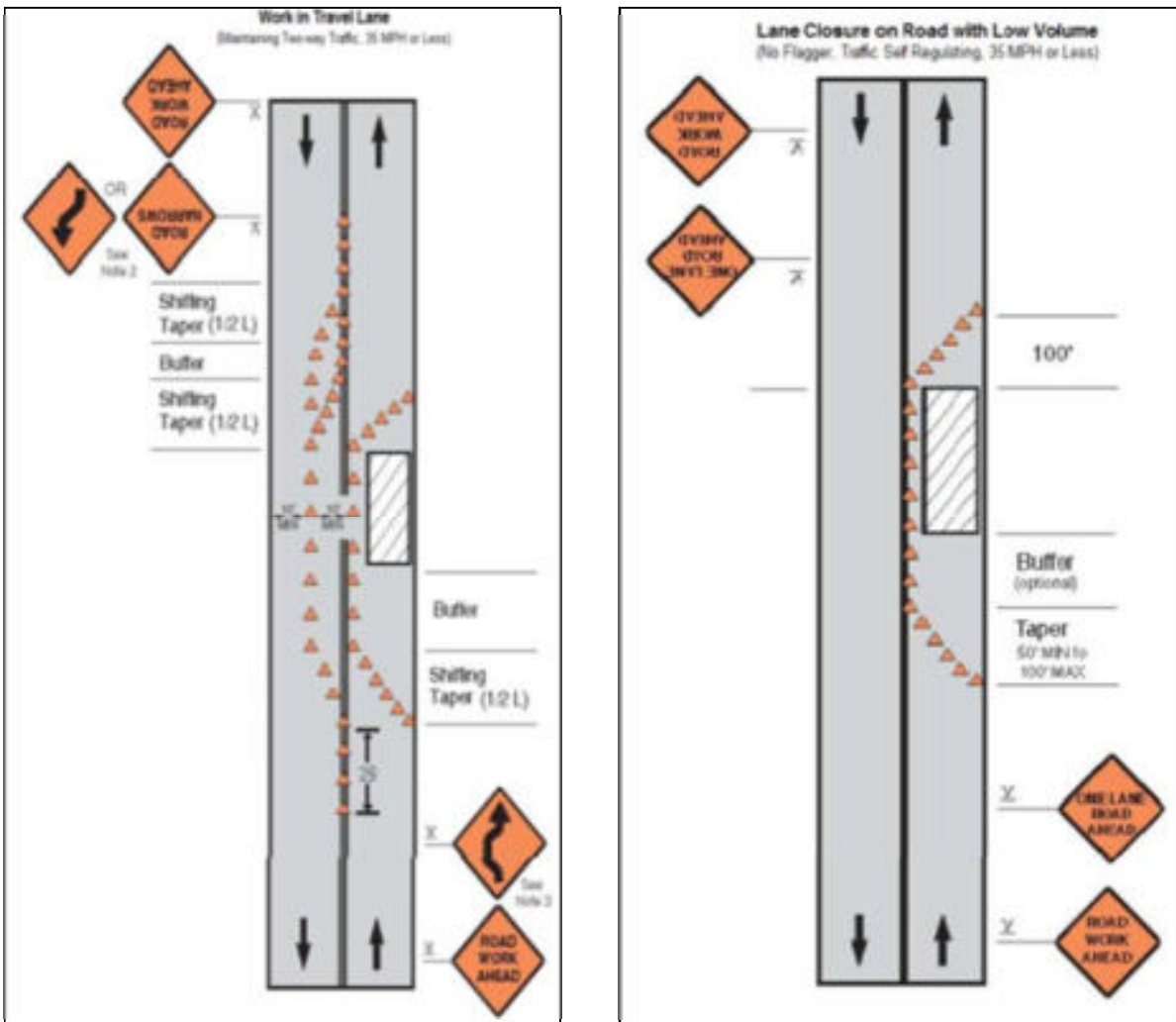


Figure A4 &amp; A5: Work in Travel Lane &amp; Lane closure on road with low volume







**Figure A8 & A9: Lane Closure on a Two-Lane Road (Two Flagger Operation) & Lane Closure on a Four-Lane Undivided Road**

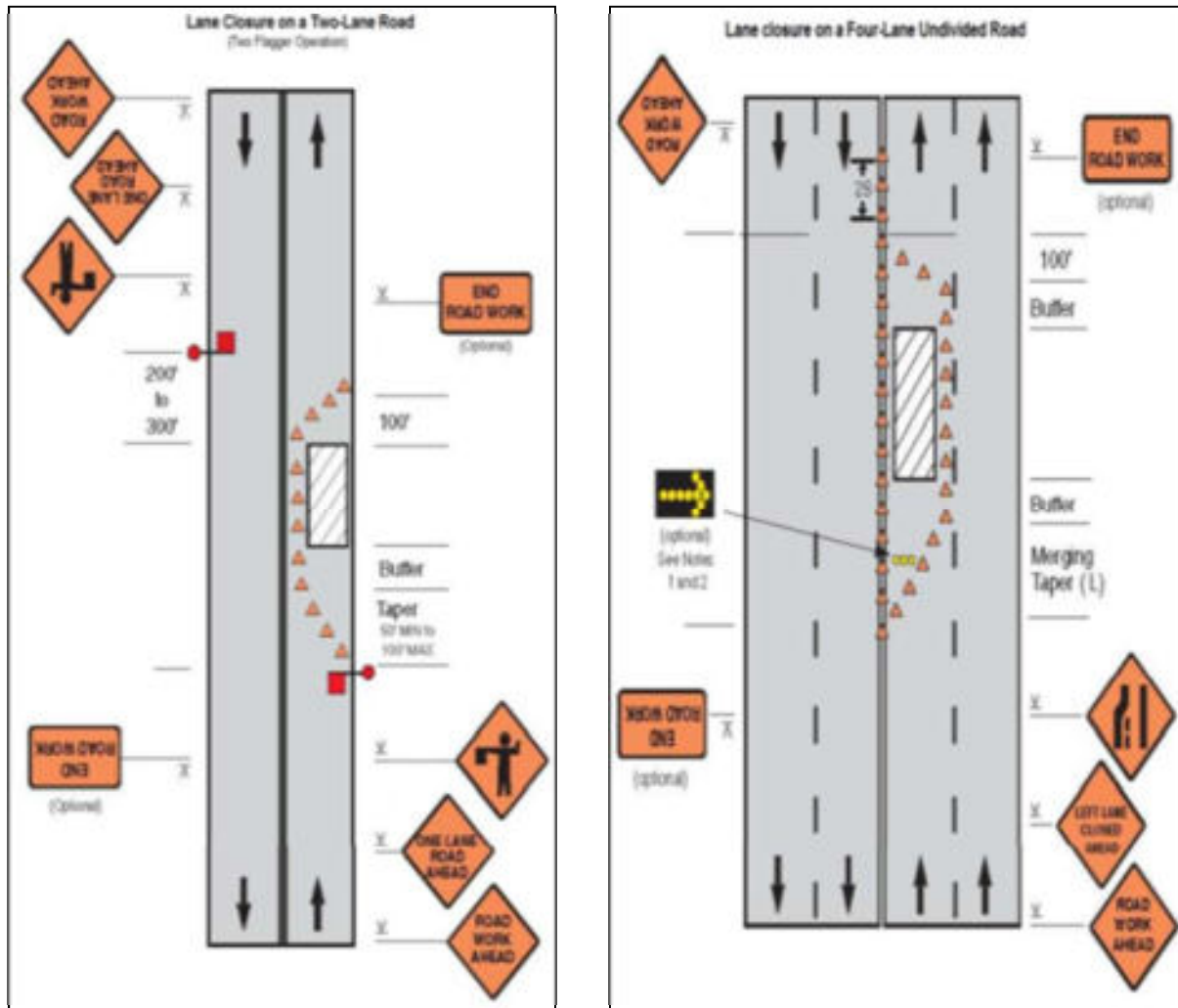


Figure A10 & A11: Lane Closure on Divided Roadway & Half Road Closure on Multi-Lane Roadway

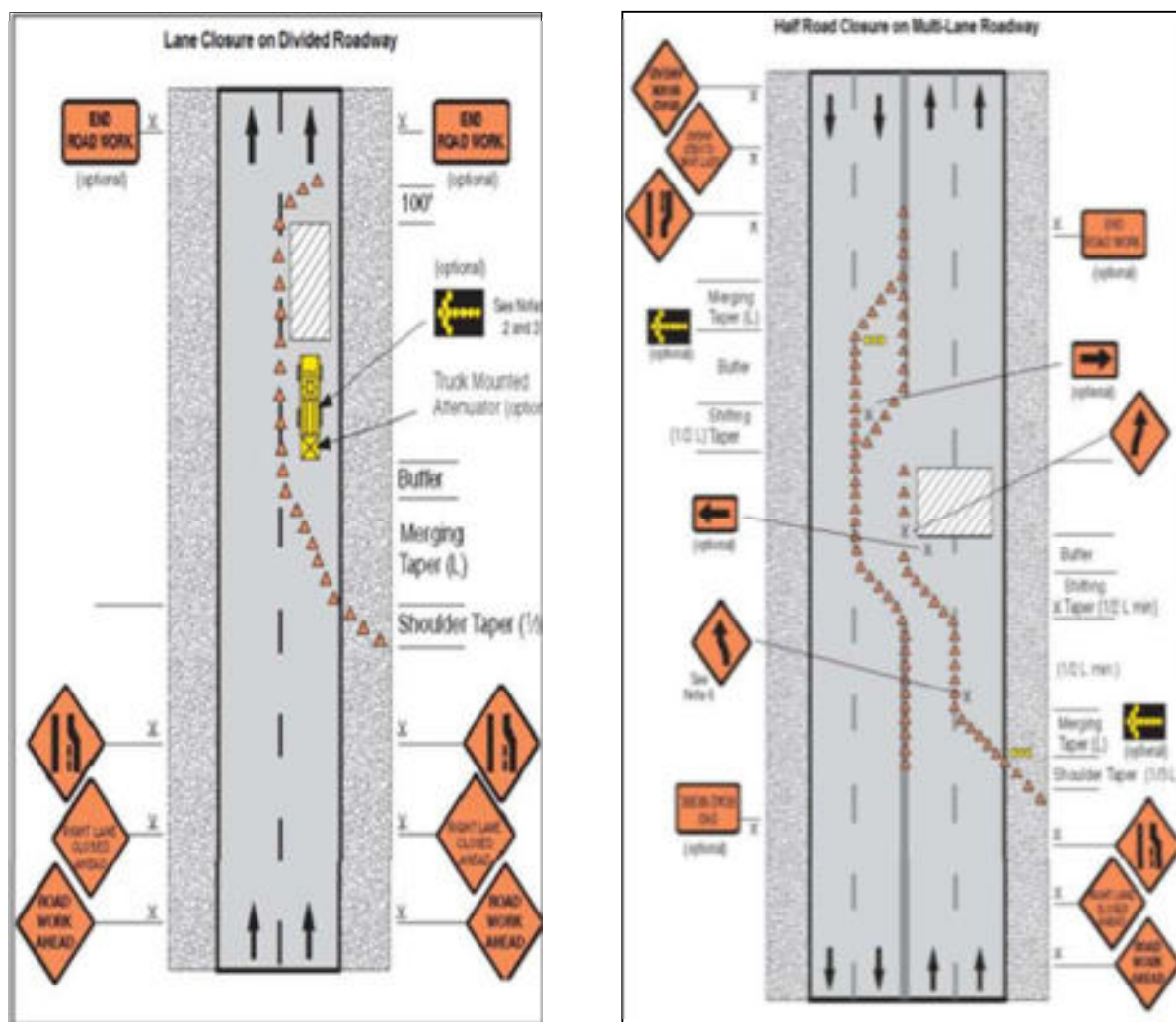
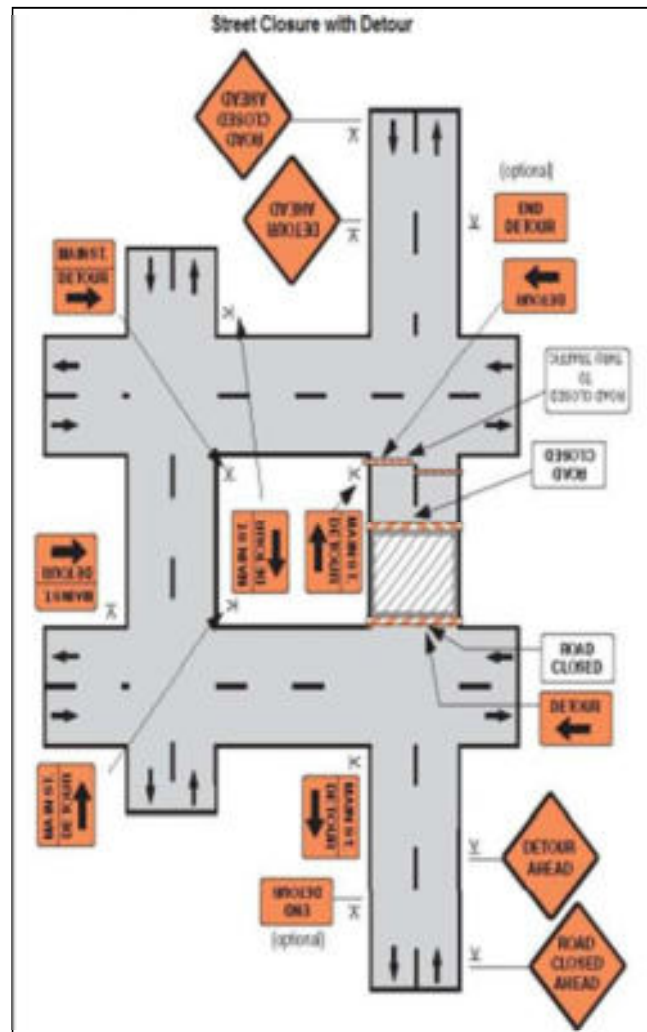


Figure A12: Street closure with detour



## Appendix 13: WHO Interim Guidance on Water, Sanitation, Hygiene and Waste Management for the COVID19 Virus



# Water, sanitation, hygiene, and waste management for the COVID-19 virus

Interim guidance  
19 March 2020

## Background

This interim guidance supplements the infection prevention and control (IPC) documents by summarizing WHO guidance on water, sanitation and health care waste relevant to viruses, including coronaviruses. It is intended for water and sanitation practitioners and providers and health care providers who want to know more about water, sanitation and hygiene (WASH) risks and practices.

The provision of safe water, sanitation, and hygienic conditions is essential to protecting human health during all infectious disease outbreaks, including the COVID-19 outbreak. Ensuring good and consistently applied WASH and waste management practices in communities, homes, schools, marketplaces, and health care facilities will help prevent human-to-human transmission of the COVID-19 virus.

The most important information concerning WASH and the COVID-19 virus is summarized here.

- Frequent and proper hand hygiene is one of the most important measures that can be used to prevent infection with the COVID-19 virus. WASH practitioners should work to enable more frequent and regular hand hygiene by improving facilities and using proven behavior-change techniques.
- WHO guidance on the safe management of drinking-water and sanitation services applies to the COVID-19 outbreak. Extra measures are not needed. Disinfection will facilitate more rapid die-off of the COVID-19 virus.
- Many co-benefits will be realized by safely managing water and sanitation services and applying good hygiene practices.

Currently, there is no evidence about the survival of the COVID-19 virus in drinking-water or sewage. The morphology and chemical structure of the COVID-19 virus are similar to those of other human coronaviruses for which there are data about both survival in the environment and effective inactivation measures. This document draws upon the evidence base and WHO guidance on how to protect against viruses in sewage and drinking-water. This document will be updated as new information becomes available.

## 1. COVID-19 transmission

There are two main routes of transmission of the COVID-19 virus: respiratory and contact. Respiratory droplets are generated when an infected person coughs or sneezes. Any person who is in close contact with someone who has respiratory symptoms (sneezing, coughing) is at risk of being exposed to potentially infective respiratory droplets.<sup>1</sup> Droplets may also land on surfaces where the virus could remain viable; thus, the immediate environment of an infected individual can serve as a source of transmission (contact transmission).

Approximately 2–10% of cases of confirmed COVID-19 disease present with diarrhoea,<sup>2,4</sup> and two studies detected COVID-19 viral RNA fragments in the faecal matter of COVID-19 patients.<sup>3,6</sup> However, only one study has cultured the COVID-19 virus from a single stool specimen.<sup>7</sup> There have been no reports of faecal–oral transmission of the COVID-19 virus.

## 2. Persistence of the COVID-19 virus in drinking-water, faeces and sewage and on surfaces.

Although persistence in drinking-water is possible, there is no evidence from surrogate human coronaviruses that they are present in surface or groundwater sources or transmitted through contaminated drinking water. The COVID-19 virus is an enveloped virus, with a fragile outer membrane. Generally, enveloped viruses are less stable in the environment and are more susceptible to oxidants, such as chlorine. While there is no evidence to date about survival of the COVID-19 virus in water or sewage, the virus is likely to become inactivated significantly faster than non-enveloped human enteric viruses with known waterborne transmission (such as adenoviruses, norovirus, rotavirus and hepatitis A). For example, one study found that a surrogate human coronavirus survived only 2 days in dechlorinated tap water and in hospital wastewater at 20°C.<sup>8</sup> Other studies concur, noting that the human coronaviruses transmissible gastroenteritis coronavirus and mouse hepatitis virus demonstrated a 99.9% die-off in from 2 days<sup>9</sup> at 23°C to 2 weeks<sup>10</sup> at 25°C. Heat, high or low pH, sunlight, and common disinfectants (such as chlorine) all facilitate die-off.

It is not certain how long the virus that causes COVID-19 survives on surfaces, but it seems likely to behave like other coronaviruses. A recent review of the survival of human



coronaviruses on surfaces found large variability, ranging from 2 hours to 9 days.<sup>11</sup> The survival time depends on a number of factors, including the type of surface, temperature, relative humidity, and specific strain of the virus. The same review also found that effective inactivation could be achieved within 1 minute using common disinfectants, such as 70% ethanol or sodium hypochlorite (for details, see Cleaning practices).

### 3. Keeping water supplies safe

The COVID-19 virus has not been detected in drinking-water supplies, and based on current evidence, the risk to water supplies is low.<sup>12</sup> Laboratory studies of surrogate coronaviruses that took place in well-controlled environments indicated that the virus could remain infectious in water contaminated with faeces for days to weeks.<sup>13</sup> A number of measures can be taken to improve water safety, starting with protecting the source water, treating water at the point of distribution, collection, or consumption; and ensuring that treated water is safely stored at home in regularly cleaned and covered containers.

Conventional, centralized water treatment methods that use filtration and disinfection should inactivate the COVID-19 virus. Other human coronaviruses have been shown to be sensitive to chlorination and disinfection with ultraviolet (UV) light.<sup>12</sup> As enveloped viruses are surrounded by a lipid host cell membrane, which is not robust, the COVID-19 virus is likely to be more sensitive to chlorine and other oxidant disinfection processes than many other viruses, such as coxsackieviruses, which have a protein coat. For effective centralized disinfection, there should be a residual concentration of free chlorine of  $\geq 0.5$  mg/L after at least 30 minutes of contact time at pH  $< 8.0$ .<sup>12</sup> A chlorine residual should be maintained throughout the distribution system.

In places where centralized water treatment and safe piped water supplies are not available, a number of household water treatment technologies are effective in removing or destroying viruses, including boiling or using high-performing ultrafiltration or nanomembrane filters, solar irradiation and, in non-turbid waters, UV irradiation and appropriately dosed free chlorine.

### 4. Safely managing wastewater and faecal waste

There is no evidence that the COVID-19 virus has been transmitted via sewerage systems with or without wastewater treatment. Further, there is no evidence that sewage or wastewater treatment workers contracted the severe acute respiratory syndrome (SARS), which is caused by another type of coronavirus that caused a large outbreak of acute respiratory illness in 2003. As part of an integrated public health policy, wastewater carried in sewerage systems should be treated in well-designed and well-managed centralized wastewater treatment works. Each stage of treatment (as well as retention time and dilution) results in a further reduction of the potential risk. A waste stabilization pond (an oxidation pond or lagoon) is generally considered a practical and simple wastewater treatment technology particularly well suited to destroying pathogens, as relatively long retention times (20 days or longer) combined with sunlight, elevated pH levels, biological activity, and other factors serve to accelerate pathogen destruction. A final disinfection step may be considered if existing wastewater treatment plants are not optimized to remove viruses. Best practices for protecting the health of workers at sanitation treatment facilities should

be followed. Workers should wear appropriate personal protective equipment (PPE), which includes protective overwear, gloves, boots, goggles or a face shield, and a mask; they should perform hand hygiene frequently; and they should avoid touching eyes, nose, and mouth with unwashed hands.

## WASH in health care settings

Existing recommendations for water, sanitation and hygiene measures in health care settings are important for providing adequate care for patients and protecting patients, staff, and caregivers from infection risks.<sup>14</sup> The following actions are particularly important: (i) managing excreta (faeces and urine) safely, including ensuring that no one comes into contact with it and that it is treated and disposed of correctly; (ii) engaging in frequent hand hygiene using appropriate techniques; (iii) implementing regular cleaning and disinfection practices; and (iv) safely managing health care waste. Other important measures include providing sufficient safe drinking-water to staff, caregivers, and patients; ensuring that personal hygiene can be maintained, including hand hygiene, for patients, staff and caregivers; regularly laundering bed sheets and patients' clothing; providing adequate and accessible toilets (including separate facilities for confirmed and suspected cases of COVID-19 infection); and segregating and safely disposing of health care waste. For details on these recommendations, please refer to Essential environmental health standards in health care.<sup>14</sup>

### 1. Hand hygiene practices

Hand hygiene is extremely important. Cleaning hands with soap and water or an alcohol-based hand rub should be performed according to the instructions known as "My 5 moments for hand hygiene".<sup>15</sup> If hands are not visibly dirty, the preferred method is to perform hand hygiene with an alcohol-based hand rub for 20–30 seconds using the appropriate technique.<sup>16</sup> When hands are visibly dirty, they should be washed with soap and water for 40–60 seconds using the appropriate technique.<sup>17</sup> Hand hygiene should be performed at all five moments, including before putting on PPE and after removing it, when changing gloves, after any contact with a patient with suspected or confirmed COVID-19 infection or their waste, after contact with any respiratory secretions, before eating, and after using the toilet.<sup>18</sup> If an alcohol-based hand rub and soap are not available, then using chlorinated water (0.05%) for handwashing is an option, but it is not ideal because frequent use may lead to dermatitis, which could increase the risk of infection and asthma and because prepared dilutions might be inaccurate.<sup>19</sup> However, if other options are not available or feasible, using chlorinated water for handwashing is an option.

Functional hand hygiene facilities should be present for all health care workers at all points of care and in areas where PPE is put on or taken off. In addition, functional hand hygiene facilities should be available for all patients, family members, and visitors, and should be available within 5 m of toilets, as well as in waiting and dining rooms and other public areas.

## 2. Sanitation and plumbing

People with suspected or confirmed COVID-19 disease should be provided with their own flush toilet or latrine that has a door that closes to separate it from the patient's room. Flush toilets should operate properly and have functioning drain traps. When possible, the toilet should be flushed with the lid down to prevent droplet splatter and aerosol clouds. If it is not possible to provide separate toilets, the toilet should be cleaned and disinfected at least twice daily by a trained cleaner wearing PPE (gown, gloves, boots, mask, and a face shield or goggles). Further, and consistent with existing guidance, staff and health care workers should have toilet facilities that are separate from those used by all patients.

WHO recommends the use of standard, well-maintained plumbing, such as sealed bathroom drains, and backflow valves on sprayers and faucets to prevent aerosolized faecal matter from entering the plumbing or ventilation system,<sup>20</sup> together with standard wastewater treatment.<sup>21</sup> Faulty plumbing and a poorly designed air ventilation system were implicated as contributing factors to the spread of the aerosolized SARS coronavirus in a high-rise apartment building in Hong Kong in 2003.<sup>22</sup> Similar concerns have been raised about the spread of the COVID-19 virus from faulty toilets in high-rise apartment buildings.<sup>23</sup> If health care facilities are connected to sewers, a risk assessment should be conducted to confirm that wastewater is contained within the system (that is, the system does not leak) before its arrival at a functioning treatment or disposal site, or both. Risks pertaining to the adequacy of the collection system or to treatment and disposal methods should be assessed following a safety planning approach,<sup>24</sup> with critical control points prioritized for mitigation.

For smaller health care facilities in low-resource settings, if space and local conditions allow, pit latrines may be the preferred option. Standard precautions should be taken to prevent contamination of the environment by excreta. These precautions include ensuring that at least 1.5 m exists between the bottom of the pit and the groundwater table (more space should be allowed in coarse sands, gravels, and fissured formations) and that the latrines are located at least 30 m horizontally from any groundwater source (including both shallow wells and boreholes).<sup>25</sup> If there is a high groundwater table or a lack of space to dig pits, excreta should be retained in impermeable storage containers and left for as long as feasible to allow for a reduction in virus levels before moving it off-site for additional treatment or safe disposal, or both. A two-tank system with parallel tanks would help facilitate inactivation by maximizing retention times, as one tank could be used until full, then allowed to sit while the next tank is being filled. Particular care should be taken to avoid splashing and the release of droplets while cleaning or emptying tanks.

## 3. Toilets and the handling of faeces

It is critical to conduct hand hygiene when there is suspected or direct contact with faeces (if hands are dirty, then soap and water are preferred to the use of an alcohol-based hand rub). If the patient is unable to use a latrine, excreta should be collected in either a diaper or a clean bedpan and immediately and carefully disposed of into a separate toilet or latrine used only by suspected or confirmed cases of COVID-19. In all health care settings, including those with suspected or confirmed COVID-19 cases, faeces must be treated as a biohazard and handled as little as possible. Anyone handling

faeces should follow WHO contact and droplet precautions<sup>26</sup> and use PPE to prevent exposure, including long-sleeved gowns, gloves, boots, masks, and goggles or a face shield. If diapers are used, they should be disposed of as infectious waste as they would be in all situations. Workers should be properly trained in how to put on, use, and remove PPE so that these protective barriers are not breached.<sup>27</sup> If PPE is not available or the supply is limited, hand hygiene should be regularly practiced, and workers should keep at least 1 m distance from any suspected or confirmed cases.

If a bedpan is used, after disposing of excreta from it, the bedpan should be cleaned with a neutral detergent and water, disinfected with a 0.5% chlorine solution, and then rinsed with clean water; the rinse water should be disposed of in a drain or a toilet or latrine. Other effective disinfectants include commercially available quaternary ammonium compounds, such as cetylpyridinium chloride, used according to manufacturer's instructions, and peracetic or peroxyacetic acid at concentrations of 500–2000 mg/L.<sup>28</sup>

Chlorine is ineffective for disinfecting media containing large amounts of solid and dissolved organic matter. Therefore, there is limited benefit to adding chlorine solution to fresh excreta and it is possible that this may introduce risks associated with splashing.

## 4. Emptying latrines and holding tanks, and transporting excreta off-site

There is no reason to empty latrines and holding tanks of excreta from suspected or confirmed COVID-19 cases unless they are at capacity. In general, the best practices for safely managing excreta should be followed. Latrines or holding tanks should be designed to meet patient demand, considering potential sudden increases in cases, and there should be a regular schedule for emptying them based on the wastewater volumes generated. PPE (long-sleeved gown, gloves, boots, masks, and goggles or a face shield) should be worn at all times when handling or transporting excreta off-site, and great care should be taken to avoid splashing. For crews, this includes pumping out tanks or unloading pumper trucks. After handling the waste and once there is no risk of further exposure, individuals should safely remove their PPE and perform hand hygiene before entering the transport vehicle. Soiled PPE should be put in a sealed bag for later safe laundering (see Cleaning practices). Where there is no off-site treatment, in-situ treatment can be done using lime. Such treatment involves using a 10% lime slurry added at 1-part lime slurry per 10 parts of waste.

## 5. Cleaning practices

Recommended cleaning and disinfection procedures for health care facilities should be followed consistently and correctly.<sup>29</sup> Laundry should be done and surfaces in all environments in which COVID-19 patients receive care (treatment units, community care centres) should be cleaned at least once a day and when a patient is discharged.<sup>27</sup> Many disinfectants are active against enveloped viruses, such as the COVID-19 virus, including commonly used hospital disinfectants. Currently, WHO recommends using:

- 70% ethyl alcohol to disinfect small areas between uses, such as reusable dedicated equipment (for example, thermometers);
- sodium hypochlorite at 0.5% (equivalent to 5000 ppm) for disinfecting surfaces.

All individuals dealing with soiled bedding, towels, and clothes from patients with COVID-19 infection should wear appropriate PPE before touching soiled items, including heavy-duty gloves, a mask, eye protection (goggles or a face shield), a long-sleeved gown, an apron if the gown is not fluid resistant, and boots or closed shoes. They should perform hand hygiene after exposure to blood or body fluids and after removing PPE. Soiled linen should be placed in clearly labelled, leak-proof bags or containers, after carefully removing any solid excrement and putting it in a covered bucket to be disposed of in a toilet or latrine. Machine washing with warm water at 60–90°C (140–194°F) with laundry detergent is recommended. The laundry can then be dried according to routine procedures. If machine washing is not possible, linens can be soaked in hot water and soap in a large drum using a stick to stir and being careful to avoid splashing. The drum should then be emptied, and the linens soaked in 0.05% chlorine for approximately 30 minutes. Finally, the laundry should be rinsed with clean water and the linens allowed to dry fully in sunlight.

If excreta are on surfaces (such as linens or the floor), the excreta should be carefully removed with towels and immediately safely disposed of in a toilet or latrine. If the towels are single use, they should be treated as infectious waste; if they are reusable, they should be treated as soiled linens. The area should then be cleaned and disinfected (with, for example, 0.5% free chlorine solution), following published guidance on cleaning and disinfection procedures for spilled body fluids.<sup>27</sup>

#### 6. Safety disposing of greywater or water from washing PPE, surfaces and floors.

Current WHO recommendations are to clean utility gloves or heavy duty, reusable plastic aprons with soap and water and then decontaminate them with 0.5% sodium hypochlorite solution after each use. Single-use gloves (nitrile or latex) and gowns should be discarded after each use and not reused; hand hygiene should be performed after PPE is removed. If greywater includes disinfectant used in prior cleaning, it does not need to be chlorinated or treated again. However, it is important that such water is disposed of in drains connected to a septic system or sewer or in a soakaway pit. If greywater is disposed of in a soakaway pit, the pit should be fenced off within the health facility grounds to prevent tampering and to avoid possible exposure in the case of overflow.

#### 7. Safe management of health care waste

Best practices for safely managing health care waste should be followed, including assigning responsibility and sufficient human and material resources to dispose of such waste safely. There is no evidence that direct, unprotected human contact during the handling of health care waste has resulted in the transmission of the COVID-19 virus. All health care waste produced during the care of COVID-19 patients should be collected safely in designated containers and bags, treated, and then safely disposed of or treated, or both, preferably on-site. If waste is moved off-site, it is critical to understand where and how it will be treated and destroyed. All who handle health care waste should wear appropriate PPE (boots, apron, long-sleeved gown, thick gloves, mask, and goggles or a face shield) and perform hand hygiene after removing it. For more information refer to the WHO guidance, Safe management of wastes from health-care activities.<sup>28</sup>

### Considerations for WASH practices in homes and communities.

Upholding best WASH practices in the home and community is also important for preventing the spread of COVID-19 and when caring for patients at home. Regular and correct hand hygiene is of particular importance.

#### 1. Hand hygiene

Hand hygiene in non-health care settings is one of the most important measures that can prevent COVID-19 infection. In homes, schools and crowded public spaces – such as markets, places of worship, and train or bus stations – regular handwashing should occur before preparing food, before and after eating, after using the toilet or changing a child's diaper, and after touching animals. Functioning handwashing facilities with water and soap should be available within 5 m of toilets.

#### 2. Treatment and handling requirements for excreta.

Best WASH practices, particularly handwashing with soap and clean water, should be strictly applied and maintained because these provide an important additional barrier to COVID-19 transmission and to the transmission of infectious diseases in general.<sup>17</sup> Consideration should be given to safely managing human excreta throughout the entire sanitation chain, starting with ensuring access to regularly cleaned, accessible, and functioning toilets or latrines and to the safe containment, conveyance, treatment, and eventual disposal of sewage.

When there are suspected or confirmed cases of COVID-19 in the home setting, immediate action must be taken to protect caregivers and other family members from the risk of contact with respiratory secretions and excreta that may contain the COVID-19 virus. Frequently touched surfaces throughout the patient's care area should be cleaned regularly, such as bedside tables, bed frames and other bedroom furniture. Bathrooms should be cleaned and disinfected at least once a day. Regular household soap or detergent should be used for cleaning first and then, after rinsing, regular household disinfectant containing 0.5% sodium hypochlorite (that is, equivalent to 5000 ppm or 1-part household bleach with 5% sodium hypochlorite to 9 parts water) should be applied. PPE should be worn while cleaning, including mask, goggles, a fluid-resistant apron, and gloves,<sup>29</sup> and hand hygiene with an alcohol-based hand rub or soap and water should be performed after removing PPE.

### References

1. Coronavirus disease (COVID-19) advice for the public. Geneva: World Health Organization, 2020 (<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>, accessed 3 March 2020).
2. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;295:497–506. doi:10.1016/S0140-6736(20)30183-5.



3. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet*. 2020;395:507–13. doi:10.1016/S0140-6736(20)30211-7.
4. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA*. 2020. Feb 7. doi:10.1001/jama.2020.1585.
5. Niao H, Tang M, Zheng Y, Li C, He J, Hong H, et al. Evidence for gastrointestinal infection of SARS-CoV. *medRxiv*. doi:10.1101/2020.02.17.20023721.
6. Holshue SL, DeLotto C, Lindquist S, Lofy KJ, Wiesman J, Bruce H et al. for the Washington State 2019-nCoV Case Investigation Team. First case of 2019 novel coronavirus in the United States. *N Engl J Med*. 2020. Jan 31. doi:10.1056/NEJMoA2001191.
7. Zhang Y, Chen C, Zhu S et al. [Isolation of 2019-nCoV from a stool specimen of a laboratory-confirmed case of the coronavirus disease 2019 (COVID-19)]. *China CDC Weekly*. 2020;2(6):123–4. (In Chinese.)
8. Wang XW, Li JH, Zhen H, Kong QN, Song N, Xiao WJ et al. Study on the resistance of severe acute respiratory syndrome-associated coronavirus. *J Virol Methods*. 2005;126:171–7. doi:10.1016/j.jviromet.2005.02.005.
9. Gandy P, Gorbu CP, Pepper IL. Survival of coronaviruses in water and wastewater. *Food Environ Virol*. 2009;1:10–14. doi:10.1007/s12560-008-9001-6.
10. Casanova L, Rutala WA, Weber DJ, Sobsey MD. Survival of surrogate coronaviruses in water. *Water Res*. 2009;43(7):1893–8. doi:10.1016/j.watres.2009.02.002.
11. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *J Hosp Infect*. 2020;104(3):246–51. doi:10.1016/j.jhin.2020.01.022.
12. Guidelines for drinking-water quality, fourth edition, incorporating the first addendum. Geneva: World Health Organization; 2017 ([http://apps.who.int/iris/bitstream/handle/10665/254637/1/9789241549950-eng.pdf?accessed=3 March 2020](http://apps.who.int/iris/bitstream/handle/10665/254637/1/9789241549950-eng.pdf?accessed=3%20March%202020)).
13. SARS-CoV-2 – water and sanitation. Adelaide: Water Research Australia; 2020 ([http://www.watersa.com.au/r9244/media/avstem/mh/file/2199/WaterSA\\_1-8\\_Coronavirus\\_V10.pdf](http://www.watersa.com.au/r9244/media/avstem/mh/file/2199/WaterSA_1-8_Coronavirus_V10.pdf), accessed 3 March 2020).
14. Essential environmental health standards in health care. Geneva: World Health Organization; 2008 ([https://apps.who.int/iris/bitstream/handle/10665/43267/9789241547239\\_eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/43267/9789241547239_eng.pdf?sequence=1&isAllowed=y), accessed 3 March 2020).
15. My 5 moments for hand hygiene. In: WHO/Infection prevention and control [website]. Geneva: World Health Organization; 2020 (<https://www.who.int/infection-prevention/campaigns/clean-hands/5moments/en/>, accessed 3 March 2020).
16. Siddharta A, Pfander S, Vielle NJ, Dijkman R, Friesland M, Becker B, et al. Virucidal activity of World Health Organization-recommended formulations against enveloped viruses, including Zika, Ebola, and emerging coronaviruses. *J Infect Dis*. 2017;215(6):902–6. doi:10.1093/infdis/jix046.
17. WHO guidelines on hand hygiene in health care settings. Geneva: World Health Organization; 2009 ([https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906\\_eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/44102/9789241597906_eng.pdf?sequence=1&isAllowed=y), accessed 3 March 2020).
18. Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected: interim guidance, 25 January 2020. Geneva: World Health Organization ([https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-\(ncov\)-infection-is-suspected-20200125](https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected-20200125), accessed 3 March 2020).
19. Q&A on infection prevention and control for health care workers caring for patients with suspected or confirmed 2019-nCoV. In: WHO/Newsroom [website]. Geneva: World Health Organization; 2020 (<https://www.who.int/news-room/q-a-detail/q-a-on-infection-prevention-and-control-for-health-care-workers-caring-for-patients-with-suspected-or-confirmed-2019-ncov>, accessed 3 March 2020).
20. Health aspects of plumbing. Geneva: World Health Organization; 2006 (<https://apps.who.int/iris/bitstream/handle/10665/43423>, accessed 3 March 2020).
21. Guidelines on sanitation and health. Geneva: World Health Organization; 2018 (<https://apps.who.int/iris/bitstream/handle/10665/274939/9789241514705-eng.pdf?ua=1>, accessed 3 March 2020).
22. Yu ITS, Li Y, Wong TW, Tam W, Chan A, Lee JHW, et al. Evidence of airborne transmission of the severe acute respiratory syndrome virus. *N Engl J Med*. 2004;350(17):1731–9. doi:10.1056/NEJMoA032867.
23. Regan H. How can the coronavirus spread through bathroom pipes? Experts are investigating in Hong Kong. CNN. 12 February 2020 (<https://edition.cnn.com/2020/02/12/asia/hong-kong-coronavirus-pipes-test-link/index.html>).
24. Sanitation safety planning: manual for safe use and disposal of wastewater, greywater and excreta. Geneva: World Health Organization; 2015 (<https://apps.who.int/iris/bitstream/handle/10665/171753>, accessed 3 March 2020).
25. How to put on and take off personal protective equipment. Geneva: World Health Organization; 2008 (<https://apps.who.int/iris/bitstream/handle/10665/70066>, accessed 3 March 2020).
26. Chemical disinfectants: guideline for disinfection and sterilization in healthcare facilities (2008). In: CDC/Infection Control [website]. Atlanta: US Centers for Disease Control and Prevention; 2019 (<https://www.cdc.gov/infectioncontrol/guidelines/disinfection/disinfection-methods/chemical.html>, accessed 3 March 2020).



27. Best practices for environmental cleaning in healthcare facilities in resource-limited settings. Atlanta: US Centers for Disease Control and Prevention; 2019.  
(<https://www.cdc.gov/hai/pdfs/resource-limited-environmental-cleaning-508.pdf>, accessed 3 March 2020).
28. Safe management of wastes from health-care activities: a summary. Geneva: World Health Organization; 2017.  
(<https://apps.who.int/iris/handle/10665/259491>, accessed 3 March 2020).
29. Home care for patients with suspected novel coronavirus (COVID-19) infection presenting with mild symptoms, and management of their contacts: interim guidance, 4 February 2020.  
([https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-\(ncov\)-infection-presenting-with-mild-symptoms-and-management-of-contacts](https://www.who.int/publications-detail/home-care-for-patients-with-suspected-novel-coronavirus-(ncov)-infection-presenting-with-mild-symptoms-and-management-of-contacts), accessed 3 March 2020).

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WHO continues to monitor the situation closely for any changes that may affect this interim guidance. Should any factors change, WHO will issue a further update. Otherwise, this interim guidance document will expire 2 years after the date of publication.

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## Appendix 14: ADB's Interim Advisory Note on Protecting the Safety and Well-Being of Workers and Communities from COVID-19 (2020)

### INTERIM ADVISORY NOTE

## Protecting the Safety and Well-Being of Workers and Communities from COVID-19



Health and safety risks from the coronavirus disease (COVID-19) pandemic can cause an additional burden on workers, local communities, and employers. To support its developing member countries in managing these risks, the Asian Development Bank (ADB) has prepared the following advisory note on publicly available international good practice. These preventive measures can be adapted for a variety of workplaces and country-specific contexts.<sup>1</sup>

**Transmission, spread, and infection are the greatest health and safety risks to projects and local communities. If left unmanaged, rising infection rates can result in project delays and job losses as well as overwhelm health care systems.**

### What can governments and companies (including enterprises of all sizes) do to prevent and manage COVID-19 risks?

To protect the health and safety of workers, as well as surrounding communities, it is recommended to conduct a workplace review and risk assessment for exposure to COVID-19. The nature of works, stage of implementation, location of the project activities, and status of the project (whether it is ongoing or under development) must be taken into consideration. In addition, vulnerable groups such as migrant workers as well as women, older workers, at-risk workers including those with underlying health conditions, or those with combined vulnerability factors (e.g., migrant women workers with underlying health conditions) who will also be disproportionately impacted, should be taken into account.<sup>2</sup>

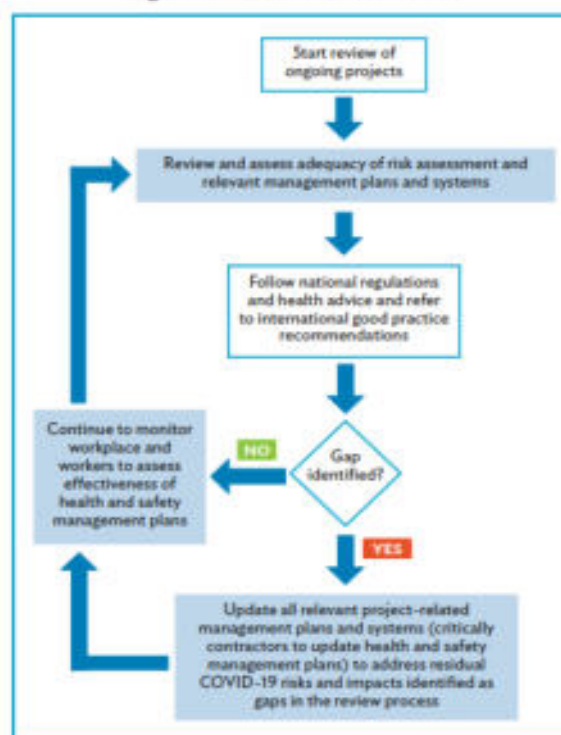
The decision tree (Figure 1) outlines how to review and assess the adequacy of management plans and systems to prevent the spread of COVID-19 in the workplace.

### Which sectors are more at risk from COVID-19?

COVID-19 may be more easily transferred among workers or service users and local communities in the following sectors and associated workplace activities:<sup>3</sup>

- Projects and businesses where there are a **large number of workers in close proximity with one another**, particularly where remote work is not feasible.
- Projects that involve **worker accommodation camps**, where physical distancing and robust hygiene measures may be more difficult to implement.
- **Health care providers** including hospitals, laboratories, clinics, dentists, ambulances, and pharmacies.

Figure 1: COVID-19 Decision Tree



Source: Asian Development Bank.

<sup>1</sup> This advisory note may not cover all circumstances. It will remain a living document and will be updated regularly to reflect updates to international good practice in preventing and managing the COVID-19 pandemic at the workplace as listed in Annex.

<sup>2</sup> Migrant workers are faced with multiple impacts including the challenge of returning home, accessing food and medical assistance, and experiencing potential loss of income.

<sup>3</sup> The list represents a selection and is not exhaustive.





- **Food and agriculture** including food processing plants and those handling live animals and animal products.
- **Education**, after lockdowns are lifted and schools reopen in affected countries.
- **Consumer-centric businesses** where workers may come into regular contact with customers including **hotels, retail, and other tourism-related sectors**.
- **Logistics and transport**, where workers come into contact with a large number of people across potentially a large geographic region.
- **Businesses where workers come into contact with suppliers and supply chains** operating in affected areas.

### How can governments and companies apply a risk-based approach to assess exposure risks to COVID-19 in the workplace?

#### 1. DETERMINE LEVEL OF EXPOSURE RISK

The risk of work-related exposure to COVID-19 depends on the probability of coming into close or frequent contact with people who may be infected and through contact with contaminated surfaces and objects. According to guidance from the World Health Organization (WHO), the risk levels (Figure 2) may be useful in carrying out a workplace risk assessment for exposure risk to COVID-19 and planning for preventive measures in non-health care workplaces.<sup>4</sup>

Figure 2: COVID-19 Risk Categories

LOW EXPOSURE RISK
Jobs or work tasks <b>without frequent, close contact with the general public and other co-workers</b> , visitors, clients or customers, or contractors, and that do not require contact with people known to be or suspected of being infected with COVID-19.
MEDIUM EXPOSURE RISK
Jobs or work tasks <b>with close (less than 1 meter) frequent contact with the general public, or other co-workers</b> , visitors, clients or customers, or contractors, that do not require contact with people known to be or suspected of being infected with COVID-19.
HIGH EXPOSURE RISK
Jobs or work tasks with high potential for <b>close contact with people who are known or suspected of having COVID-19</b> as well as contact with objects and surfaces possibly contaminated with the virus.

Source: World Health Organization.

#### 2. DETERMINE ADDITIONAL EXPOSURE RISK FACTORS

Work-related exposure can occur anytime in the workplace, during work-related travel to an area with local community transmission, as well as on the way to and from the workplace.

In the same work setting, there may be jobs with different levels of risk, and different jobs or work tasks may have similar levels of exposure. Therefore, risk assessment should be carried out for each specific work setting and for each job or group of jobs. For each risk assessment, it is important to consider the environment; the task; the threat, if any (e.g., for frontline staff); and resources available such as personal protective equipment.

Some workers may be at higher risk of developing severe COVID-19 illness because of age or pre-existing medical conditions; this should be considered in the risk assessment for individuals. Essential public services, such as security and police, food retail, accommodation, public transport, deliveries, water and sanitation, and frontline workers may be at an increased risk of exposure.

#### 3. CONSULT WITH WORKERS

Employers and managers, in consultation with workers, are encouraged to carry out and regularly update the risk assessment for work-related exposure to COVID-19, preferably with support from occupational health services and local primary health care facilities.

#### 4. UPDATE OR DEVELOP NEW HEALTH AND SAFETY MANAGEMENT PLANS

Following completion of the review and risk assessment process, health and safety plans in the workplace may require updates or may have to be developed for ongoing projects that did not require one previously. Relevant approvals of the health and safety plan should be obtained.

#### 5. REVIEW INTERNATIONAL GOOD PRACTICES

ADB recommends that employers review [WHO-issued key guidance](#) to manage the spread of COVID-19 in the workplace (Table).

<sup>4</sup> WHO. 2020. Considerations in adjusting public health and social measures in the context of COVID-19: interim guidance. 15 April. <https://www.who.int/publications/item/considerations-in-adjusting-public-health-and-social-measures-in-the-context-of-covid-19-interim-guidance>.



Table: Guidelines on Preventive Measures at the Workplace

MEASURES FOR ALL WORKPLACES	
<b>Hand hygiene</b>	<ul style="list-style-type: none"> <li>Regular and thorough handwashing with soap and water or hand hygiene with alcohol-based hand-rub before starting work; before eating; frequently during the work shift, especially after contact with co-workers or customers; after using the bathroom; after contact with secretions, excretions, and body fluids; after contact with potentially contaminated objects (gloves, clothing, masks, used tissues, waste); and immediately after removing gloves and other protective equipment but before touching eyes, nose, or mouth.</li> <li>Hand hygiene stations, such as handwashing and hand rub dispensers, should be put in prominent places around the workplace and be made accessible to all staff, contractors, clients or customers, and visitors along with communication materials to promote hand hygiene.</li> </ul>
<b>Respiratory hygiene</b>	<ul style="list-style-type: none"> <li>Promote respiratory etiquette by all people at the workplace. Ensure that medical face masks and paper tissues are available, for those who develop a runny nose or cough at work, along with bins with lids for hygienic disposal.</li> <li>Develop a policy on wearing a face mask or cover in line with national or local guidance. Masks may carry some risks if not used properly. If a worker is sick, they should not come to work. If a worker feels unwell while at work, provide a medical mask so that they may get home safely. Where masks are used, whether in line with government policy or by personal choice, it is very important to ensure safe and proper use, care, and disposal.</li> </ul>
<b>Physical distancing</b>	<ul style="list-style-type: none"> <li>Introduce measures to keep a distance of at least 1 meter between people and avoid direct physical contact i.e., hugging, touching, shaking hands), strict control over external access, queue management (marking on the floor, barriers).</li> <li>Reduce density of people in the building (no more than one person per 10 square meters), physical spacing at least 1 meter apart for workstations and common spaces, such as entrances/exits, lifts, pantries/canteens, stairs, and other areas congregation or queuing of employees or visitors/clients might occur.</li> <li>Minimize the need for physical meetings, e.g., by using teleconferencing facilities.</li> <li>Avoid crowding by staggering working hours to reduce congregation of employees at common spaces such as entrances or exits.</li> <li>Implement or enhance shift or split-team arrangements, or teleworking.</li> <li>Defer or suspend workplace events that involve close and prolonged contact among participants, including social gatherings.</li> </ul>
<b>Reduce and manage work-related travels</b>	<ul style="list-style-type: none"> <li>Cancel or postpone non-essential travel to areas with community transmission of coronavirus disease (COVID-19), provide hand sanitizer to workers who must travel, advise workers to comply with instructions from local authorities where they are traveling as well as information on whom to contact if they feel ill while traveling.</li> <li>Workers returning from an area where COVID-19 transmission is occurring should monitor themselves for symptoms for 14 days and take their temperature twice a day; if they are feeling unwell, they should stay at home, self-isolate, and contact a medical professional.</li> </ul>

Source: World Health Organization.



<b>Regular environmental cleaning and disinfection</b>	<ul style="list-style-type: none"> <li>• Clean surfaces by brushing or scrubbing thoroughly using soap or a neutral detergent to remove dirt, debris, and other materials. After the cleaning process is completed, disinfection is used to kill pathogens and other microorganisms on surfaces.</li> <li>• Selection of disinfectants should align with the local authorities' requirements for market approval, including any regulations applicable to specific sectors.</li> <li>• Identify "high-touch" surfaces for priority disinfection (e.g., commonly used areas, door and window handles, light switches, kitchen and food preparation areas, bathroom surfaces, toilets and taps, touchscreen personal devices, personal computer keyboards, and work surfaces).</li> <li>• Prepare and use disinfectant solutions according to the manufacturer's instructions, including instructions on how to protect the safety and health of disinfection workers and how to use personal protective equipment (PPE); avoid mixing different chemical disinfectants.</li> <li>• In indoor workplaces, routine application of disinfectants to environmental surfaces via spraying or fogging is generally not recommended because it is ineffective at removing contaminants outside of direct spray zones and can cause eye, respiratory, and skin irritation and other toxic effects.</li> <li>• In outdoor workplaces, there is currently insufficient evidence to support recommendations for large-scale spraying or fumigation.</li> <li>• Spraying of people with disinfectants (such as in a tunnel, cabinet, or chamber) is not recommended under any circumstances.</li> </ul>
<b>Risk communication, training, and education</b>	<ul style="list-style-type: none"> <li>• Provide posters, videos, and electronic message boards to increase awareness of COVID-19 among workers, and promote safe individual practices at the workplace and engage workers in providing feedback on the preventive measures and their effectiveness.</li> <li>• Provide regular information about the risk of COVID-19 using official sources such as government agencies and the World Health Organization, and emphasize the effectiveness of adopting protective measures and counteracting rumors and misinformation.</li> <li>• Special attention should be given to reaching out to and engaging vulnerable and marginalized groups of workers, such as those in the informal economy as well as migrant workers, domestic workers, subcontracted and self-employed workers, and those working under digital labor platforms.</li> </ul>
<b>Management of people with suspected COVID-19 or their contacts</b>	<ul style="list-style-type: none"> <li>• Urge workers who are unwell or who develop symptoms consistent with COVID-19 to stay at home, self-isolate, and contact a medical professional or the local COVID-19 information line for advice on testing and referral.</li> <li>• Where local community transmission is high, and work continues, allow for a telemedicine consultation where available, or consider waiving the requirement for a medical note for workers who are sick so that they may stay home.</li> <li>• Urge all workers to self-monitor their health, possibly with the use of questionnaires, and take their body temperature regularly.</li> </ul>

### SPECIFIC MEASURES FOR WORKPLACES AND JOBS AT MEDIUM RISK

#### In addition to the measures for all sites

- Enhance cleaning and disinfection of objects and surfaces that are touched regularly, including all shared rooms, surfaces, floors, bathrooms, and changing rooms.
- Where the physical distancing of at least 1 meter cannot be implemented to a particular activity, workplaces should consider whether that activity needs to continue; if so, take all the mitigating actions possible to reduce the risk of transmission between workers, clients or customers, contractors, and visitors such as scheduling staggered activities, minimizing face-to-face and skin-to-skin contacts, placing workers side-by-side or facing away from each other rather than face-to-face, assigning staff to the same shift teams to limit social interaction, and installing plexiglass barriers at all points of regular interaction and cleaning them regularly.
- Enhance hand hygiene—regular handwashing with soap and water or use of alcohol-based hand rub—before entering and after leaving enclosed machinery, vehicles, confined spaces, and before putting on and after taking off PPE.
- Provide PPE and training on its proper use—e.g., masks, disposable gowns, and disposable gloves or heavy-duty gloves that can be disinfected. Provide face or eye protection (medical mask) during cleaning procedures that generate splashes (e.g., washing surfaces).
- Increase ventilation rate, through natural aeration or artificial ventilation, preferably without re-circulation of the air.

### SPECIFIC MEASURES FOR WORKPLACES AND JOBS AT HIGH RISK

#### In addition to the measures for all sites

- Assess the possibility of suspending the activity.
- Adhere to hygiene before and after contact with any known or suspected case of COVID-19, before and after using PPE.
- Require use of medical mask, disposable gown, gloves, and eye protection for workers who must work in the homes of people who are suspected or known to have COVID-19. Use the protective equipment when in contact with the sick person, or respiratory secretions, body fluids, and potentially contaminated waste.
- Train workers on infection prevention and control practices and use of PPE.
- Avoid assigning tasks with high risk to workers who have pre-existing medical conditions, are pregnant, or older than 60 years of age.

Source: World Health Organization.

**The application of the international good practice within job-specific method statements/schedules and environments should be informed by a job-specific risk assessment.**



### How do governments and companies ensure effective implementation?

Cooperation between workplace managers, workers and their representatives, surrounding communities, and primary health care facilities is an essential element of workplace-related preventive measures in line with international good practice. To assess the effectiveness of implementation of the workplace health and safety management plan, regular monitoring of site conditions and those of surrounding communities is recommended. It is also important for management of workplaces to keep abreast with the latest updates to the international good practice guidance referenced in this advisory note including government issued health advice in relation to COVID-19 to ensure effective implementation. A select list is provided in Annex.

Risks communication, training, awareness campaigns, and the development of an emergency action plan are also recommended to address suspected cases of COVID-19 in the workplace.

The decision to close or reopen workplaces, and suspend or downscale individual work activities at the workplace should be made in light of the risk assessment, the capacity of contractors to implement proposed preventive measures within the Health and Safety Management Plan, and also the recommendations of national authorities for adjusting public health and social measures at the workplace in the context of COVID-19.

### Further Assistance

ADB may be able to provide assistance to our developing member countries in emergency planning, emergency assistance, and continuous sharing of international best practice. Please contact [ADB resident missions and offices](#) to request assistance.



The Pandemic Sub-National Reference Laboratory at the Jose B. Lingad Memorial Regional Hospital in San Fernando City, Pampanga on 9 May 2020. The laboratory financed by the \$3 million grant from the Asia Pacific Disaster Response Fund, can perform up to 3,000 COVID-19 tests daily, significantly increasing the country's testing capacity (photo by Eric Sales/ADB).

## Annex: Publicly Available Sources and Useful Links

### Asian Development Bank

Managing Infectious Medical Waste during the COVID-19 Pandemic, April 2020. An outline of key considerations for governments to understand their country's capacity to manage an anticipated surge in infectious medical waste. Also includes practical recommendations to improve disposal of household and hospital waste—as well as municipal solid waste—with the aim of reducing the further spread of the coronavirus disease (COVID-19) and other diseases. Links to important technical resources and guidance materials are also provided.

### Belgian Investment Company for Developing Countries

COVID-19: ESG Guidance Note for Employers, March 2020. General Environmental, Social and Governance guidance to employers on how to minimize business disruptions and take the most adequate actions.

### Canadian Construction Association

Standardized Protocols for All Canadian Construction Sites

### Centre for Disease Control

Centre for Disease Control (CDC) Group COVID-19 Guidance for Employers, March 2020. Summary of publicly available guidance and examples of practice adopted by some CDC Group investees and fund managers. Aims to provide a framework that can be applied to many companies and situations, but guidance is not able to cover all circumstances and not every company will be able to benefit from all of the guidance, in particular if employees are not able to work from home or practice social distancing.

### European Bank for Reconstruction and Development Workers Accommodation

Worker accommodation and COVID-19, April 2020. Note on key issues relating to workers living in accommodation camps and considerations on how to address certain risks. In alignment with good international industry practice and international lenders' standards. Developed by Mott MacDonald's social, labor, and health specialists based on their experience, drawing on the guidance of the World Health Organization (WHO).

### Her Majesty's Government, United Kingdom

Her Majesty's Government. Working safely during COVID-19 in construction and other outdoor work, 2020. Guidance for employers, employees, and the self-employed.

### Inter-American Development Bank

Corporate Governance: COVID-19 and the board of directors, March 2020. Indicative guidance for the Board of Directors in identifying, prioritizing, and implementing a governance framework to deal with the strategy and oversight challenges that COVID-19 may present, and a list of questions that can be asked by investors and that Board of Directors should consider to build an effective response to the COVID-19 crisis.

COVID-19 Guidance for Infrastructure Projects, March 2020. Guidance for clients to identify project performance and capacity gaps, along with context and project-related risks, that could contribute to COVID-19 transmission.

### International Federation of Consulting Engineers

COVID-19 guidance memorandum for users of International Federation of Consulting Engineers (FIDIC) standard forms of works contract. An outline of the provisions in FIDIC's various general conditions of contract for works which may be relevant with regard to likely scenarios that are arising as a consequence of COVID-19. Guidance memorandum to help parties to a FIDIC contract to consider mutually satisfactory solutions and avoid disputes arising between them.

Coronavirus (COVID-19): FIDIC Guidance for Global Consulting Engineering Businesses, March 2020.

### International Finance Corporation

Interim Advice for International Finance Corporation (IFC) Clients on Preventing and Managing Health Risks of COVID-19 in the Workplace, April 2020. A selection of publicly available advice from internationally recognized sources to help IFC clients rapidly identify measures for preventing and managing outbreaks of COVID-19 in the workplace, and for responding to community COVID-19 infection. Not exhaustive, and provides generic rather than sector-specific advice. Companies in high-risk sectors should refer to sector-specific procedures and standards.

Interim Advice for IFC Clients on Supporting Workers in the Context of COVID-19, April 2020. Tip sheet of useful information to support decision making in response to the impacts of COVID-19 on workers and employment. Focus areas include:

- (i) Health and safety, including actions to prevent transmission.
- (ii) Job protection, including supporting workers through difficult times and building resilience for businesses to operate during and after the immediate crisis.
- (iii) Responsible retrenchment as an option only if there is no other alternative, and how to re-employ those workers, when possible, once the situation has improved.

Corporate Governance Tip-Sheet for Company Leadership on Crisis Response, Facing the COVID-19 Pandemic, April 2020. Generally applicable to any type of business, some tips may not be relevant based on the nature or size of business, shareholding structure, or other factors.



### International Labour Organization

International Labour Organization (ILO) Standards and COVID-19 FAQ, March 2020. A compilation of answers to most frequently asked questions related to international labor standards and COVID-19.

Family-Friendly Policies and other Good Workplace Practices in the Context of COVID-19: Key steps employers can take, March 2020. General recommendations to help employers strengthen support for workers and their families. In collaboration with UNICEF.

### International Organization for Migration

COVID-19: Guidance for employers and business to enhance migrant worker protection during the current health crisis, April 2020.

### KfW

KfW DEG COVID-19 Guidance for employers, March 2020. Guidance specifically from the perspective of international guidance on social topics and occupational health and safety.

### Occupational Health and Safety Organization

Guidance on Preparing Workplaces for COVID-19. Recommendations and descriptions of mandatory safety and health standards (based on the United States' Occupational Safety and Health Act of 1970). Advisory only. Identifies four categories of risk (low, medium, high, very high) depending on proximity to the people infected with the virus and recommends taking different level of precautions in the areas of engineering control, administrative control, and personal protective equipment (PPE).

### Pan American Health Organization, World Health Organization, and United Nations Office for Project Services

COVID-19 Prevention Measures at Construction Sites

### The United Nations Entity for Gender Equality and the Empowerment of Women (UN Women)

Guidance for Action: Addressing the Emerging Impact of the COVID-19 Pandemic on Migrant Women in Asia and the Pacific for a Gender-Responsive Recovery. Note on the emerging impacts of the COVID-19 pandemic on women migrant workers and recommendations to support governments, donors, civil society organizations, employers, and the private sector in addressing those impacts.

### World Health Organization

Considerations in adjusting public health and social measures in the context of COVID-19 (Interim Guidance) (WHO 2020).

Considerations in adjusting public health and social measures in the context of COVID-19 (Interim Guidance, April 2020) (WHO 2020).

Coronavirus disease (COVID-19) advice for the public, March 2020. Web page providing advice for the public, including on social distancing, respiratory hygiene, self-quarantine, and those seeking medical advice.

Getting your workplace ready for COVID-19, March 2020. Summary of general considerations for getting businesses ready for work in the context of COVID-19. Does not provide technical detail but useful starting point to develop further awareness. Also provides some specific guidance on meetings and travel.

Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response, March 2020. Advice on communicating effectively with the public, engaging with communities, local partners, and other stakeholders to prepare and protect public health relating to COVID-19.

Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19), March 2020. Guidance to member states on quarantine measures for individuals in the context of COVID-19. Intended for those responsible for establishing local or national policy for quarantine of individuals, and adherence to infection prevention and control measures.

Operational considerations for case management of COVID-19 in health facility and community, March 2020. Intended for health ministers, health system administrators, and other decision makers. Guidance for the care of COVID-19 patients as the response capacity of health systems is challenged; aims to ensure that COVID-19 patients can access lifesaving treatment, without compromising public health objectives and safety of health workers.

Rational use of personal protective equipment for coronavirus disease 2019 (COVID-19), February 2020. Summary of WHO's recommendations for the rational use of PPE in health care and community settings, as well as during the handling of cargo. Intended for those who are involved in distributing and managing PPE as well as public health authorities and individuals in health care and community settings. Provides information about when PPE use is most appropriate.

Water, sanitation, hygiene and waste management for COVID-19, March 2020. Technical brief that supplements existing infection prevention and control (IPC) documents by referring to and summarizing WHO guidance on water, sanitation, and health care waste which is relevant for viruses (including coronaviruses). Written for water and sanitation practitioners and providers.

Safe management of wastes from health care activities, 2014. Handbook of practical guidance on the management of healthcare waste in local facilities. Provides guidelines for national and local administrators.

Advice on the use of masks in the community, during home care and in health care settings in the context of the novel coronavirus (COVID-19) outbreak, March 2020. Intended for individuals in the community, public health and IPC professionals, health care managers, health care workers, and community health workers. Updated version also includes advice to decision makers on the use of masks for healthy people in community settings.

Laboratory biosafety guidance related to coronavirus disease 2019 (COVID-19), March 2020. Interim guidance on laboratory biosafety related to the testing of clinical specimens of COVID-19 patients.

Infection prevention and control during health care when novel coronavirus infection is suspected, March 2020. Guidance for healthcare workers, health care managers, and IPC teams at the facility level, also relevant for national and district/provincial level.

Coronavirus disease (COVID-19) outbreak: rights, roles and responsibilities of health workers, including key considerations for occupational safety and health, March 2020. Outline of rights and responsibilities of health workers, including the specific measures needed to protect occupational safety and health.

Disability Considerations during the COVID-19 outbreak, March 2020. Mitigation actions and protective measures that can reduce the impacts of COVID-19 on advice on vulnerable groups, focusing on those with disabilities.

This advisory note does not constitute medical or legal advice and is not a substitute for professional advice from international public health organizations such as the World Health Organization, national public health authorities, and national governments. We strongly encourage our borrowers and clients to seek guidance and monitor regular updates as the COVID-19 pandemic evolves. ADB is not responsible for the content of any external references within this document.



Cover photo. Tokyo, Japan—Elementary students wearing masks sit with distance to each other during graduation in Tokyo, 25 March 2020.

Japanese Prime Minister Shinzo Abe has called for all schools in the country to close until the end of the spring holidays to reduce the risk of spreading the virus (photo by Richard Atrero de Guzman/ADB).

Annex 1 photo. San Fernando, Pampanga—Medical technicians test the equipment inside a sterile lab during the inauguration and turnover of the Pandemic Sub-National Reference Laboratory at the Jose B. Lingad Memorial Hospital in San Fernando, Pampanga on 9 May 2020. The laboratory financed by the \$3 million grant from the Asia Pacific Disaster Response Fund, can perform up to 3,000 COVID-19 tests daily, significantly increasing the country's testing capacity (photo by Veejay Villafranca/ADB).



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## Appendix 15: IFC Benchmark Standards for Workers Accommodation

August 2009

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### PART II: STANDARDS FOR AND MANAGEMENT OF WORKERS' ACCOMMODATION

#### I. Standards for workers' accommodation

This section looks at the principles and standards applicable to the location and construction of workers' accommodation, including the transport systems provided, the general living facilities, rooms/dormitories facilities, sanitary facilities, canteen and cooking facilities, food safety, medical facilities and leisure/social facilities.

##### A. National/local standards

The key standards that need to be taken into consideration, as a baseline, are those contained in national/local regulations. Although it is quite unusual to find regulations specifically covering workers' accommodation, there may well be general construction standards which will be relevant. These may include the following standards:

- **Building construction:** for example, quality of material, construction methods, resistance to earthquakes.
- **Housing and public housing:** in some countries regulations for housing and public housing contain requirements on issues such as the basic amenities, and standards of repair.
- **General health, safety and security:** requirements on health and safety are often an important part of building standards and might include provisions on occupation density, minimal air volumes, ventilation, the quality of the flooring (slip-resistant) or security against intrusion.
- **Fire safety:** requirements on fire safety are common and are likely to apply to housing facilities of any type. This can include provision on fire extinguishers, fire alarms, number and size of staircases and emergency exits, restrictions on the use of certain building materials.
- **Electricity, plumbing, water and sanitation:** national design and construction standards often include very detailed provisions on electricity or plumbing fixtures/fittings, water and sanitation connection/equipment.

#### Benchmark

1. The relevant national and local regulations have been identified and implemented.

#### B. General living facilities

Ensuring good standards in living facilities is important in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus, proliferation of insects or rodents, as well as to maintain a good level of morale. The location of the facilities is important to prevent exposure to wind, fire, flood and other natural hazards. It is also important that workers' accommodation is unaffected by the environmental or operational impacts of the worksite (for example noise, emissions or dust) but is sufficiently close that workers do not have to spend undue amounts of time travelling from their accommodation to the worksite. Living facilities should be built using adequate materials and should always be kept in good repair, clean and free from rubbish and other refuse.

#### Benchmarks

1. Living facilities are located to avoid flooding and other natural hazards.
2. Where possible, living facilities are located within a reasonable distance from the worksite.
3. Transport from the living facilities to worksite is safe and free.
4. The living facilities are built with adequate materials, kept in good repair and kept clean and free from rubbish and other refuse.

#### Drainage

The presence of stagnant water is a factor of proliferation of potential disease vectors such as mosquitoes, flies and others, and must be avoided.

#### Benchmarks

1. The building site is adequately drained to avoid the accumulation of stagnant water.



**Heating, air conditioning, ventilation and light**

Heating, air-conditioning and ventilation should be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time.

**Benchmarks**

1. For facilities located in cold weather zones, the temperature is kept at a level of around 20 degrees Celsius notwithstanding the need for adequate ventilation.
2. For facilities located in hot weather zones, adequate ventilation and/or air conditioning systems are provided.
3. Both natural and artificial lighting are provided and maintained in living facilities. It is best practice that the window area represents not less than 5% to 10% of the floor area. Emergency lighting is provided.

**Water**

Special attention to water quality and quantity is absolutely essential. To prevent dehydration, water poisoning and diseases resulting from lack of hygiene, workers should always have easy access to a source of clean water. An adequate supply of potable water must be available in the same buildings where bedrooms or dormitories are provided. Drinking water must meet local or WHO drinking water standards<sup>7</sup> and water quality must be monitored regularly. Depending on the local context, it could either be produced by dedicated catchment and treatment facilities or tapped from existing municipal facilities if their capacity and quality are adequate.

**Benchmarks**

1. Access to an adequate and convenient supply of free potable water is always available to workers. Depending on climate, weather conditions and accommodation standards, 80 to 180 litres per person per day are available.
2. Drinking water meets national/local or WHO drinking water standards.<sup>8</sup>
3. All tanks used for the storage of drinking water are constructed and covered as to prevent water stored therein from becoming polluted or contaminated.

4. Drinking water quality is regularly monitored.

**Wastewater and solid waste**

Wastewater treatment and effluent discharge as well as solid waste treatment and disposal must comply with local or World Bank effluent discharge standards<sup>9</sup> and be adequately designed to prevent contamination of any water body, to ensure hygiene and to avoid the spread of infections and diseases, the proliferation of mosquitoes, flies, rodents, and other pest vectors. Depending on the local context, treatment and disposal services can be either provided by dedicated or existing municipal facilities.

**Benchmarks**

1. Wastewater, sewage, food and any other waste materials are adequately discharged, in compliance with local or World Bank standards – whichever is more stringent – and without causing any significant impacts on camp residents, the biophysical environment or surrounding communities.
2. Specific containers for rubbish collection are provided and emptied on a regular basis. Standards range from providing an adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers protected from insects and rodents. In addition it is best practice to locate rubbish containers 30 metres from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic materials.
3. Pest extermination, vector control and disinfection are carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be performed on a regular basis.

7. [www.who.int/water\\_sanitation\\_health/dwa/en/](http://www.who.int/water_sanitation_health/dwa/en/)  
8. *ibid*

9. As per the "Pollution Prevention and Abatement Handbook", World Bank Group, July 1998, available from [www.worldbank.org](http://www.worldbank.org)

### C. Room/dormitory facilities

The standards of the rooms or dormitory facilities are important to allow workers to rest properly and to maintain good standards of hygiene. Overcrowding should be avoided particularly. This also has an impact on workers' productivity and reduces work-related accidents. It is generally acknowledged that rooms/dormitories should be kept clean and in a good condition. Exposure to noise and odour should be minimised. In addition, room/dormitory design and equipment should strive to offer workers a maximum of privacy. Resorting to dormitories should be minimised and single or double rooms are preferred. Dormitories and rooms must be single-sex.

#### Benchmarks

1. Rooms/dormitories are kept in good condition.
2. Rooms/dormitories are aired and cleaned at regular intervals.
3. Rooms/dormitories are built with easily cleanable flooring material.
4. Sanitary facilities are located within the same buildings and provided separately for men and women.
5. Density standards are expressed either in terms of minimal volume per resident or of minimal floor space. Usual standards range from 10 to 12.5 cubic metres (volume) or 4 to 5.5 square metres (surface).
6. A minimum ceiling height of 2.10 metres is provided.
7. In collective rooms, which are minimised, in order to provide workers with some privacy, only a reasonable number of workers are allowed to share the same room. Standards range from 2 to 8 workers.
8. All doors and windows should be lockable, and provided with mosquito screens where conditions warrant.
9. There should be mobile partitions or curtains to ensure privacy.
10. Every resident is provided with adequate furniture such as a table, a chair, a mirror and a bedside light.
11. Separate sleeping areas are provided for men and women, except in family accommodation.

#### Additional issue

Irrespective of whether workers are supposed to keep their facilities clean, it is the responsibility of the accommodation manager to ensure that rooms/dormitories and sanitary facilities are in good condition.

#### Bed arrangements and storage facilities

The provision of an adequate numbers of beds of an appropriate size is essential to provide workers with decent, safe and hygienic conditions to rest and sleep. Here again, particular attention should be paid to privacy. Consideration should be given to local customs so beds could be replaced by hammocks or sleeping mats for instance.

#### Benchmarks

1. A separate bed for each worker is provided. The practice of "hot-bedding" should be avoided.
2. There is a minimum space between beds of 1 metre.
3. Double deck bunks are not advisable for fire safety and hygiene reasons, and their use is minimised. Where they are used, there must be enough clear space between the lower and upper bunk of the bed. Standards range from 0.7 to 1.10 metres.
4. Triple deck bunks are prohibited.
5. Each worker is provided with a comfortable mattress, pillow, cover and clean bedding.
6. Bed linen is washed frequently and applied with repellents and disinfectants where conditions warrant (malaria).
7. Facilities for the storage of personal belongings for workers are provided. Standards vary from providing an individual cupboard for each worker to providing 475-litre big lockers and 1 metre of shelf unit.
8. Separate storage for work boots and other personal protection equipment, as well as drying/airing areas may need to be provided depending on conditions.

## D. Sanitary and toilet facilities

It is essential to allow workers to maintain a good standard of personal hygiene but also to prevent contamination and the spread of diseases which result from inadequate sanitary facilities. Sanitary and toilet facilities will always include all of the following: toilets, urinals, washbasins and showers. Sanitary and toilet facilities should be kept in a clean and fully working condition. Facilities should also be constructed of materials that are easily cleanable and ensure privacy. Sanitary and toilet facilities are never shared between male and female residents, except in family accommodation. Where necessary, specific additional sanitary facilities are provided for women.

### Benchmarks

1. Sanitary and toilet facilities are constructed of materials that are easily cleanable.
2. Sanitary and toilet facilities are cleaned frequently and kept in working condition.
3. Sanitary and toilet facilities are designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors.
4. Sanitary and toilet facilities are not shared between men and women, except in family accommodation.

### Toilet facilities

Toilet arrangements are essential to avoid any contamination and prevent the spread of infectious disease.

### Benchmarks

1. An adequate number of toilets is provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons. For urinals, usual standards are 1 unit to 15 persons.
2. Toilet facilities are conveniently located and easily accessible. Standards range from 30 to 60 metres from rooms/dormitories. Toilet rooms shall be located so as to be accessible without any individual passing through any sleeping room. In addition, all toilet rooms should be well-lit, have good ventilation or external windows, have sufficient hand wash basins and be conveniently located. Toilets and other sanitary facilities should be ("must be" in cold climates) in the same building as rooms and dormitories.

### Showers/bathrooms and other sanitary facilities

Hand wash basins and showers should be provided in conjunction with rooms/dormitories. These facilities must be kept in good working condition and cleaned frequently. The flooring for shower facilities should be of hard washable materials, damp-proof and properly drained. Adequate space must be provided for hanging, drying and airing clothes. Suitable light, ventilation and soap should be provided. Lastly, hand washing, shower and other sanitary facilities should be located within a reasonable distance from other facilities and from sleeping facilities in particular.

### Benchmarks

1. Shower/bathroom flooring is made of anti-slip hard washable materials.
2. An adequate number of handwash facilities is provided to workers. Standards range from 1 unit to each 15 persons to 1 unit per 6 workers. Handwash facilities should consist of a tap and a basin, soap and hygienic means of drying hands.
3. An adequate number of shower/bathroom facilities is provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons.
4. Showers/bathrooms are conveniently located.
5. Shower/bathroom facilities are provided with an adequate supply of cold and hot running water.

## E. Canteen, cooking and laundry facilities

Good standards of hygiene in canteen/dining halls and cooking facilities are crucial. Adequate canteen, cooking and laundry facilities and equipments should also be provided. When caterers are contracted to manage kitchens and canteens, special attention should be paid to ensure that contractors take into account and implement the benchmarks below, and that adequate reporting and monitoring mechanisms are in place. When workers can individually cook their meals, they should be provided with a space separate from the sleeping areas. Facilities must be kept in a clean and sanitary condition. In addition, canteen, kitchen, cooking and laundry floors, ceilings and walls should be made of easily cleanable materials.

### Benchmarks

1. Canteen, cooking and laundry facilities are built in adequate and easy to clean materials.
2. Canteen, cooking and laundry facilities are kept in a clean and sanitary condition.
3. If workers can cook their own meals, kitchen space is provided separate from sleeping areas.

### Laundry facilities

Providing facilities for workers to wash both work and non-work related clothes is essential for personal hygiene. The alternative is for the employer to provide a free laundry service.

### Benchmarks

1. Adequate facilities for washing and drying clothes are provided. Standards range from providing sinks or tubs with hot and cold water, cleaning soap and drying lines to providing washing machines and dryers.
2. When work clothes are used in contact with dangerous substance (for example, application of pesticide), special laundry facilities (washing machines) should be provided.

#### Additional issue

When workers are provided with facilities allowing them to individually do their laundry or cooking, it should be the responsibility of each worker to keep the facilities in a clean and sanitary condition. Nonetheless, it is the responsibility of the accommodation manager to make sure the standards are respected and to provide an adequate cleaning, disinfection and pest/vector control service when necessary.

#### Additional issue

When the employer provides family accommodation, it is best practice to provide each family with a private kitchen or the necessary cooking equipment to allow the family to cook on their own.

### Canteen and cooking facilities

Canteen and cooking facilities should provide sufficient space for preparing food and eating, as well as conform to hygiene and safety requirements.

### Benchmarks

1. Canteens have a reasonable amount of space per worker. Standards range from 1 square metre to 1.5 square metres.

2. Canteens are adequately furnished. Standards range from providing tables, benches, individual drinking cups and plates to providing special drinking fountains.

3. Places for food preparation are designed to permit good food hygiene practices, including protection against contamination between and during food preparation.

4. Kitchens are provided with facilities to maintain adequate personal hygiene including a sufficient number of washbasins designated for cleaning hands with clean, running water and materials for hygienic drying.

5. Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.

6. All kitchen floors, ceiling and wall surfaces adjacent to or above food preparation and cooking areas are built using durable, non-absorbent, easily cleanable, non-toxic materials.

7. Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are equipped with a smooth, durable, easily cleanable, non-corrosive surface made of non-toxic materials. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures have a smooth, durable and washable surface.

8. Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided.

9. Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to avoid accumulation.



## F. Standards for nutrition and food safety

When cooking for a number of workers, hygiene and food safety are absolutely critical. In addition to providing safe food, providing nutritious food is important as it has a very direct impact on workers' productivity and well-being. An ILO study demonstrates that good nutrition at work leads to gains in productivity and worker morale, prevention of accidents and premature deaths and reductions in health care costs.<sup>10</sup>

## Benchmarks

1. The WHO 5 keys to safer food or an equivalent process is implemented (see Box 6 below).
2. Food provided to workers contains an appropriate level of nutritional value and takes into account religious/cultural backgrounds; different choices of food are served if workers have different cultural/religious backgrounds.
3. Food is prepared by cooks. It is also best practice that meals are planned by a trained nutritionist.

### Box 6 - Five keys to safer food

#### Keep clean

Wash your hands before handling food and often during food preparation.  
Wash your hands after going to the toilet.  
Wash and sanitise all surfaces and equipment used for food preparation.  
Protect kitchen areas and food from insects, pests and other animals.

While most micro organisms do not cause disease, dangerous micro organisms are widely found in soil, water, animals and people. These micro organisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause food borne diseases.

#### Separate raw and cooked

Separate raw meat, poultry and seafood from other foods.  
Use separate equipment and utensils such as knives and cutting boards for handling raw foods.  
Store food in containers to avoid contact between raw and prepared foods.

Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous micro organisms which may be transferred onto other foods during food preparation and storage.

#### Cook thoroughly

Cook food thoroughly, especially meat, poultry, eggs and seafood.  
Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer.  
Reheat cooked food thoroughly.

Proper cooking kills almost all dangerous micro organisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meats, rolled roasts, large joints of meat and whole poultry.

#### Keep food at safe temperatures

Do not leave cooked food at room temperature for more than 2 hours.  
Refrigerate promptly all cooked and perishable food (preferably below 5°C).  
Keep cooked food piping hot (more than 60°C) prior to serving.  
Do not store food too long even in the refrigerator.  
Do not thaw frozen food at room temperature.

Micro organisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of micro organisms is slowed down or stopped. Some dangerous micro organisms still grow below 5°C.

#### Use safe water and raw materials

Use safe water or treat it to make it safe.  
Select fresh and wholesome foods.  
Choose foods processed for safety, such as pasteurised milk.  
Wash fruits and vegetables, especially if eaten raw.  
Do not use food beyond its expiry date.

Raw materials, including water and ice, may be contaminated with dangerous micro organisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Take care in selection of raw materials and implement simple measures such as washing.

**Source:** World Health Organization, Food Safety

[www.who.int/foodsafety/publications/consumer/en/5keys\\_en.pdf](http://www.who.int/foodsafety/publications/consumer/en/5keys_en.pdf)

10. C. Wanjek (2005), "Food at Work – Workplace solutions for malnutrition, obesity and chronic disease", International Labour Organization, Geneva.

### G. Medical facilities

Access to adequate medical facilities is important to maintain workers' health and to provide adequate responses in case of health emergency situations. The availability or level of medical facilities provided in workers' accommodation is likely to depend on the number of workers living on site, the medical facilities already existing in the neighbouring communities and the availability of transport. However, first aid must always be available on site.

#### First aid facilities

Providing adequate first aid training and facilities can save lives and prevent minor injuries becoming major ones.

#### Other medical facilities

Depending on the number of workers living on site and the medical services offered in the surrounding communities, it is important to provide workers with additional medical facilities. Special facilities for sick workers and medical services such as dental care, surgery, a dedicated emergency room can, for instance, be provided.

#### Benchmarks

1. A number of first aid kits adequate to the number of residents are available.
2. First aid kits are adequately stocked. Where possible a 24/7 first aid service/facility is available.
3. An adequate number of staff/workers is trained to provide first aid.
4. Where possible and depending on the medical infrastructures existing in the community, other medical facilities are provided (nurse rooms, dental care, minor surgery).

#### Box 7 - UK/HSE First Aid facilities

##### What should be in a first aid kit?

There is no standard list and it very much depends on the assessment of the needs in a particular workplace:

- a leaflet giving general guidance on first aid, for example HSE leaflet *Basic advice on first aid at work*
- individually wrapped sterile adhesive dressings (assorted sizes)
- two sterile eye pads
- four individually wrapped triangular bandages (preferably sterile)
- six safety pins
- six medium-sized (approximately 12 cm x 12 cm) individually wrapped sterile unmedicated wound dressings
- two large (approximately 18 cm x 18 cm) sterile individually wrapped unmedicated wound dressings
- one pair of disposable gloves.

##### What should be kept in the first aid room?

The room should contain essential first aid facilities and equipment. Typical examples of these are:

- a sink with hot and cold running water
- drinking water and disposable cups
- soap and paper towels
- a store for first aid materials
- foot-operated refuse containers, lined with disposable yellow clinical waste bags or a container for the safe disposal of clinical waste
- a couch with waterproof protection, clean pillows and blankets
- a chair
- a telephone or other communication equipment
- a record book for recording incidents where first aid has been given.

Source: UK Health and Safety Executive

## H. Leisure, social and telecommunication facilities

Basic leisure and social facilities are important for workers to rest and also to socialise during their free time. This is particularly true where workers' accommodation is located in remote areas far from any communities. Where workers' accommodation is located in the vicinity of a village or a town, existing leisure or social facilities can be used so long as this does not cause disruption to the access and enjoyment of local community members. But in any case, social spaces should also be provided on site. Exercise and recreational facilities will increase workers' welfare and reduce the impact of the presence of workers in the surrounding communities. In addition it is also important to provide workers with adequate means to communicate with the outside world, especially when workers' accommodation is located in a remote location or where workers live on site without their family or are migrants. Consideration of cultural attitudes is important. Provision of space for religious observance needs to be considered, taking account of the local context and potential conflicts in certain situations.

### Benchmarks

1. Basic collective social/rest spaces are provided to workers. Standards range from providing workers multi-purpose halls to providing designated areas for radio, TV, cinema.
2. Recreational facilities are provided. Standards range from providing exercise equipment to providing a library, swimming pool, tennis courts, table tennis, educational facilities.
3. Workers are provided with dedicated places for religious observance if the context warrants.
4. Workers have access to public phones at affordable/public prices (that is, not inflated).
5. Internet facilities can also be provided, particularly where large numbers of expatriates/Third Country Nationals (TCNs) are accommodated.

### Box 8 - Examples of social/leisure facilities

In Qatar there is a newly built 170-hectare complex which accommodates contractors and more than 35,000 workers for a project run by a major oil company. At the heart of this complex, the recreation area includes extensive sport facilities, a safety-training centre, an outdoor cinema and a park. The purpose of those facilities goes beyond providing adequate accommodation to the large numbers of contractors and workers on this project but is designed to provide the same level of services as a small town. The accommodation complex has a mayor, as well as a dedicated welfare team which is responsible for the workers' welfare, cultural festivals and also acts as the community's advocates.

## II. Managing workers' accommodation

Once the living facilities have been constructed and are operational, effective ongoing management of living facilities is essential. This encompasses issues such as the physical maintenance of buildings, security and consultation with residents and neighbouring communities in order to ensure the implementation of the housing standards in the long term.

### A. Management and staff

Worker camps and housing facilities should have a written management plan, including management policies or plans on health and safety, security, living conditions, workers' rights and representation, relationships with the communities and grievance processes. Part of those policies and plans can take the form of codes of conduct. The quality of the staff managing and maintaining the accommodation facilities will have a decisive impact on the level of standards which are implemented and the well-being of workers (for instance on the food safety or overall hygiene standards). It is therefore important to ensure that managers are competent and other workers are adequately skilled. The manager will be responsible for overseeing staff, for ensuring the implementation of the accommodation standards and for the implementation of the management plans. It is important the accommodation manager has the corresponding authority to do so.

If the facility is being managed by a contractor, as is often the case, the expected housing and management standards should be specified in the relevant contract, and mechanisms to ensure that those standards are implemented should be set up. As part of this process, the accommodation manager (or contractor) should have a duty to monitor the application of the accommodation standards and to report frequently on their implementation to the client.

#### **Benchmarks**

1. There are management plans and policies especially in the field of health and safety (with emergency responses), security, workers' rights, relationships with the communities.
2. An appointed person with the adequate background and experience is in charge of managing the workers' accommodation.
3. If contractors are being used, there are clear contractual management responsibilities and monitoring and reporting requirements.
4. Depending on the size of the accommodation, there is a sufficient number of staff in charge of cleaning, cooking and of general maintenance.
5. Such staff are recruited from the local communities.
6. Staff have received basic health and safety training.
7. Persons in charge of the kitchen are trained in nutrition and food-handling and adequately supervised.

#### **B. Charging fees for accommodation and services**

Charging fees for the accommodation or the services provided to workers such as food or transport should be avoided where workers do not have the choice to live or eat anywhere else, or if deemed unavoidable, should take into account the specific nature of workers' accommodation. Any charges should be transparent, discussed during recruitment and specified in workers' contracts. Any such charges should still leave workers with sufficient income and should never lead to a worker becoming indebted to an employer.

#### **Benchmarks**

1. When fees are charged, workers are provided with clear information and a detailed description of all payments made such as rent, deposit and other fees.
2. When company housing is considered to be part of workers' wages, it is best practice that workers are provided with an employment contract clearly specifying housing arrangements and regulations, in particular rules concerning payments and fees, facilities and services offered and rules of notice.
3. When fees are charged, the renting arrangements are fair and do not cost the worker more than a small proportion of income and never include a speculative profit.
4. Food and other services are free or are reasonably priced, never above the local market price.
5. The provision of accommodation or other services by employers as a payment for work is prohibited.

#### **Additional issue**

To avoid that fair renting arrangements turn into unfair ones, any deposit of advance should be set at a reasonable level and it is best practice that renting prices include a fixed fee covering the water needed and the use of the energy required to the functioning of the heating/cooling/ventilation/cooking systems. However, in such cases it might be necessary to raise workers' awareness to ensure that workers will use the facilities responsibly, particularly in areas where water is scarce.

#### **C. Health and safety on site**

The company or body in charge of managing the workers' accommodation should have the prime responsibility for ensuring workers' physical well-being and integrity. This involves making sure that the facilities are kept in good condition (ensuring that sanitary standards or fire regulations are respected for instance) and that adequate health and safety plans and standards are designed and implemented.

### Benchmarks

1. Health and safety management plans including electrical, mechanical, structural and food safety have been carefully designed and are implemented.

2. The person in charge of managing the accommodation has a specific duty to report to the health authorities the outbreak of any contagious diseases, food poisoning and other important casualties.

3. An adequate number of staff/workers is trained to provide first aid.

4. A specific fire safety plan is prepared, including training of fire wardens, periodic testing and monitoring of fire safety equipment and periodic drills.

5. Guidance on the detrimental effects of the abuse of alcohol and drugs and other potentially harmful substances and the risk and concerns relating to HIV/AIDS and of other health risk-related activities is provided to workers. It is best practice to develop a clear policy on this issue.

6. Workers have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.

7. Workers have easy access to medical facilities and medical staff. Where possible, female doctors/nurses should be available for female workers.

8. Emergency plans on health and fire safety are prepared. Depending on the local context, additional emergency plans are prepared as needed to handle specific occurrences (earthquakes, floods, tornadoes).

### D. Security of workers' accommodation

Ensuring the security of workers and their property on the accommodation site is of key importance. To this end, a security plan must be carefully designed including appropriate measures to protect workers against theft and attacks. Policies regarding the use of force (force can only be used for preventive and defensive purposes in proportion to the nature and the extent of the threat) should also be

carefully designed. To implement those plans, it may be necessary to contract security services or to recruit one or several staff whose main responsibility is to provide security to safeguard workers and property. Before making any security arrangements, it is necessary to assess the risks of such arrangements to those within and outside the workers' accommodation and to respect best international practices, including IFC PS4 and EBRD PR4 and applicable law.<sup>11</sup> Particular attention should be paid to the safety and security of women workers.

### Benchmarks

1. A security plan including clear measures to protect workers against theft and attack is implemented.

2. A security plan including clear policies on the use of force has been carefully designed and is implemented.

3. Security staff have been checked to ensure that they have not been implicated in any previous crimes or abuses. Where appropriate, security staff from both genders are recruited.

4. Security staff have a clear mandate and have received clear instruction about their duties and responsibilities, in particular their duties not to harass, intimidate, discipline or discriminate against workers.

5. Security staff have received adequate training in dealing with domestic violence and the use of force.

6. Security staff have a good understanding about the importance of respecting workers' rights and the rights of the communities.

7. Body searches are only allowed in specific circumstances and are performed by specially trained security staff using the least-intrusive means possible. Pat down searches on female workers can only be performed by female security staff.

8. Security staff adopt an appropriate conduct towards workers and communities.

9. Workers and members of the surrounding communities have specific means to raise concerns about security arrangement and staff.

11. See for instance the Voluntary Principles on Security and Human Rights, [www.voluntaryprinciples.org/principles](http://www.voluntaryprinciples.org/principles)

### E. Workers' rights, rules and regulations on workers' accommodation

Freedoms and human rights of workers should be recognised and respected within their living quarters just as within the working environment. House rules and regulations should be reasonable and non discriminatory. It is best practice that workers' representatives are consulted about those rules. House rules and regulations should not prevent workers from exercising their basic rights. In particular, workers' freedom of movement needs to be preserved if they are not to become effectively "trapped". To this end it is good practice to provide workers with 24/7 access to the accommodation and free transport services to and from the surrounding communities. Any restriction to this freedom of movement should be limited and duly justified. Penalties for breaking the rules should be proportional and implemented through a proper procedure allowing workers to defend themselves and to challenge the decision taken. The relationship between continuing employment and compliance with the rules of the workers' accommodation should be clear and particular attention should be paid to ensure that housing rules do not create indirect limitation of the right to freedom of association. Best practice might include a code of conduct relating to the accommodation to be signed together with the contract of employment.

#### Box 9 - Dole housing plantation regulation in Costa Rica

In every plantation there is an internal accommodation regulation that every worker is required to sign together with his/her employment contract. That document describes the behaviour which is expected from workers at all times and basic rules such as the prohibition of alcohol and the interdiction to make noise after a certain time at night. In case there is any problem concerning the application of those internal rules, a set of disciplinary procedures which have been designed with the workers' representatives can be enforced. Workers are absolutely free to enter or leave the site and do not have any restrictions in relation to accessing their living quarters. Families are not allowed in the living quarters unless they have been registered for a visit.

### Benchmarks

1. Restriction of workers' freedom of movement to and from the site is limited and duly justified. It is good practice to provide workers 24/7 access to the accommodation site. Any restrictions based on security reasons should be balanced by the necessity to respect workers' freedom of movement.
2. Where possible, an adequate transport system to surrounding communities is provided. It is good practice to provide workers with free transportation to and from local communities.
3. Withholding workers' ID papers is prohibited.
4. Freedom of association is expressly respected. Provisions restricting workers' rights on site should take into account the direct and indirect effect on workers' freedom of association. It is best practice to provide trade union representatives access to workers in the accommodation site.
5. Workers' gender and religious, cultural and social backgrounds are respected. In particular, workers should be provided with the possibility of celebrating religious holidays and observances.
6. Workers are made aware of their rights and obligations and are provided with a copy of the internal workers' accommodation rules, procedures and sanction mechanisms in a language or through a media which they understand.
7. Housing regulations, including those relating to allocation of housing, should be non-discriminatory. Any justifiable discriminatory rules – for example all-male dormitories – should be strictly limited to the rules which are necessary to ensure the smooth running of the worker camp and to maintain a good relationship with the surrounding communities.
8. Where possible, visitor access should be allowed.
9. Decisions should be made on whether to prohibit alcohol, tobacco and third party access or not from the camp and the relevant rules should be clearly communicated to all residents and workers.
10. A fair and non-discriminatory procedure exists to implement disciplinary procedures including the right of workers to defend themselves (see also next section).

## F. Consultation and grievance mechanisms

All residents should be made aware of any rules governing the accommodation and the consequences of breaking such rules. Processes that allow for consultation between site management and the resident workers will assist in the smooth running of an accommodation site. These may include a dormitory or camp committee as well as formal processes that allow workers to lodge any grievances about their accommodation.

### Benchmarks

1. Mechanisms for workers' consultation have been designed and implemented. It is best practice to set up a review committee which includes representatives elected by workers.
2. Processes and mechanisms for workers to articulate their grievances are provided to workers. Such mechanisms are in accordance with PS2/PR2.
3. Workers subjected to disciplinary proceedings arising from behaviour in the accommodation should have access to a fair and transparent hearing with the possibility to contest decisions and refer the dispute to independent arbitration or relevant public authorities.
4. In case conflicts between workers themselves or between workers and staff break out, workers have the possibility of easily accessing a fair conflict resolution mechanism.
5. In cases where more serious offences occur, including serious physical or mental abuse, there are mechanisms to ensure full cooperation with the police authority (where adequate).

### Additional issue

Alcohol is a complex issue and requires a very clear policy from the workers' accommodation management. If a non-alcohol policy is taken, special attention should be paid to clearly communicate the interdiction, how it applies and the consequences for breaching this rule. Special attention should also be paid to enforce it adequately.

## G. Management of community relations

Workers' living facilities have various ongoing impacts on adjacent communities. In order to manage these, it is good practice to design a thorough community relations management plan. This plan will contain the processes to implement the findings of the preliminary community impact assessment and to identify, manage, mitigate or enhance ongoing impacts of the workers' accommodation on the surrounding communities. Issues to be taken into consideration include:

- community development – impact of workers' camp on local employment, possibility of enhancing local employment and income generation through local sourcing of goods and services
- community needs – ways to identify and address community needs related to the arrival of specific infrastructures such as telecommunications, water sanitation, roads, health care, education, housing
- community health and safety – addressing and reducing the risk in the increase in communicable diseases, corruption, trade in illegal substances such as drugs, alcohol (in the Muslim context), petty crimes and other sorts of violence, road accidents
- community social and cultural cohesion – ways to mitigate the impact of the presence of large numbers of foreign workers, often males, with different cultural and religious background, ways to mitigate the possible shift in social, economic and political structures due to changes in access to income generation opportunities.

### Benchmarks

1. Community relations plans addressing issues around community development, community needs, community health and safety and community social and cultural cohesion have been designed and implemented.
2. Community relations plans include the setting up of a liaison mechanism allowing a constant exchange of information and consultation with the local communities in order to identify and respond quickly to any problems and maintain good working relationships.
3. A senior manager is in charge of implementing the community relations management plan and liaising with the community.



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4. The impacts of workers' accommodation on local communities are periodically reviewed, mitigated or enhanced.
  5. Community representatives are provided with an easy means to voice their opinions and to lodge complaints.
  6. There is a transparent and efficient process for dealing with community grievances, in accordance with PS1/PR10.

**Box 10 - Examples of community relations management**

**Community consultation in the Baku-Tbilisi-Ceyhan (BTC) pipeline**

The BTC pipeline's Environment and Social Management Plans incorporated a Worker Camp Management Plan to be implemented by the construction contractor. As part of ongoing community liaison over the project as a whole, community liaison officers were appointed for worker camps who were responsible for meeting regularly with communities, identifying issues and addressing community concerns. A particular responsibility was to review HR records and disciplinary logs at worker camps to assess that rules were being implemented effectively and that any community liaison after any incidents was effective.

## **Appendix 16: Guidelines and Emergency plan for handling and storing Chlorine Instructions for Storage and Handling of Chlorine Cylinders**

(Based on the 'Manual on Operation and Maintenance of Water Supply Systems' published by the Central Public Health and Environmental Engineering Organization (CPHEEO) in 2005)

### **1. Storage Area**

- (i) Obtain storage license from controller of explosives under Gas Cylinder Rules 2004 if the quantity of Cl<sub>2</sub> containers to be stored is more than 5 Nos.
- (ii) Storage area should be cool, dry, well ventilated, and clean of trash and protected from external heat sources. Please refer to Manual on "Water Supply and Treatment", (1999 Edition), for further details.
- (iii) Ventilation must be sufficient to prevent accumulation of vapor pockets. The exhaust should be located either near the floor or duct be provided extending to the floor. All fan switches should be outside the storage area.
- (iv) Do not store container directly under the sun.
- (v) Weather cock should be installed near the storage to determine wind direction.
- (vi) The storage building should be of non-combustible construction with at least two exits opening outside.
- (vii) Neutralization system should be provided.
- (viii) Continuous monitoring of chlorine leak detection equipment with alarm should be installed in the storage area.
- (ix) The area should be free and remote from elevators, gangways or ventilating system to avoid dangerous concentration of Chlorine during leak.
- (x) Two portable foam type fire extinguishers should be provided in the premises.
- (xi) Corrosive substances shall not be stored nearby which react violently with each other.
- (xii) Unauthorized person should not be allowed to enter into the storage area.
- (xiii) The floor level of storage shed should be preferably 30 cms (at least one foot) higher from the ground level to avoid water logging.
- (xiv) Ensure that all containers are properly fitted with safety caps or hooks.

### **2. Cylinder & Drum Containers**

- a) Store chlorine cylinders upright and secure them so that they do not fall.

- b) Drum containers should be stored on their sides on rails, a few inches above the floor. They should not be stacked one upon the other. They should be stored such that the valves are in vertical plane.
- c) Keep enough space between containers so as to have accessibility in case of emergency.
- d) Store the containers in a covered shed only. Keep them away from any source of heat as excessive heat may increase the pressure in container which will result into burst.
- e) Do not store explosives, acids, turpentine, ether, anhydrous ammonia, finely divided metals or other flammable material in the vicinity of Chlorine.
- f) Do not store containers in wet and muddy areas.
- g) Store filled and empty containers separately.
- h) Protective covers for valves are secured even when the containers are empty, except during use in the system.
- i) Never use containers as a roller to move other equipment.
- j) Never tamper with fusible plugs of tonners.
- k) Check leakages every day by means of ammonia torch. However, it should not be touched to brass components like valves of container for safety.
- l) Never carry out any welding work on the chlorine system as combustion of steel takes place at 2510C in presence of chlorine.
- m) The boxes containing emergency kit, safety applications and self-contained breathing apparatus should be kept in working order in an easily approachable area.

### **3. Use of Cylinders & Drum Containers in Process System**

- a) Use containers in the order of their receipt, as valve packing can get hardened during prolonged storage and cause gas leaks.
- b) Do not use oil or lubricant on any valve of the containers.
- c) Badly fitting connections should not be forced and correct tool should always be used for opening and closing valves. They should never be hammered.
- d) The area should be well ventilated with frequent air changes.
- e) Transport the cylinders to the process area by using crane, hoist or railings etc.
- f) The drum containers should be kept in a horizontal position in such a way that the valves are in a vertical plane. The upper valve gives out gas and the lower one gives out liquid chlorine.
- g) The cylinder should be kept in upright position in order to release gas from the valve. For liquid chlorine withdrawal, it should be inverted with the help of an inverted rack.
- h) Connect the containers to the system by using approved accessories.
- i) Use copper flexible tube, with lead washer containing 2 to 4% antimony or bonded asbestos or Teflon washer. Use yoke clamp for connecting chlorine container.
- j) Never use rubber tubes, PVC tubes etc. for making connections.
- k) Use the right spanner for operating the valve. Always keep the spanner on the valve spindle. Never use ill-fitting spanner.
- l) After making the flexible connection, check for the leakage by means of ammonia torch but it should not come in contact with a valve.
- m) Keep minimum distance between the container valve and header valve so that during change-over of the container, minimum amount of gas leaks.

- n) The material of construction of the adopter should be same as that of valve outlet threads.
- o) The valve should not be used as a regulator for controlling the chlorine. During regulation due to high velocity of Chlorine, the valve gets damaged which in turn can cause difficulty in closing.
- p) The tools and other equipment used for operating the container should be clean and free of grease, dust or grit.
- q) Wear breathing apparatus while making the change-over of the container from the process header.
- r) Do not heat the container to withdraw more gas at faster rate.
- s) Use pressure gauge and flow measuring device to control the flow and to know the quantity of gas left in the container.
- t) Use an inverted U type barometric leg or vacuum breaking arrangement for connecting the container to the process piping.
- u) Withdrawal of the gas should be stopped when the gas pressure inside the container is between 0.1 to 0.5 kg/cm<sup>2</sup> approximately.
- v) If withdrawal of the gas from the container connected to the process system has to be suspended for long intervals, it should be disconnected from the system, and the valve cap and hood replaced.
- w) Gas containers should be handled by trained persons only.

#### **4. Disconnecting Containers from Process System**

- a) Use breathing apparatus before disconnecting the container.
- b) First close the container valve fully. After removal of chlorine the process valve should be closed.
- c) Remove the flexible connection, plug the flexible connection in order to avoid entry of humid air. Replace the valve cap or hood on the container.
- d) Put the tag on the empty container & bring it to storage area marked for empties.
- e) Check for the leakage.

#### **5. Loading and Unloading of Containers**

- a) The handling of containers should be done under the supervision of trained and competent person.
- b) It should be done carefully with a crane, hoist or slanted ramp. Do not use magnet or sharp object for lifting the containers.
- c) Small cylinders should not be lifted by means of valve caps as these are not designed to carry the weight.
- d) The containers should not be allowed to strike against each other or against any hard object.
- e) Vehicles should be braked and isolated against any movement.
- f) After loading, the containers should be secured properly with the help of wooden wedges, rope or sling wire so that they do not roll away.
- g) The containers should never be dropped directly to the ground or on the tyre from the vehicle.
- h) There should be no sharp projection in the vehicle.
- i) Containers must have valve caps and plugs fitted properly.
- j) Check containers for leakage before loading/unloading.

#### **6. Transportation of Container**

- a) The name of the chemical along with diamond pictorial sign denoting the dangerous goods should be marked on the vehicle.
- b) The name of the transporter, his address and telephone number should be clearly written on the vehicle.
- c) The vehicle should not be used to transport any material other than what is written on it.
- d) Only trained drivers and cleaners should transport hazardous chemical
- e) The driver should not transport any leaking cylinder.
- f) The cylinder should not project outside the vehicle.
- g) The transporter must ensure that every vehicle driver must carry "Trem Card" (Transport Emergency Card) and 'Instructions in writing booklet' and follow them.
- h) Every driver must carry safety appliances with him, viz; Emergency kit, breathing apparatus etc.
- i) The vehicles must be driven carefully, especially in crowded localities and on bumpy roads. Do not apply sudden brakes.
- j) Check for the leakage from time to time.
- k) In the case of uncontrollable leakage the vehicle should be taken to an open area where there is less population.

**7. Emergency Kit** It consists of various tools and appliances like gaskets, yokes, studs, tie rods hoods, clamps, spanners, mild steel channels, screws, pins, wooden pegs etc. of standard sizes. Separate kits are used for cylinders and tonners. All the gadgets are designed for using in controlling or stopping the leakages from valves, fusible plug and side walls of cylinders and containers used for handling chlorine.

**a. Leakage may occur through the valve. There are basically four types of valve leaks.**

- 1 Valve packing
- 2 Valve seat
- 3 Defective inlet thread
- 4 Broken valve thread

**b. Leakage may occur through container wall.** For controlling such leakages, clamps are used for cylinders and chain and yoke arrangement is used for tonner. Sometimes wooden peg is used by driving into the leaking hole as a temporary arrangement.

**c. Leakage may occur through fusible plug.**

- 1 If the leakage is through the threads of fusible plug, yoke, hood and cap nut arrangement is used to control the leak.
- 2 If fusible metal itself in the plug is leaking, yoke and stud arrangement is used to control

the leak.

## 1. First Aid to be Provided for a Person Affected by Chlorine

**a. General** Remove the affected person immediately to an uncontaminated area. Remove contaminated clothing and wash contaminated parts of the body with soap and plenty of water. Lay down the affected person in cardiac position and keep him warm. Call a physician for medical assistance at the earliest. Caution: Never attempt to neutralize chlorine with other chemicals.

**b. Skin Contact** Remove the contaminated clothes, wash the affected skin with large quantity of water. Caution: No ointment should be applied unless prescribed by the physician.

**c. Eye Contact** If eyes get affected with liquid chlorine or high concentration of chlorine gas, they must be flushed immediately with running water for at least 15 minutes keeping the eyelids open by hand. Caution: No ointment should be used unless prescribed by an eye specialist.

**d. Inhalation** If the victim is conscious, take him to a quiet place and lay him down on his back, with head and back elevated (cardiac position). Loosen his clothes and keep him warm using blankets. Give him tea, coffee, milk, peppermint etc. for making good effect on breathing system. If the victim is unconscious, but breathing, lay him down in the position mentioned above and give oxygen at low pressure until the arrival of doctor. If breathing has stopped, quickly stretch him out on the ground or a blanket if available, loosen his collar and belt and start artificial respiration without delay. Neilson arm lift back pressure method is useful. Automatic artificial respiration is preferable if available. Continue the respiration until the arrival of the doctor. Amboo bag can also be used for this purpose.

## 2. On-Site Emergency Plan to Cover the Leakage of Chlorine

**Introduction** As chlorine is a hazardous chemical, handling and storage of it demand adequate precautions to avoid possible hazards. Leakage of chlorine may develop into a major emergency. Therefore the emergency procedure to cover this eventuality is essential. It is drawn in the form of on-site emergency plan. The elements of onsite emergency plan are as follows:

### Identification of Hazard Chart

In this case the site risk is evaluated by the expert and the extent of the probable damage is calculated on the basis of stored chlorine quantity, nearby population, wind direction, type of equipment failure etc. For this purpose hazard analysis is conducted in which case all the hazardous properties of chlorine are considered. If evacuation is required, the range of it is calculated.

**Appointing Key Persons** In order to control the incident like chlorine leakage, it is essential to appoint various persons with their well-defined responsibilities. Taking into account the various activities likely to be involved, the following key persons are appointed (i) Site Controller, (ii) Incident controller, (iii) Shift Executive In charge, (iv) Communication Officer, (v) Safety Officer, (vi) Fire and Security Officer, (vii) Utilities and Services In charge, (viii) Traffic Controller, (ix) First Aider

**Assembly Points** These points are set up where persons from the plant would assemble in case of chlorine leakage. At these points the in-charge for counting the heads will be available.

### **Emergency Control Center**

The control center is the focal point in case of an emergency from where the operations to handle the emergency from are directed and coordinated. It contains site plan, telephone lines, public address system, safety equipment, first aid boxes, loud speaker, torches, list of essential telephone numbers, viz. fire brigade, police, hospital, civil defence, collector, factory inspector, organizational authorities, chlorine suppliers, mutual aid group, social workers, list of key persons and their addresses, copy of chemical fact sheet, location plan of fire hydrant, details of dispersion model of chlorine gas, population distribution pattern, location of alarm system.

### **Procedure to Meet Emergency**

The actions to be taken by the staff and authority are given below; Emergency Alarm: An audible emergency alarm system is installed throughout the plant. On hearing the alarm the incident controller will activate the public address system to communicate with the staff about the emergency and give specific instructions for evacuations etc. anyone can report the occurrence of chlorine leakage to section in-charge or incident controller through telephone or intercom or in person.



**Communication:** Communication officer shall establish the communication suitable to that incident.

### **Services**

For quickness and efficient operation of emergency plan the plant is divided into convenient number of zones and clearly marked on the plan. These are emergency services viz. firefighting, first aid, rescue, alternative source of power supply, communication with local bodies etc. The incident controller will hand over the charge to the site controller of all these coordinating activities, when the site controller appears on the site. The site controller will coordinate all the activities of the key persons. On hearing the emergency alarm system all the key persons will take their charge. In case of their absence other alternatives are nominated. The person nominated for personnel and administration purposes will be responsible for informing all statutory authorities, keeping account of all persons in the plant including contract labor, casual workers and visitors. He will be responsible for giving information to press or any outside agencies. He is also responsible for organizing canteen facilities and keeping informed the families of affected persons. The person nominated as security officer should guide police, fire fighting and control the vehicle entries. The site controller or any other nominated person will announce resumption of normalcy after everything is brought under control. The onsite emergency plan needs to be evaluated by mock drill. Any weaknesses noticed during such drills should be noted and the plan is modified to eliminate the weaknesses.

### **Emergency**

Measures In case of leakage or spillage of Chlorine, the following emergency measures should be taken:

- 1) Take a shallow breath and keep eyes opened to a minimum.
- 2) Evacuate the area.
- 3) Investigate the leak with proper gas mask and other appropriate Personal protection.
- 4) The investigator must be watched by a rescuer to rescue him in emergency.
- 5) If liquid leak occurs, turn the containers so as to leak only gas.
- 6) In case of major leakage, all persons including neighbors should be warned.
- 7) As the escaping gas is carried in the direction of the wind all persons should be moved in a direction opposite to that of the wind. Nose should be covered with wet handkerchief.
- 8) Under no circumstances should water or other liquid be directed towards leaking containers, because water makes the leak worse due to corrosive effect.




- 9) The spillage should be controlled for evaporation by spraying chilled water having temperature below 9.4oC. With this water crystalline hydrates are formed which will temporarily avoid evaporation. Then try to neutralize the spillage by caustic soda or soda ash or hydrated Lime solution carefully. If fluoroprotein foam is available, use for preventing the evaporation of liquid chlorine.
- 10) Use emergency kit for controlling the leak.
- 11) On controlling the leakage, use the container in the system or neutralize the contents in alkali solution such as caustic soda, soda ash or hydrated lime. Caution: Keep the supply of caustic soda or soda ash or hydrated lime available. Do not push the leaking container in the alkali tank. Connect the container to the tank by barometric leg.
- 12) If container commences leak during transport, it should be carried on to its destination or manufacturer or to remote place where it will be less harmful. Keeping the vehicle moving will prevent accumulation of high concentrations.
- 13) Only specially trained and equipped workers should deal with emergency arising due to major leakage.
- 14) If major leak takes place, alert the public nearby by sounding the siren.
- 15) Any minor leakage must be attended immediately or it will become worse.
- 16) If the leakage is in the process system, stop the valve on the container at once.



### **Safety Systems Required at Chlorination Plant**



The following safety systems should be kept ready at the chlorination plant:

- 1) Breathing apparatus.
- 2) Emergency kit.
- 3) Leak detectors.
- 4) Neutralization tank.
- 5) Siren system.
- 6) Display of boards in local language for public cautioning, first aid and list of different authorities with phone numbers.
- 7) Communication system.
- 8) Tagging system for equipment.
- 9) First aid including tablets and cough mixtures.
- 10) Exhaust fans.
- 11) Testing of pressure vessels, chlorine lines etc. every year as per factory act.
- 12) Training & mock drill.
- 13) Safety showers.
- 14) Eye fountain.
- 15) Personal protective equipment.
- 16) Protecting hoods for ton-containers.
- 17) Fire extinguishers.
- 18) Wind cock.



### Appendix 17: Summary of Public Consultation



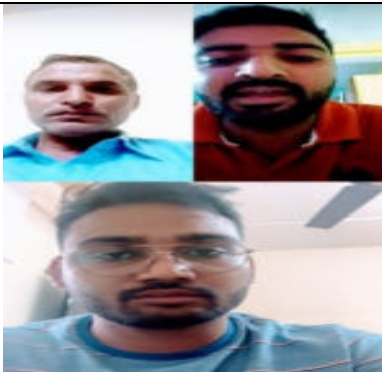
Sr. No	Location	Participants No	Concerns / issues discussed	Photographs
1	Village Barotiwala	26	<p>The community consultation was held at Village Barotiwala. Issues raised by public were about the irregular supply of water (once in 2 days – 20 min to 40min), sources drying up causing issues in supply of water in peak summer, leakages of water pipelines.</p> <p>The participants conveyed their support to the project and its benefits. Continuous community consultations will be organized before, during and after execution of the project.</p>	 
2	Village Landeywal	54	<p>The community consultation was held at Landeywal Village belonging to kotla Panchayat. The project proposal was also explained to the community members.</p> <p>The issues raised by community were about irregular supply of water, scarcity of water due to unsustainability of water at source. The water is contaminated due to industries in nearby locality, rich amount of calcium and turbidity is found in drinking water, which results into poor health of the community. No treatment plant is available to treat drinking water from source.</p> <p>Other problems stated were leakages of pipes, repairs and maintenance issues in pipelines. The water quality during rainy seasons is also very bad.</p> <p>The community also enquired about the timelines for commencement and completion of the project</p>	

Sr. No	Location	Participants No	Concerns / issues discussed	Photographs
			<p>The participants conveyed their support to the project and its benefits. Continuous community consultations will be organized before, during and after execution of the project.</p>	
3	Damuwala Village	26	<p>The community consultation was held at Damunwala village. The issues raised by community were about sustainability of water at source during summer. The supply of water is 2. To 2.5 hrs each day and that too on alternate days. Other problems stated were leakages of pipes, repairs and maintenance issues in pipelines. The water quality during rainy seasons is also very bad. Irregular cleaning of tanks and no-proper disinfection were also their major concerns. The community also enquired about the timelines for commencement and completion of the project.</p> <p>Alternative arrangement of water supply, during execution phase would be ensured. The participants conveyed their support to the project and its benefits. Continuous community consultations will be organized before, during and after execution of the project.</p>	

Sr. No	Location	Participants No	Concerns / issues discussed	Photographs
4	GP office Chamian	23	<p>Consultation with Women Group was carried out, the female community members informed that there is an urgent need of water to their habitations. Majority of the community members store water in their personal tanks and drums since the supply is not regular. The existing pipelines are frequently being broken by the running vehicles. Large amount of calcium get deposited every 2<sup>nd</sup> week in tanks. Due to industrial area the underground water is contaminated and its consumption without treatment is hazardous to health.</p> <p>The reliable source selection and water demand projections to cater water demand till 2042 was explained. The proposed source and the automation concept were explained to the community. The smart water metering was explained, and community was willing to pay the charges for the frequent and good quality of water supply.</p>	
5	G.P. Garkhal Sanawar and GP Garkhal Kasauli	33	<p>The community consultation was held at Chamian village. At the outset the proposal of SS-1 grid covering the command area of scheme with details of all the major components like source, WTP, MBR and SRs along with its serving habitation was explained to community members.</p> <p>The issues raised by community were about sustainability of water at source during summer. The existing source serving them was a local spring source whose discharge is not reliable throughout the year. Hence in peak summers the spring dries up causing delays in water supply. Other problems stated were leakages of pipes, repairs and maintenance issues in pipelines. The water quality during rainy seasons is also very bad</p> <p>Alternative arrangement of water supply, if required during execution phase would be ensured. The participants conveyed their support to the project and its benefits.</p>	



Sr. No	Location	Participants No	Concerns / issues discussed	Photographs
6	Village Hurang Kotla	27	<p>The community consultation was held at GarkhalLarah Village. At the outset the proposal of SS-1 grid covering the command area of scheme with details of all the major components like source, WTP, MBR and SRs along with its serving habitation was explained to community members.</p> <p>The issues raised by community were about extraction of water by certain household more than requirement which lead to scarcity for some other. Thereforethe community supported the water metering and also advised for slab fixation. The existing source serving them was a local spring source whose discharge is not reliable throughout the year. Hence in peak summers the spring dries up causing delays in water supply. Other problems stated were leakages of pipes, repairs and maintenance issues in pipelines. The water quality during rainy seasons is also very bad</p> <p>The participants conveyed their support to the project and its benefits.</p>	
7	Village Bhawguri	29	<p>The community consultation was held at HurangKotla village. At the outset the proposal of SS-10 grid covering the command area with details of all the major components like source, WTP, MBR and SRs along with its serving habitation was explained to community members.</p> <p>The issues raised by community were about sustainability of water at source during summer. The existing source serving them was a local spring source whose discharge is not reliable throughout the year. Hence in peak summers the spring dries up causing delays in water supply. Other problems stated were leakages of pipes, repairs and maintenance issues in pipelines. The water quality during rainy seasons is also very bad. Irregular cleaning of tanks and no-proper disinfection were also their major concerns. The community also enquired about the timelines for commencement and completion of the project.</p> <p>The participants conveyed their support to the project and its benefits.</p> <p>Continuous community consultations will be organized before, during and after execution of the project.</p>	

Sr. No	Location	Participants No	Concerns / issues discussed	Photographs
8	Village Mussal Khana, Gram Panchayat Jangeshu	14	<p>The community consultation was held at Bhawguri Village belonging to Deothi Panchayat.</p> <p>The issues raised by community were about irregular supply of water every third day, scarcity of water due to unsustainability of water at source. No of times pump are not able to lift the water due to poor functioning. Other problems stated were leakages of pipes, repairs and maintenance issues in pipelines. The water quality during rainy seasons is also very bad.</p>	
9	Focused Group Discussion at Village Landeywal	18	<p>The community consultation was held at MussalKhana Village belonging to Jhangeshu Panchayat.</p> <p>The issues raised by community were about Turbidity of water, irregular supply of water, scarcity of water due to unsustainability of water at source which get dry during March. No treatment facility available. No of times pumps are not able to lift the water due to poor functioning. The community also enquired about the timelines for commencement and completion of the project</p> <p>The participants conveyed their support to the project and its benefits.</p>	
10	Virtual Consultation	3	<p>The virtual consultation with Voluntary Land Donor was carried out. Mr. Amer Singh readily agreed to donate his land and confirmed that he has given signed the NOC for the land.</p> <p>He raised a major concern that water quality and quantity is insufficient to meet daily needs. Hence, this scheme is required.</p> <p>He is donating the land for personal and community benefits.</p>	



Scanned Copy of Attendance Sheet:

## Public Consultation at Village Barotiwala

Public Consultation at Barotiwala

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

Attendance Sheet – Community Consultation

Zone: Chimla Package: 2 Circle: Solan District: Solan

Grid: SS 9 Location: Barotiwala

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
1.	Sohan Singh	M	Panchayat Member		9816294967	Barotiwala	
2.	Amerjeet	M	Contractor	-	9882830749	Barotiwala	
3.	Rishav Thakur	M	Own Business	-	9882050002	"	
4.	Dharmender	M	Own Business	-	8278844698	"	
5.	Baljeet Kumar	M	JSV	JE	8219187165	Barotiwala	
6.	Hans Raj	M	JSV	W.T.	9318086255	Barotiwala	
7.	Shyam Lal	M	JSV	Fitter	9805290576	"	
8.	Bhupender Kumar	M	JSV	Belder	7008694442	"	
9.	Basir	M	JSV	Belder	8628861677	"	
10.	Jaswanti Prasad	M	Doctor	+	9805226755	Balyana	
11.	Hans Raj Kaithi	M	Pradhan	-	8814616076	Barotiwala	
12.	Veer Singh Thakur	M	Numberdar	-	8894817093	"	
13.	Surjeet Sharma	M	Own Business	-	9736827003	Baker	
14.	Puneet Sharma	M	PE (JSV)	EE	9418011356	Barotiwala	
15.	Chaman Lal	M	AE (JSV)	A.E	7084675733	Barotiwala	
16.	Huridas	M	JE (TSV)	JE	7018972194	Barotiwala	
17.	Kiramata	F	H.W.	H.W.	9418357901	"	
18.	Hemlata	F	H.W.	H.W.	9816853261	"	
19.	Hidender Kumar	M	Dist. Pradhan	-	9882400032	"	
20.	Amar Nath	M	Ex-JSV	Panchayat	8219970972	"	
21.	Kamcharn	F	H.W.	H.W.	8357074963	"	
22.	Abhinav Jain	M	Consultant	Ex	999969060	"	
23.	Shanu Prakash Singh	M	"	"	988275688	"	
24.	Ketan Sonkar	M	"	"	9140003192	"	
25.	Sakib Qadri	M	Env. Spec.	Ex	7006880047	"	
26.	Dr. Poochi Sharma	F	Social Expert Consultant		8373179182	"	

## Public Consultation at Landeywal

10/2/21

Public Consultation at Landeywal

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

Attendance Sheet - Community Consultation

Zone: Sirmur Package: 2 Circle: Solan District: Solan

Grid: SS9 Location: Landeywal

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
1.	Amar Chand	M	farmer	Ex Service IPH	9318284888	Sitalpur	Amar
2.	Baldev Singh	M	farmer	-	787656146	Sitalpur	Baldev Singh
3.	Dhyan Singh	M	labour	-	8580447987	Sitalpur	Dhyan Singh
4.	Raja Ram	M	farmer	-	9805139070	Landeywal	Raja Ram
5.	Husan chand	M	Farmer	keyman	889403682	Landeywal	Husan chand
6.	Ram	M	farmer	-	-	Sitalpur	Ram
7.	Ram chand	M	"	-	-	Landeywal	Ram chand
8.	Kanahi Ram	M	"	-	-	Landeywal	Kanahi Ram
9.	Rachna Ram	M	"	-	-	Sitalpur	Rachna Ram
10.	Dev Ram	M	"	-	9816088345	Sitalpur	Dev Ram
11.	Gyan chand	M	"	-	6230037502	Sitalpur	Gyan chand
12.	Shyam Lal	M	"	-	9805292884	Sitalpur	Shyam Lal
13.	Amer Singh	M	"	-	9805710674	Sitalpur	Amer Singh
14.	Devi Raj Chaudhary	M	Ex UP Pradhan	-	9418491319	Sitalpur	Devi Raj Chaudhary
15.	Bhag Singh	M	Farmer	-	9876046759	H/Sandhwa	Bhag Singh
16.	Bhagat Ram Chaudhary	M	Labourer class Association	President	9218000066	Sitalpur	Bhagat Ram Chaudhary
17.	Sardara Singh	M	farmer	-	-	Sitalpur	Sardara Singh
18.	Gyan chand	M	farmer	-	9218737246	Sitalpur	Gyan chand
19.	Chintak Kumar	M	Own Business	-	9318848000	Sitalpur	Chintak Kumar
20.	Dev Raj	M	farmer	-	-	Sitalpur	Dev Raj
21.	Jagga Ram	M	"	-	-	Kalpanpur	Jagga Ram
22.	Rajdev Ram	M	"	-	9882606585	Kalpanpur	Rajdev Ram
23.	Om Prakash	M	"	-	7018613823	Sitalpur	Om Prakash



S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
24.	Kuldeep Singh	M	Farmer	-	9459753978	Sitalpur	[Signature]
25.	Curdas	M	Labour	-	8219890427	Sitalpur	[Signature]
26.	Yashpal	M	Farmer	-	988885967	Sitalpur	[Signature]
27.	Buch Ram	M	"	-	-	Landyad	[Signature]
28.	Sukh Ram	M	"	-	9805410084	Sitalpur	[Signature]
29.	Bhajan Lal	M	"	-	8219065791	Landyad	[Signature]
30.	Ramesh	M	"	-	9805862008	Landyad	Ramesh
31.	Surender	M	"	-	9805852157	Sitalpur	[Signature]
32.	Chaman Lal	M	"	-	9459424955	Sitalpur	Chaman
33.	Droon Chand	M	"	-	7018195926	Sitalpur	Droon
34.	Balwinder Singh	M	"	-	827877892	"	[Signature]
35.	Bashniya	F	"	-	-	Sitalpur	[Signature]
36.	Kamla Devi	F	H.W.	-	-	Sitalpur	[Signature]
37.	Kanta Devi	F	H.W.	-	-	Sitalpur	[Signature]
38.	Pooja Devi	F	Student	-	9756242785	Sitalpur	Pooja Devi
39.	Jaspreet	F	Student	-	981658382	Sitalpur	Jaspreet
40.	Pinky	F	H.W.	-	8219724084	Sitalpur	Pinky
41.	Suresh Kumar	F	H.W.	-	9318843000	Sitalpur	Suresh Kumar
42.	Raj Rani	F	H.W.	-	9816558455	Sitalpur	Raj Rani
43.	Rita Devi	F	H.W.	-	9805230999	Sitalpur	Rita Devi
44.	Sheela	F	H.W.	-	-	Sitalpur	[Signature]
45.	Sukhwinder	F	H.W.	-	-	Sitalpur	[Signature]
46.	Mandak Kaur	F	H.W.	-	7018925066	Sitalpur	Mandak Kaur
47.	Chaman Singh	M	A.E.	AE.	7018467515	Beckhi	[Signature]
48.	Kuldeep Singh	M	Ant Gump	Outsource	7018402623	Landyad	[Signature]
49.	Puneet Sharma	M	EE (CSU)	EE	9418011354	Sitalpur	[Signature]
50.	Ashish Jain	M	Engineer	-	999960037	"	[Signature]
51.	Dr. Prachi Sharma	F	Soil Specialist	-	6343471102	-	[Signature]
52.	Sakib Qadri	M	Env Engin	Consultant	2006880047	-	[Signature]
53.	Ketan Sonkar	M	EY	Associate	9999140003192	-	[Signature]
54.	Sham Prakash	M	EY	Associate	9802756066	-	[Signature]

10/2/21

Public Consultation at Damdalsala

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh


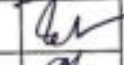

Attendance Sheet - Community Consultation

Zone: Shimla Package: 2 Circle: Solan District: Solan

Grid: SS 9 Location: Damdalsala

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
1.	Raman Sharma	M	Driving	-	9936681101	Baker	
2.	Ram Suresh Thakur	M	Retired Hk Ex-Sub	-	981717178	Baker	
3.	Suresh Chaudhary	M	Transport	-	982857219	Upper Baker	
4.	Mahender Pal	M	Agriculture	-	9816725006	Baker	
5.	Bhaag Singh	M	Agriculture	-	9805354396	Baker	
6.	Ramlak	M	- "	-	858077703	Upper Baker	
7.	Urmay	M	- "	-	-	Upper Baker	
8.	Shubham	M	- "	-	9816954402	Baker	
9.	Raj Kumar	M	- "	-	9857209901	Baker	
10.	Shubham <sup>Som Nath</sup>	M	- "	-	8679767190	Upper Baker	
11.	Dheeraj Pal Sharma	M	"	-	9816587116	Upper Baker	
12.	Aram Nath	M	"	-	968455459	Upper Baker	
13.	Ramlak Sharma	M	"	-	9882372380	Upper Baker	
14.	Preetal Thakur	M	"	-	-	Upper Baker	
15.	Sangeet	M	Medical	Helper	9857305113	Upper Baker	
16.	Anish	M	Student	-	9736420020	Upper Baker	
17.	Baljeet Kumar	M	JSV	J.E.	824157165	Baddi	
18.	Hans Ar	M	JSV	W-I	9312026255	Baddi	
19.	Deewan Chand	M	Agriculture	-	9695827150	Upper Baker	
20.	T. Singh	M	JSV	CE	9418011386	Upper Baker	
21.	Chaman Singh	M	JSV	A.F.	9816141714	Baker	
22.	Deborah Singh	F	Social Specialist	Ec	2393479193	Baker	
23.	Sakshi Baddi	M	Consultant	Spreading Ec	7006880047	Baker	



S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
24.	Kefan Sontkar	M	ET, Assistant	—	9740003192		
25.	Bhram. Prateek Singh	M	ET Assistant		988227606		
26.	Abhinav Jain	M	ET		999667007		
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## Public Consultation at Village Chamian

Public Consultation at GP Chamian

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

Attendance Sheet - Community Consultation

Zone: Shimla Package: 2 Circle: Solan District: Solan

Grid: SS-1 Location: Chamian

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
1.	Smt. Raksha Devi	F	H.W.	-	853079821	Bania	Raksha
2.	Amar Das	M	Panchayat	ward member	948452531	Chamian -2	Amar Das
3.	Amar Singh	M	farmer	-	9816949480	Chamian -1	Amar Singh
4.	Tara Dutt	M	farmer	-	982817802	Shimla	Tara Dutt
5.	Nitaram	M	J.S.V.	Supervisor	9418650210	Bania	Nitaram
6.	Anita	F	Panchayat	ward member	7807704789	Chamian -1	Anita
7.	<del>Anita</del> Dei	F	H.W.	-	9459875681	Chamian -1	Anita Dei
8.	Usha Thakur	F	H.W.	-	2219853688	Chamian -1	Usha
9.	Tulsi Devi	F	H.W.	-	-	Chamian -1	Tulsi Devi
10.	Uma Devi	F	H.W.	-	9459875681	Chamian -1	Uma Devi
11.	Manju Devi	F	P	-	835096565	-	Manju Devi
12.	Ganesh	F	P-Jee	P-Jee	9418662032	Ganesh	Ganesh
13.	N.C. Mahajan	M	J.E	J.E	9418463209	Ganesh	N.C. Mahajan
14.	Sakib Spdai	M	Consultant	Environment Specialist	7006880047	-	Sakib Spdai
15.	Dr. Pradipt Kumar	F	Consultant	Special Specialist	6393479102	-	Dr. Pradipt Kumar
16.	Akhinur Joon	M	EY	Associate	999761068	-	Akhinur Joon
17.	Ketan Sonka	M	EY	Associate	9140003712	-	Ketan Sonka
18.	Bhona Prady Singh	M	EY	Associate	98225608	-	Bhona Prady Singh
19.	Meeta Devi	F	H.W.	-	989484228	Chamian -1	Meeta Devi
20.	Veena Devi	F	H.W.	-	9816061960	Mandla	Veena Devi
21.	Jyoti Bala	F	H.W.	-	980595268	Mandla	Jyoti Bala
22.	Mohan Lal	M	Panchayat	Chairman	8219523495	Chamian -1	Mohan Lal
23.	Abresh Kumar	M	J.S.V.	A.E.	8219739779	Chamian -1	Abresh Kumar

## Public Consultation at Village Garkhal, GarkhalGram Panchayat

- C.P. Garkhal Karauli

Public Consultation at Gram Panchayat office - Garkhal Sarana

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

Attendance Sheet - Community Consultation

Zone: Shivalik Package: 2 Circle: Solan District: Solan

Grid: SS-1 Location: Garkhal

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
1.	Savitri	F	H.W	-	9418162018	Garkhal	
2.	Nikita	F	Student	-	-	Karauli	
3.	Recta	F	H.W	-	9882171637	Karauli	
4.	Binta	F	H.W	-	986772804	Karauli	
5.	Jish Kumar	M	Employee	-	9816257836	Karauli	
6.	Durgesh	M	Business	-	941823100	Garkhal	
7.	Ram Singh	M	do	-	01792-9851335	Karauli	
8.	Prakash	M	H.W	-	8580455006	Pun	
9.	Deep Kame	M	Bus driver	-	98521000	Panna	
10.	Deepak	M	Business	OWNER	9852540734	Garkhal	
11.	VIKAS-BEHL	M	BUSINESS	OWNER	7590079668	GARKHAL	
12.	Ram Singh	M	Farmer	-	94182-28502	Karauli	
13.	CHAMMAL	F	H.W	-	88941-3101	GARKHAL	
14.	VIPIN GUPTA	M	Guest. Contract	Owner	8219342208	Garkhal	
15.	Banika Veer	F	Housewife	-	9418451428	Garkhal	
16.	Vandana Khurana	F	Housewife	-	9318743005	Garkhal	
17.	Priyanka Chakraborty	F	Housewife	-	9982007031	Garkhal	
18.	Trishu Gupta	F	Housewife	-	9882407163	Garkhal	
19.	Anita Sharma	F	Housewife	-	851978510	Deosi	
20.	Sumita DEVI	F	Housewife	-	9816152779	Lardha	
21.	Jyoti Bhat	F	H.W	-	9805909632	Garkhal	
22.	Shilpi	F	H.W	-	9418151311	Garkhal	
23.	Shwami	F	H.W	-	9805295716	Garkhal	



S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
24.	Anita	F	H.W	-	98707878	Gandhi	Anita
25.	Santosh		H.W		701829869	"	Santosh
26.	Pooja		H.W		821937989	Nadla	Pooja
27.	N.C. Mahajan	M	Survey	J.E	941846209	Gandhi	N.C.
28.	Naresh Kumar	M	S/Survey	A.E.	821973979	S/Pur	Naresh
29.	Sakshi Pandey	M	Consultant	Environment Expert	7006880047		Sakshi
30.	Dr. Prachi Sharma	F	Consultant	Social Scientist	639347087	-	Dr. Prachi
31.	Abhinav Jain	M	consultant	EY	992110637	-	Abhinav
32.	Ketan Sonkar	M	EY	Associate	914000392	-	Ketan
33.	Bhenu Pradeep Singh	M	EY	Associate	9882756066	-	Bhenu
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## Public Consultation at Village Hurang Kotla

11/2/22

*Public Consultation at Hurang Kotla*



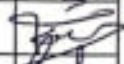

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

Attendance Sheet - Community Consultation

Zone: *Shimla* Package: *2* Circle: *Solan* District: *Solan*

Grid: *SS-1* Location: *Hurang Kotla*

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
1.	Husan Datta	M	Farmer	-	889432336	<i>Khadu</i>	<i>Husan Datta</i>
2.	Kixan	FM	ward member	-	9805671293	<i>Shikhar</i>	<i>Kixan</i>
3.	Poonam	FM	"	-	821917095	<i>Gundol</i>	<i>Poonam</i>
4.	मीनाकुमारी	FM	Housewife	-	980577663	<i>Khadu</i>	<i>मीनाकुमारी</i>
5.	MAST RAM	M	Farmer	-	9816988213	<i>Khadu</i>	<i>MAST RAM</i>
6.	Khanit Ray	M	Farmer	-	941682998	<i>Hurang</i>	<i>Khanit Ray</i>
7.	Himanshu	M	Farmer	-	981692178	<i>Khadu</i>	<i>Himanshu</i>
8.	Agarwal	M	Farmer	-	82078-84781	<i>Khadu</i>	<i>Agarwal</i>
9.	Kiran	FM	Housewife	-	98161-69412	<i>Dusan</i>	<i>Kiran</i>
10.	निमिती	FM	"	-	9186-19278	<i>Dusan</i>	<i>निमिती</i>
11.	निमिती	FM	"	-		<i>V</i>	<i>निमिती</i>
12.	निमिती	FM	"	-	98056-75317	<i>"</i>	<i>निमिती</i>
13.	Omavati	FM	"	-		<i>2135</i>	<i>Omavati</i>
14.	Rakesh Thakur	M	Farmer	-	941690662	<i>2135</i>	<i>Rakesh Thakur</i>
15.	NARINDER KUMAR	M	Business Man	-	980561201	<i>Khadu</i>	<i>NARINDER KUMAR</i>
16.	Govind Ram	M	Ward member	-	88946-43789	<i>Khadu</i>	<i>Govind Ram</i>
17.	Vidender Kumar	M	"	-	9817593039	<i>Khadu</i>	<i>Vidender Kumar</i>
18.	GOPAL Singh	M	Agriculture	UP. Panchayat	9816595942	<i>Khadu</i>	<i>GOPAL Singh</i>
19.	Madan Mohan Bhatia	M	Associate	Vice Chair man B.D.C.	9816375779	<i>Khadu</i>	<i>Madan Mohan Bhatia</i>
20.	Laxmi DEVI	FM	Agriculture	Farmer	9418372209	<i>Gardol</i>	<i>Laxmi DEVI</i>
21.	N.C. Mahajan	M	Source	J.E.	940648205	<i>Gardol</i>	<i>N.C. Mahajan</i>
22.	Naraj Kumar	M	Grnt Source	A.E.	821973977	<i>Spur</i>	<i>Naraj Kumar</i>
23.	Sakib Qadri	M	Consultant	Env. Expert	7006880047		<i>Sakib Qadri</i>

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
24.	Dr. Prachinshree	F	Consultant	Social Expert	839347120	-	
25.	Abhinav Jais	M	Consultant	ET	9999610678	-	
26.	Ketan Sonkar	M	ET	Associate	914000371	-	
27.	Bhanu Prakash Singh	M	ET	Associate	9822718066	-	
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## Public Consultation at Village Bhawguri, Bhawguri Gram Panchayat

Public Consultation at Gram Panchayat Bhawguri

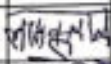
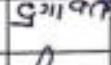


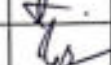

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

Attendance Sheet - Community Consultation

Zone: Shimla Package: 2 Circle: Solan District: Solan

Grid: SS-1 Location: Bhawguri

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
1.	Jalam Singh	M	HPP Govt Job	Head Constable	9418734401	Bhawguri	[Signature]
2.	Smt Nagu Devi	F	M.W.	-	8894275297	Bastra	[Signature]
3.	Rajinder kumar	M	Farmer	-	8988178182	Beani	[Signature]
4.	Ganga Ram	M	"	-	9418743210	Beani	[Signature]
5.	Rajinder Singh	M	Contractor	-	9418090072	Chamakuli	[Signature]
6.	Ram Chandra	M	Farmer	-	98055839	Manghyar	[Signature]
7.	Rajinder kumar	M	Farmer	-	8988179074	Bastra	[Signature]
8.	Jeet Ram	M	Farmer	-	9459422118	Sangri	[Signature]
9.	Hari manan	M	Farmer	-	9817926733	Bhawguri	[Signature]
10.	Bhawan kumar	M	Farmer	-	9418743537	Chamakuli	[Signature]
11.	Leela Devi	M	Farmer	-	94185553397	Manghyar	[Signature]
12.	Bhagat Ram	M	Farmer	-	98591-58228	Gahar	[Signature]
13.	Rakesh kumar	M	Farmer	-	98171-07476	Ander	[Signature]
14.	Girish Chandra	M	Farmer	-	889452210	Auda	[Signature]
15.	Mahendrakumar	M	Farmer	-	9418510924	Beani	[Signature]
16.	Jai Singh Thakur	M	Farmer	-	9816082335	Gahar	[Signature]
17.	Baldev sharma	M	Farmer	-	9418376741	Auda	[Signature]
18.	Yash Datta	M	Farmer	-	9882953397	Manghyar	[Signature]
19.	Anand Reddy	M	Farmer	-	9418270465	Singhi	[Signature]
20.	Bhawan kumar	M	Farmer	-	8899021158	Bandh	[Signature]
21.	Nagim Chandra	M	Farmer	-	988216073	Chamakuli	[Signature]
22.	Shyam Lal	M	Farmer	-	7042693531	Singhi	[Signature]
23.	Ipamant Thakur	M	Farmer	-	9888657393	Chamakuli	[Signature]

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
24.	Like Ram	M	Farmer	-	-	Bukla	
25.	Durgawati	F	Pracham	-	9805304099	Bhagpur	
26.	Dr. Pradeep Kumar	F	Social Scientist	Consultant	639317182	-	
27.	Ketan Sonkar	M	Ex. Associate	Consultant	940008992	-	
28.	Sakib Qadri	M	Consultant	Environment Specialist	7006880097	-	
29.	Bhanu Prakash Singh	M	ET	ET	9882756066	-	
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## Public Consultation at Village Mussal Khana, Jangeshu Gram Panchayat

*Public Consultation at GP Jangeshu*

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

Attendance Sheet - Community Consultation

Zone: *Shimlo* Package: *2* Circle: *Solan* District: *Solan*

Grid: *SS-1* Location: *GP Jangeshu (karauli) PLO-Mussal Khana*

S.No.	Name	Gender	Occupation	Designation	Mobile. No.	Village	Sign
1.	<i>Turo Chand</i>	<i>M</i>	<i>J.S.V</i>	<i>Helper</i>	<i>9817355584</i>	<i>Mussal Khana</i>	<i>Turo Chand</i>
2.	<i>Bijay Ram Karwal</i>	<i>M</i>	<i>Panchayat member</i>	<i>ward member</i>	<i>819610352</i>	<i>Tibba</i>	<i>Bijay Ram Karwal</i>
3.	<i>Man Singh</i>	<i>M</i>	<i>farmer</i>	<i>-</i>	<i>9459220719</i>	<i>Shilu Kalan</i>	<i>Man Singh</i>
4.	<i>Madan Lal</i>	<i>M</i>	<i>own business</i>	<i>-</i>	<i>980241077</i>	<i>Tibba</i>	<i>Madan Lal</i>
5.	<i>Sunil Datta</i>	<i>M</i>	<i>Procure</i>	<i>-</i>	<i>9818732222</i>	<i>Thana</i>	<i>Sunil Datta</i>
6.	<i>Neesha Chandel Mohan</i>	<i>m</i>	<i>J.S.V</i>	<i>J.E</i>	<i>948468209</i>	<i>Costa</i>	<i>Neesha Chandel Mohan</i>
7.	<i>Naveen Kumar</i>	<i>M</i>	<i>J.S.V</i>	<i>A.E.</i>	<i>8219729719</i>	<i>A/PW</i>	<i>Naveen Kumar</i>
8.	<i>Rajender Kumar</i>	<i>M</i>	<i>Panchat</i>	<i>-</i>	<i>9892401278</i>	<i>Pu</i>	<i>Rajender Kumar</i>
9.	<i>Vijay Dahi</i>	<i>f</i>	<i>Jangeshu Jangeshu</i>	<i>-</i>	<i>8278758</i>	<i>Vijay Dahi</i>	<i>Vijay Dahi</i>
10.	<i>Sakib Dahi</i>	<i>M</i>	<i>Procure</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>Sakib Dahi</i>
11.	<i>Sakib Dahi</i>	<i>M</i>	<i>Consultant</i>	<i>Env Expert</i>	<i>7066880047</i>	<i>-</i>	<i>Sakib Dahi</i>
12.	<i>Dr. Prachi Sharma</i>	<i>F</i>	<i>Consultant</i>	<i>Social Expert</i>	<i>639347982</i>	<i>-</i>	<i>Dr. Prachi Sharma</i>
13.	<i>Abhinav Jain</i>	<i>M</i>	<i>Consultant</i>	<i>EY</i>	<i>977960175</i>	<i>-</i>	<i>Abhinav Jain</i>
14.	<i>Ketan Sonkar</i>	<i>M</i>	<i>Consultant</i>	<i>EY</i>	<i>9140003142</i>	<i>-</i>	<i>Ketan Sonkar</i>
15.	<i>Bhansh Singh</i>	<i>M</i>	<i>EY</i>	<i>Assistant</i>	<i>9822756066</i>	<i>-</i>	<i>Bhansh Singh</i>
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# Focused Group Discussion at Village Landeywal


Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh						
Attendance Sheet - Focused Group Discussion						
Zone: Shimla		Package: 2		Circle: Solan		District: Solan.
Grid: 559		Location: Landeywal.				
S.No.	Name	Gender	Occupation	Mobile. No.	Village	Sign
1.	Bachanija.	F	Farmer	—	Sitalpur	वैजना
2.	Kamla Devi	F	H.W.	—	Sitalpur	कमला देवी
3.	Kanta Devi	F	H.W.	—	Sitalpur	कान्ता
4.	Pooja Devi	F	Student	9736242335	Sitalpur	Pooja Devi
5.	Jaspreet	F	Student	9816563832	Sitalpur	Jaspreet
6.	Pinky	F	H.W.	8219724084	Sitalpur	Pinky
7.	Suresh Kumar	F	H.W.	9318884300	Sitalpur	Suresh Kumar
8.	Raj Rani	F	H.W.	—	Sitalpur	राज रानी
9.	Ripu Devi	F	H.W.	—	Sitalpur	रिपु देवी
10.	Sheela	F	H.W.	—	Sitalpur	शीला
11.	Sukhinder	F	H.W.	—	Sitalpur	सुखिंदर
12.	Mandeep Kaur	F	H.W.	—	Sitalpur	Mandeep Kaur
13.	Abhijeet Jais	M	Assistant Consulting	—	Sitalpur	अभिजीत
14.	Punam Sharma	M	EE (TSV)	9418011326	Sitalpur	Punam
15.	Dr. Prachi Sharma	F	Social Scientist	639317907	—	Dr. Prachi
16.	Sakshi Sharma	F	Environment Scientist	7006880047	—	Sakshi
17.	Chaman Rajput	M.	Asst.	7018467573	Baedi	चमन
18.	Ketan Sonkar	M	EX. Asst.	9140003772	—	Ketan
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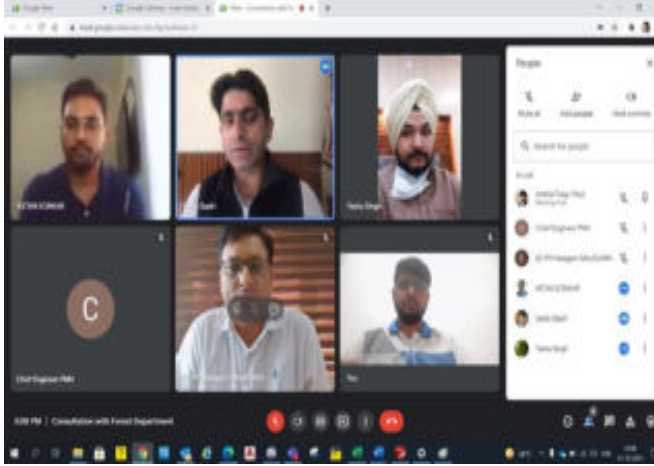
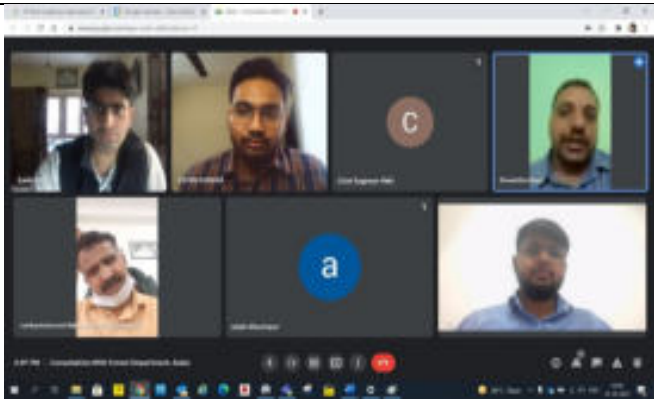
**D. Consultation with Jal Shakti Vibhag Officials, Forest Officials and Fishery Officials**


<b>Sr. No</b>	<b>Date</b>	<b>Circle</b>	<b>Division/Subdivision</b>	<b>Location</b>	<b>Total No of Participants</b>
1	10-02-2021	Solan circle	Baddi	Hotel Baghban Baddi	8
2	11-02-2021	Solan circle	Dharampur	JSV Circle Office, Solan	11
3.	13-10-2021	DFO,Nalagarh Circle	Nalagarh	Virtual Meeting	6
4.	14-10-2021	DFO Solan circle	Solan	Virtual Meeting	7
5	11-11-2021	Fishery Department	Kullu	Trout Firm, Hamni	6
	12-11-2021	Fishery Department	, Mandi	Mahseer Sanctuary Jogendranagar,	7


### Summary of Consultations

Sr. no	Location (Date)	Participants No	Concerns / issues discussed	Photographs
1	Executive Engineer & Assistant Engineer, <b>Hotel Baghban Baddi</b> (10-02-2021)	8	<p>Firstly, the overall components (Existing &amp; Proposed) and the complete proposal of SS-9 Grid comprising of Water Supply Scheme Dumanwala, Barotiwala, Kotian Mandhala, Landeywal, amroo Bawasni were discussed with Mr. Puneet Sharma, Executive Engineer and Mr Chaman Rajput Assistant Engineer. The proposed sites to be visited and the Locations for public consultations were finalized. The Consultation meeting with community was arranged in habitation of Barotiwala Village, Gram Panchayat Barotiwala and village Landeywal.</p> <p>The importance and readiness of Land ownership for the proposed components was explained. The necessary land details with its land records will be given by JSV.</p> <p>JSV has agreed to provide the land ownership and land transfer documents for the required land parcels shortly and it was informed that there are no private land parcels involved in the project for voluntary land donation.</p> <p>Also, the JSV officials were apprised to apply online for FCA for the respective components located on forest land and share the copy of online applied proposal no. as deemed necessary. The same was agreed upon to be shared at the earliest.</p> <p>The documents such as Written Consents from respective Gram Panchayats involved in the project, for Execution of Project activities were discussed and requested to be provided at the earliest and the same was agreed upon.</p>	

Sr. no	Location (Date)	Participants No	Concerns / issues discussed	Photographs
			<p>Further, it was informed by the JSV officials that there are no Wildlife Sanctuaries within 10 KM radius of the proposed project components.</p> <p>The team along with JSV officials visited the WTP site at Baroitwala which is a proposed WTP site.</p>	
2	<p>Superintending Engineer, Executive Engineer, Assistant Engineer &amp; Junior Engineer <b>Circle office Solan, JSV</b></p> <p>(11-02-2021).</p>	11	<p>The brief summary of the site visit findings pertaining to SS-9 , Dumanwala, Barotiwala, Kotian Mandhala, Landeywal, amroo Bawasni site visit grids was briefed to Mr. Mukesh Hira SE, Solan circle Shimla Zone, JSV</p> <p>The land details (Khasra number, ownership) and transfer procedures for Govt. Land and Forest Land were explained. SE, Shimla zone agreed to persuade respective division and sub-division offices to comply with same and provide the relevant documents within stipulated timeframe.</p> <p>The documents such as Written Consents from Private Voluntary Land Donors and from respective Gram Panchayats involved in the project, for Execution of Project activities required were discussed and agreed to be shared at the earliest.</p> <p>The following major findings were discussed in detail for future course of actions pertaining to SS9 Grid;</p> <ol style="list-style-type: none"> <li>1. Site location of Proposed SR Damunwala is falling directly under the HT cables. Thus, it needs to be shifted around 15-20m away from the proposed location. JSV to provide the new location and design to be updated accordingly.</li> <li>2. Due to the unavailability of enough land for construction of WTP and PH Mandhala, the site</li> </ol>	

Sr. no	Location (Date)	Participants No	Concerns / issues discussed	Photographs
			locations were changed. Proposal to be revised according to the new locations.	
3	Virtual with Divisional Forest Officer, Nalagarh, Google Meet.	6	<p>Consultation with Mr. Yashu Sharma, Divisional forest officer, Chamba was held on 13<sup>th</sup> October 2021 virtually.</p> <p>Detailed discussion was made with Mr. Yashu Singh on the species of Flora and Fauna found in Nalagarh, protected species of trees, shrubs and herbs found in the region, provision required if any tree felling is required.</p> <p>Mr. Shreasthanand was informed the no forest land is required for construction of components in Grid SS1.</p> <p>It was informed to Mr. Yashu singh that few tree felling is required under the project in Nalagarh district. On enquiring about requirement of tree cutting Mr. Yashu Singh replied, cutting of trees included protected species can be allowed by the forest department on getting necessary approvals from the forest department and necessary compensation.</p>	
4	Virtual with Divisional Forest Officer, Solan, Google Meet.	7	<p>Consultation with Mr. Shearstanand, Divisional forest officer, Chamba was held on 14<sup>th</sup> October 2021 virtually.</p> <p>Detailed discussion was made with Mr. Shearstanand on the species of Flora and Fauna found in Nalagarh, protected species of trees, shrubs and herbs found in the region, provision required if any tree felling is required.</p> <p>Mr. Shreasthanand replied the dominant species generally found in Solan district are Chil, Deodar, Ban, and Kail. Mr. Shreasthanand informed the process of forest land transfer to another department.</p> <p>Mr. Shreasthanand was informed the no forest land is required for construction of components in Grid SS1.</p>	

Sr. no	Location (Date)	Participants No	Concerns / issues discussed	Photographs
			<p>On enquiring about requirement of tree cutting Mr. Shreasthanand replied, cutting of trees included protected species can be allowed by the forest department on getting necessary approvals from the forest department and necessary compensation.</p> <p>Mr. Shreasthanand was requested to share the site-specific information of important trees and Shurbs.</p>	
5	Consultation with Mr D.C Arya, Fishery officer at Trout fish farm, Hamni.	6	<p>According to Mr D.C Arya, Fishery officer at Trout fish farm, Hamni , Rainbow / brown (resident) and snow trout (introduced from Denmark) along with local small fishes (Chal/Minnows) are commonly available.</p> <p>Mahseer is not seen in cold water Khads/nallahs as the condition is not favourable for breeding due to cold water. Trout breeding period is October to March. The trouts spawn in slight gravel depression in shallow banks vegetated with water moss. Fishery department has adopted artificial breeding of Rainbow and Brown trout's and releasing in the different ewater bodies from the firms. As a part of trout conservation purpose organises "catch and release" events in April every year with the help of local NGOs. Anglers from all over the world participate in this event.</p>	
6	Consultation with Mr Ajay Sharma, Fishery officer at Macchyal Mahseer Firm, Jogendranagar.	6	<p>According to Mr Ajay Sharma, Fishery officer at Mahseer farm, Macchyal , Golden Mahseer which is an endangered species as per IUCN status is a long range migrant and use the Beas river stretch between Pong dam and Pandoh dam and also found in Satluj and Giri rivers and their tributaries for breeding and spawning during monsoon (mid May to September). Other fish species are local and low/medium range migrant.</p> <p>Golden Mahseer is called sporty/game fish and can move upstream upto 100km. During torrential monsoon migrates</p>	

Sr. no	Location (Date)	Participants No	Concerns / issues discussed	Photographs
			<p>upstream from Lakes / lowland rivers to reach suitable spawning grounds. It prefers to spawn over rocky and stony substrates. It is omnivorous but during migration carni-omnivorous.</p> <p>In recent years due to their proximity to human intervention, mahseer stock is threatened with multifaceted dangers posed by construction of series of dams, barrages / weirs across the rivers on one hand and over-exploitation on the other. The ever-diminishing catches of Mahseer from the river Satluj, Giri, Beas, Chenab and their tributaries clearly bespeaks the affects caused by the construction of Pandoh, Chamera, Pong, Bhakra &amp; Giribata barrages. <u>Regardless of their height, weirs and dams constitute barriers to breeding migration of Mahseer.</u></p> <p>Further, mahseer population is also affected by morphological modifications resulting from completion of river valley projects. These include change in slope, river-bed profile, submersion of gravel zones or riffle section as well as destruction of riparian vegetation and changes in tropic regimes. Most of the negative factors affect upper parts of the streams where lacustrine conditions are superimposed on the river. Downstream, the hydrological conditions get severely altered through reduction of water discharge. The adverse conditions of the flow can extend over many kilometers downstream of the obstruction so that fish passages become difficult.</p> <p>The habitat preference displayed by many species during spawning is closely related to the stage of the course of the life cycle occurring in the flooding at monsoon. The trouts spawn in slight gravel depression in shallow banks vegetated with water moss. Mahseer prefers shallow semi - stagnant water in general with stones for spawning. Carps generally do not breed in confined channels but rather spawn in flooded fields during monsoon at depth</p>	 

Sr. no	Location (Date)	Participants No	Concerns / issues discussed	Photographs
			<p>of 0.5 to 1m.</p> <p>Normally the spawning of Mahseer takes place at confluences of the tributaries with the main streams where water is well oxygenated and has a moderate velocity. ,</p> <p>Several fish species including Tor putitora (Golden Mahseer) which requires upstream migration to reach the spawning ground in order to reproduce will be obstructed <u>by head weirs in their specific pathways from successfully reaching their spawning grounds</u> and breed.</p> <p>State Government through its conservation plan launched to save endangered Golden Mahseer from the brink of extinction has succeeded in improving the status of this specie in the rivers and reservoirs of Himachal Pradesh.</p> <p>There are many natural Mahseer sanctuaries called Machhial in the state water where Golden Mahseer is being conserved spiritually by the people and department of fisheries also doing commendable work in this direction by strictly implementing fisheries Act and Rules. It has also created opportunities of employment and strengthened the economy of fishermen of the state. So far now 10893 families have been involved in captive fisheries in the state out of which 5883 families are involved in riverine around 5010 families are involved in fish catches in reservoirs area.</p>	



## Attendance sheet

## 1. Meeting at Hotel Baghban Baddi, Baddi subdivision

Meeting with EE Nalgargh

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

Attendance Sheet – Meeting with Jai Shakti Vibhag

Zone: Shimla Package: 2 Circle: Solan District: Solan

Grid: SS9 Location: Hotel Baghban (Baddi)

S.No.	Name	Designation	Mobile. No.	Sign	Email ID
1.	Puneet Sharma	E.E. (JSV)	9418011356		enabargh@yahoo.in
2.	Chaman Rajput	A.E. (JSV)	7018467573		chamanrajput7@gmail.com
3.	Dr. Prachi Sharma	General Expert	90393479182		—
4.	Sakshi Baddi	Environment Specialist	7006880047		—
5.	TARUN KADWAL	GENERALIST	8745949264		—
6.	KETAN SONWAR	EY, ASSOCIATE	9140003192		—
7.	BRAMU BETA D SINGH	EY Associate	9882756066		—
8.	Abhinav Jain	EY Associate	9999610632		—
9.					
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## 2. Meeting at JSV Circle Office, Solan, Dharampur subdivision

Meeting with SE Sir Solan Circle office

Site Visit for Environment and Social Safeguard Documents for Renovation and Remodelling of Rural Water supply schemes commissioned prior 01.01.2000 Himachal Pradesh

## Attendance Sheet - Meeting with Jal Shakti Vibhag

Zone: Shimla Package: 2 Circle: Solan District: Solan

Grid: SS1/SS10 &amp; SS9 (SZ-PK2) Location: JSV Circle office Solan

S.No.	Name	Designation	Mobile. No.	Sign	Email ID
1.	Mukesh Hira	SG JSV Solan	94180 27912		sciph.solan@gmail.com
2.	Puneet Sharma	EE JSV Nalgah	94180 11356		anabganh@yahoo.in
3.	Yogesh Kumar	EECO, JSV Solan	94184 92574		sciph.solan@gmail.com
4.	Naveesh Kumar	Assistant Engineer	8219739779		anesh.kumar@gmail.com
5.	Meesam Ahmad	Junior Engineer	9018468209		meesam.ahmad1985@gmail.com
6.	Baljeet Kumar	Junior Engg.	8219187165		baljeet.kumar1989@gmail.com
7.	Sakib Qadri	Environment Expert	7006880049		SAKIBQADRI@GMAIL.COM
8.	Dr. Pradeep Sharma	Specialist	6393979187		pradeep.sharma.waste@gmail.com
9.	Ketan Sankar	EY, Associate	9140003192		ketan.sankar@in-ey.com
10.	Abhinav Jais	EY, Associate	9996680678		abhinav.jais@in-ey.com
11.	Bhanu Pratap Singh	EY, Associate	9882756066		bhanu1989@gmail.com
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### Appendix 18: Sample Grievance Registration Form

(To be available in Hindi and English)

The\_\_\_\_\_Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing \*(CONFIDENTIAL)\* above your name. Thank you.

Date	Place of registration	Project Town			
		Project:			
Contact information/personal details					
Name		Gender	* Male * Female	Age	
Home address					
Place					
Phone no.					
E-mail					
Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below:					
If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

#### FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)
Mode of communication:

Note/letter	
E-mail	
Verbal/telephonic	
Reviewed by: (Names/positions of officials reviewing grievance)	
Action taken:	
Whether action taken disclosed:	Yes s No
Means of disclosure:	

## Appendix 19: Sample Environmental Site Inspection Checklist

Project Name

Contract

Number

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_ TITLE: \_\_\_\_\_

WEATHER:

	Project	Survey	
	Activity	Design	
	Stage	Implementation	
		Pre-Commissioning	
		Guarantee Period	

Monitoring Items	Compliance
<b>Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI)</b>	
EHS supervisor appointed by contractor and available on site	
Construction site management plan (spoils, safety, schedule, equipment etc.,) prepared	
Traffic management plan prepared	
Dust is under control	
Excavated soil properly placed within minimum space	
Construction area is confined; no traffic/pedestrian entry observed	
Surplus soil/debris/waste is disposed without delay	
Construction material (sand/gravel/aggregate) brought to site as & when required only	
Tarpaulins used to cover sand & other loose material when transported by Vehicles	
After unloading , wheels & undercarriage of vehicles cleaned prior to leaving the site	
No chance finds encountered during excavation	



Work is planned in consultation with traffic police	
Work is not being conducted during heavy traffic	
Work at a stretch is completed within a day (excavation, pipe laying & backfilling)	
Pipe trenches are not kept open unduly	
Road is not completely closed; work is conducted on edge; at least one line is kept open	
Road is closed; alternative route provided & public informed, information board provided	
Pedestrian access to houses is not blocked due to pipe laying	
Spaces left in between trenches for access	
Wooden planks/metal sheets provided across trench for pedestrian	
No public/unauthorized entry observed in work site	
Children safety measures (barricades, security) in place at works in residential areas	
Prior public information provided about the work, schedule and disturbances	
Caution/warning board provided on site	
Guards with red flag provided during work at busy roads	
Workers using appropriate PPE (boots, gloves, helmets, ear muffs etc)	
Workers conducting or near heavy noise work is provided with ear muffs	
Contractor is following standard & safe construction practices	
Deep excavation is conducted with land slip/protection measures	
First aid facilities are available on site and workers informed	
Drinking water provided at the site	
Monitoring Items	Compliance
Toilet facility provided at the site	
Separate toilet facility is provided for women workers	
Workers camps are maintained cleanly	
Adequate toilet & bath facilities provided	
Contractor employed local workers as far as possible	
Workers camp set up with the permission of PIU	
Adequate housing provided	
Sufficient water provided for drinking/washing/bath	
No noisy work is conducted in the nights	
Local people informed of noisy work	

No blasting activity conducted	
Pneumatic drills or other equipment creating vibration is not used near old/risky buildings	

Signature

\_\_\_\_\_

**Sign off** \_\_\_\_\_

\_\_\_\_\_

**Name**  
**Position**

\_\_\_\_\_

**Name**  
**Position**

## Appendix 20: Semi-Annual Environmental Monitoring Report Template

### 1. introduction

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009

### 2. Project Safeguards Team

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

### 3. Overall project and subproject/package progress and status

- Indicate (i) status of design – preliminary design or final design, (ii) status of implementation - under bidding, contract awarded but no works yet, contract awarded with works, civil works completed, or O&M

Package Number	Components/List of Works	Type of Contract (specify if DBO, DB or civil works)	Status of Implementation (specify if Preliminary Design, Detailed Design, On-going Construction, Completed Works, or O&M phase) <sup>30</sup>	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
					%Physical Progress	Expected Completion Date

- For package with awarded contract, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.

#### Package-wise Contractor/s' Nodal Persons for Environmental Safeguards

Package Name	IEE Cleared by ADB (provide date)	Contractor	HSE Nodal Person	Email Address	Contact Number

<sup>30</sup> If on-going construction, include %physical progress and expected date of completion


#### 4. STATUS OF IEE PER SUBPROJECT/PACKAGE

- Provide status of updated/final IEE<sup>31</sup> per package.

#### Package-wise Implementation Status

Package Number	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? <sup>32</sup> (Yes/No)	Remarks
	Not yet due (detailed design not yet completed)	Submitted to ADB (provide date of submission)	Disclosed on project website (provide link)	Final IEE provided to Contractor/s (Yes/No)		

#### 5. Compliance status with National/State/Local statutory environmental requirements<sup>33</sup>

Package No.	Statutory Environmental Requirements <sup>34</sup>	Status of Compliance (Specify if obtained, submitted and awaiting approval, application not yet submitted)	Validity Date(s) (if already obtained)	Action Required	Specific Conditions that will require environmental monitoring <sup>35</sup>

#### 6. Compliance status with environmental loan covenants

Schedule No. and Item (see Project Loan Agreement and list provisions relevant to environmental safeguards, core labor standards and occupational health and safety)	Covenant	Status of Compliance	Action Required

<sup>31</sup> IEE prepared based on preliminary design and cleared by ADB with condition that updated/Final IEE based on detailed design will be submitted.

<sup>32</sup> Works will not be allowed until SEMP/CEMP is approved by project implementation unit or project management unit.

<sup>33</sup> All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

<sup>34</sup> Specify statutory requirements: environmental clearance? Permit/consent to establish? Forest clearance? Workers/Labor permit, etc.

<sup>35</sup> Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

**7. Compliance status with the environmental management plan (refer to EMP tables in approved IEE/s)**

- Confirm in IEE/s if contractors are required to submit site-specific EMP (SEMP)/construction EMPs (CEMP). If not, describe the methodology of monitoring each package under implementation.
- Provide over-all compliance of the contractors with SEMP/CEMP. This should be supported by contractors' monthly monitoring reports to PIU(s) and/or verification reports of PIU(s) or project consultants. Include as appendix supporting documents such as **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.

**Overall Compliance with SEMP/CEMP**

<b>Package No.</b>	<b>Status of SEMP/CEMP Implementation</b> <i>(Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)</i>	<b>Action Proposed and Additional Measures Required</b>

- Provide description based on site observations and records:
  - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
  - Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
  - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
  - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
  - Confirm spill kits on site and site procedure for handling emergencies.
  - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
  - Describe management of stockpiles in each work site (construction materials, excavated soils, spoils, etc.). Provide photographs.
  - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
  - Provide information on barricades, signages, and on-site boards. Provide photographs.
  - Provide information on workers labor camp(s). Provide photographs.
  - Provide information on work-related accidents and incidents. Describe actions implemented.
  - Provide information on if there are any activities being under taken out of working hours and how that is being managed.
- Provide list of trainings on environmental safeguards, core labor standards, and OSH conducted during the reporting period. Include ADB-organized workshop, trainings, seminars, etc)

### Trainings, Workshops and Seminars Conducted

Date	Topic	Conducted by	No. of Participants (Total)	No. of Participants (Female)	Remarks

- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).

### Summary of Environmental Monitoring Activities (for the Reporting Period)<sup>36</sup>

Impacts (List from SEMP/CEMP)	Mitigation Measures (List from SEMP/CEMP)	Parameters Monitored (As identified in the SEMP/CEMP)	Method of Monitoring (Visual, Actual Sampling, etc)	Location of Monitoring (Provide GPS Coordinates) <sup>37</sup>	Date of Monitoring Conducted	Person Who Conducted the Monitoring
<b>Design Phase</b>						
<b>Pre-Construction Phase</b>						
<b>Construction Phase</b>						
<b>Operational Phase</b>						

## 8. Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS

- Confirm records of pre-work condition of roads, agricultural land or other infrastructure prior to starting to transport materials and construction.

Package No.	Status of Pre-Work Conditions (Recorded / Not Recorded)	Baseline Environmental Conditions (air, water, noise) Documented (Yes / No)	Action Proposed and Additional Measures Required

- Provide information on monitoring activities conducted during reporting period. If not conducted, provide justification. Compare results with baseline and internationally recognized standards.<sup>38</sup>

<sup>36</sup> Attach Laboratory Results and Sampling Map/Locations

<sup>37</sup> If GPS coordinate is not available, provide landmark(s) and/or chainage.

<sup>38</sup> ADB Safeguard Policy Statement (SPS) Appendix 1, para 33: 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, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from these levels and

### Air Quality Monitoring Results

Site No.	Date of Testing	Site Location (Provide GPS Coordinates) <sup>39</sup>	Parameters (as required by statutory clearances or as mentioned in the IEE)			Remarks
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3	

### Water Quality Monitoring Results

Site No.	Date of Sampling	Site Location	Parameters (as required by statutory clearances or as mentioned in the IEE)						Remarks
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L	

### Noise Quality Monitoring Results

Site No.	Date of Testing	Site Location	LA <sub>eq</sub> (dBA) (as required by statutory clearances or as mentioned in the IEE)		Remarks
			Day Time	Night Time	

## 9. INFORMATION DISCLOSURE AND CONSULTATIONS

- Confirm PMU/PIU/contractors provide project-related information to stakeholders, communities and/or affected people before and during construction works.<sup>40</sup>
- Provide information on consultations conducted during reporting period such dates, topics discussed, type of consultation, issues/concerns raised, safeguards team member present. Attach minutes of meetings (ensure English translation is provided), attendance sheet, and photos.

Date of Consultation	Location	Number of Participants (specify total, male and female)	Issues/Concerns Raised	Response to issues/concerns

## 10. Grievance Redress Mechanism

- **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-

measures, the borrower/client will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in the SPS.

<sup>39</sup> If GPS coordinate is not available, provide landmark(s) and/or chainage.

<sup>40</sup> Check EMP requirement on information disclosure. At a minimum, PIU thru the contractor should notify communities/affected persons/sensitive receptors 7 days and again 1 day before start of works.



related issues/complaints. Include as appendix Notification of the GRM (package-wise if applicable).

- **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

#### **11. SUMMARY OF KEY ISSUES/CONCERNS Identified during the reporting period AND REMEDIAL ACTIONS**

- Provide corrective action plan which should include all issues/concerns, actions required to be implemented, responsible entities, and target dates.

#### **12. STATUS OF CORRECTIVE ACTIONS FROM PREVIOUS SEMR(S)**

- Provide information on corrective actions to be implemented as reported in the previous SEMR(s). Include status of implementation of feedbacks/comments/suggestions as provided by ADB, if any.

**Corrective Action Plan Status**

<b>Issues/Concerns</b>	<b>Corrective Action</b>	<b>Status</b>	<b>Remarks</b>

#### **13. APPENDIXES**

- Photos
- Records of consultations
- Copies of environmental clearances and permits (if not provided in the previous SEMR)
- Environmental site inspection report (if not provided in the previous SEMR)
- Other

## **Appendix 21: Guidelines for Safety during Monsoon/Heavy rainfall**

Excavation and refilling of earth are common activities, which, if not carefully executed may pose problems to the safety of works as well as passersby and road users during the impending Monsoon.

Normal and heavy rainfall event affect our ongoing works, It should be our conscientious effort to ensure that such events do not prove to be problematic to people and structures in town. During monsoon PIU/PMDSC should ensure that any further excavation work is taken up only after ensuring that the earlier work is in safe stage. It is desired that DCM/ACM & Ex En PIU should inspect all sites during rains and take proactive actions.

Some of the precautions and mitigation measures to be taken are discussed below-

- 1 The execution of works having deep excavation in smaller lanes and congested areas should be completed well before monsoon. The works of deep excavation during monsoon should not be preferably taken up or extensive care should be taken for execution of such works.
- 2 The settlement in refilled trenches of sewerage and water supply lines may occur during monsoon. PMDSC and PIU team should inspect all sites after a storm to identify such reaches and take immediate corrective action by proper refilling and compacting. It is responsibility of all engineers to look after this activity during monsoon and ensure corrective actions from Contractor's side.
- 3 The contractor's crew should be equipped with vehicle, gum boots, raincoats, torch etc. to tackle such situation during and after rains. Adequate quantities of earth, debris and gravel should be stacked at strategic places so that no time is lost in procuring such material.
- 4 In trenches where pipe laying has been done and duly tested and approved, refilling should be done and all surplus material relocated to safe disposal sites such that it does not obstruct traffic or waterways.
- 5 All open ends of WS and WW pipelines should be firmly plugged to prevent debris from entering the pipeline. Manhole covers of sewer lines should be fixed in place to avoid any harm to road users.

- 6 Drains are primary or secondary carriers of storm water. Any unutilized construction material should be relocated to allow free passage of storm water. Surplus earth should be suitably and immediately be relocated to avoid earth from falling into the drain so that choking does not occur.
- 7 Overhead works should not be carried on in-weather conditions that threaten the safety of workers. More frequent checks on scaffold and bracings should be done during monsoon season.
- 8 Additional precautions should be taken of the power lines, ignorance and carelessness can cause major accidents and casualty.
- 9 Take preventive measures for water logging in working areas by providing dewatering pumps. Place bright and reflective warning signs.
- 10 Inspection should also be carried out before resumption of work after a shower/rain.
- 11 Storage of Construction Material: Steel & Cement are vital ingredients for quality construction work but in absence of proper storage, especially during monsoon, cement and steel may rapidly decline in quality and strength. Care should be taken to protect these materials and use of any exposed material should be allowed only after conducting fresh tests. Improper storage of such material should be reported to PIU/DSC and use of any apparently affected material should be done after permission of PIU/

### **Additional Precautions**

1. Adequate set up and resources such as dewatering pumps, electrical routings etc should be planned ahead. Water logging on main roads to be avoided, where construction works are going on.
2. Ensuring the monsoon specific PPE's issued in adequate and are used during monsoon.
3. Use of electric extension box should be avoided; extension cables (if used) should not be wet and damaged. Cables connections should be only weatherproof/ waterproof. Electrical and HSE personnel of contractor should visit permanent and running sites regularly. Transparent protective sheets/rain sheds should be placed for the power distribution boards.
4. Welding machines, bar cutting machines etc. should be kept in dry conditions; should not stand in water logged area. Breakers and Drill machines should not be used when raining; dirt/mud should be scrubbed with cloth.
5. Special Trainings to all drivers and operators on safe practices and all vehicles/ equipment's maintenance checks to be more frequent.
6. High boom equipment to be stopped during blowing of high speed wind and rain storm. Arresting of parked vehicles, equipment during monsoon should be done.
7. All chemicals should be stored as per MSDS, chemicals to be protected from water ingress. Chemical waste should be disposed for preventing overflow of chemicals.
8. At labor camps following precautions should be taken:-
  - Maintaining hygiene & proper housekeeping.
  - Additional health checkup camp to identify seasonal diseases
  - Preventive measures on mosquito/parasite breeding mainly in work locations and camps
  - Frequent cleaning of toilets
  - To avoid water borne diseases, high level of cleanliness to be maintained, drinking water containers need to be cleaned and kept covered. Walk areas and pathways to be covered with Murom and soft rock particles (to avoid soft soil conditions).

- Obstacle free approach to rest sheds, camp and toilets.
- Proper illumination, provision of battery operated emergency lights
- No bonfires inside resting sheds. No use of wood.

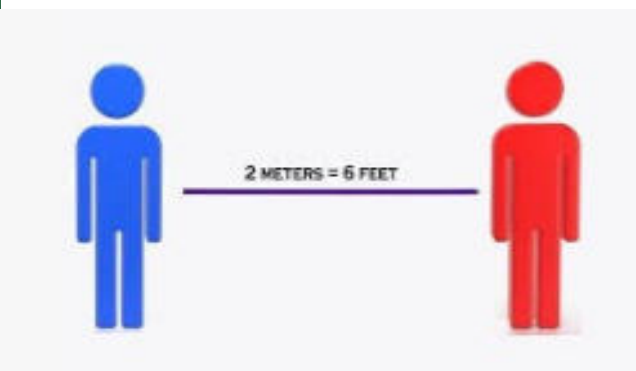
PIU and PMU should oversee the arrangements to effectively deal with the eventuality.

EHS officer of contractor should visit each site and camps more frequently. Contractor/EHS officer will also impart training on safe working methods during Monsoon and will keep a daily watch on weather conditions to share with site team to act accordingly.

Contractor should organize Monsoon Health Camps and Monitor Workmen Habitat and Hygiene.

**Appendix 22: SOP – for COVID-19 Management by JSV**

Stop the SPREAD of COVID-19



## 1. INTRODUCTION

- ▶ This document is meant to supplement Health and Safety (H&S) policies, procedures and plans for the Himachal Pradesh Rural Drinking Water Improvement and Livelihood Project.
- ▶ The project requirement will have modified requirement to have a COVID-19 Officer<sup>41</sup> at the Contractor's worksite (appointed by Contractor and agreed by PIU) submit a written daily report to the Client's Representative (Project Manager, PIU). The COVID-19 Officer shall certify that the Contractor and all subcontractors are in full compliance with these guidelines.
- ▶ The COVID-19 officer should always be present on site.
- ▶ Any issue of non-compliance with these guidelines shall be a basis for the suspension of work. The Contractor will be required to submit a corrective action plan (on the next day or immediately as per the nature of issue) detailing each issue of non-conformance and a plan to rectify the issue(s). The Contractor will not be allowed to resume work until the plan is approved by the Client (PMU). Any additional issues of non-conformance may be subject to action against the Contractor as health & safety/safeguard clauses of the contract.
- ▶ Construction sites operating during the Covid-19 pandemic need to ensure they are protecting their workforce and minimizing the risk of spread of infection.
- ▶ This guidance is intended to introduce consistent measures on sites of all scale in conformity with the Government's recommendations on social distancing as well as to conform to ADB's safeguard requirements.
- ▶ These are exceptional circumstances and the industry must remain abreast of and comply with the latest Government advice on COVID-19 at all times.
- ▶ The health and safety requirements of any construction activity must also not be compromised at this time. If an activity cannot be undertaken safely due to a lack of suitably qualified personnel being available or social distancing being implemented, it should not take place. However, prior approval of PIU/PMU shall be mandatory in such a case.
- ▶ It is to be noted that emergency services are also under great pressure and may not be in a position to respond as quickly as usual.
- ▶ Sites should remind the workforce at every opportunity about the Worksite Procedures

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<sup>41</sup> The safeguard officer or health & safety officer or Supervisor of the contractor can be designated as COVID-19 Officer by undergoing the training available at: -

- (a) <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/training/online-training>
- (b) <https://openwho.org/courses/eprotect-acute-respiratory-infections>
- (c) <https://openwho.org/courses/COVID-19-IPC-EN>



which are aimed at protecting them, their colleagues, their families and the Himachal population. If a worksite is not consistently implementing the measures in this document, it may be required to shut down.

## 2. PRINCIPLES OF WORKER PROTECTION

- ▶ Consistently practice social distancing;
- ▶ Cover coughs and sneezes;
- ▶ Maintain hand hygiene;
- ▶ Clean surfaces (e.g. desks, tables and door handles) and objects (e.g. telephone, keyboards, mobiles) with disinfectant frequently.

## 3. MAXIMUM PRECAUTION FOR PERSONS/LABOURERS REPORTING TO WORK

- ▶ If any person/worker has even mild cough or low-grade fever (i.e. temperature of 37.3C or more) ask him to stay at Home and self-isolate.
- ▶ A worker/staff/employee of the contractor showing any symptoms of COVID-19 (dry cough, fever, malaise) should be sent to the nearest hospital/clinic/quarantine facility identified for the purpose in consultation with the local administration/health authorities.
- ▶ Contractor to provide face masks (three layered medical masks for use to protect persons from COVID-19) to all persons working in or visiting the worksite. This along with procedures set out in this document is always for maximum precaution to protect all persons/laborer's working at site.

## 4. COVID-19 TYPICAL SYMPTOMS

- ▶ Fever;
- ▶ Cough;
- ▶ Shortness of Breath;
- ▶ Sore Throat.

All persons at the worksite should have their temperature screened by COVID-19 officer with Infrared Thermometer (handheld non-contact)

Prior to starting a work (on daily basis), each labour /worker will self-attest to the supervisor:

- ▶ No signs of COVID-19 symptoms within the past 24 hours;
- ▶ No contact with an individual diagnosed with COVID-19. (contact means living with a positive person, being within 6 feet of positive person OR sharing things with positive person)
- ▶ Not undergone quarantine or isolation (in case of any laborer /worker who has been quarantined or isolated previously, the engagement shall be only after quarantine period has been completed) (*Specimen copy of COVID-19 self-declaration form is attached as Annexure-C*).

The engagement of workers falling in the high-risk category such as workers over the age of 55 years, with underlying medical conditions or health issues, etc. should be done only after obtaining the requisite clearance from trained and registered medical practitioners.

The self-attestation would be verified in collaboration with trained and registered medical practitioners available at site and through discussions with laborers /workers and/or preliminary checks such as temperature checks, etc. prior to their engagement at site.

In addition, the Contractor shall mandatorily follow all medical test requirements for the workers prior to their engagement and/or mobilization at site as per the guidelines issued by the Central and State government agencies and WHO from time to time.

Persons/Labourers showing COVID-19 symptoms or not providing self-attestation shall be directed to leave the work site and report to the nearest Dedicated COVID Care Centres (DCCC), Dedicated COVID Health Centre (DCHC) and Dedicated COVID Hospital (DCH) as notified vide Office Order NO. HFW-H(COVID-19)DCCC, DCHC & DCH dated 04<sup>th</sup> May 2020 of Health & Family Welfare Deptt, Govt. of Himachal Pradesh /quarantine Centre immediately. Labour not to return to the work site until cleared by the DCCC/DCHC/DCH/quarantine Centre.

## 6. GENERAL DIRECTIONS

- ▶ No handshake, Only Namaste;
- ▶ Non-essential physical work that requires close contact between workers should not be carried out;
- ▶ Work requiring physical contact should not be carried out;
- ▶ Plan all other works to minimize contact between workers;

- ▶ Wash hands often (every 1-2 hrs or frequently as possible) with soap for at least 20 seconds;
- ▶ Use hand sanitizer;
- ▶ No person should enter the work site other than the authorized persons mentioned by supervisor during working hours;
- ▶ All must implement social distancing by maintaining a minimum distance of 6-feet from others<sup>42</sup> at all times to eliminate the potential of cross contamination;
- ▶ Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing i.e., 6 feet from others;
- ▶ Conduct all meetings via conference calls, if possible. Do not convene meetings of more than 10 people. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussion;
- ▶ All individual work group meetings/ talks should follow social distancing;
- ▶ At each job briefing /toolbox talk, employees are asked if they are experiencing any symptoms, and are sent home if they report any symptoms;
- ▶ Each worksite should have laminated COVID-19 safety guidelines and handwashing instructions, put as a notice at a prominent place at site;
- ▶ All restroom /toilet facilities should be cleaned (minimum twice a day), and handwashing facility must be provided with soap, hand sanitizer and paper towels;
- ▶ All surfaces should be regularly cleaned, including mobiles, tabletops/surfaces, door handles, laptops, records, etc.;
- ▶ All common areas and meeting areas are to be regularly cleaned (minimum twice a day) and disinfected at least twice a day;
- ▶ All persons to maintain their own water bottle and should not be shared;
- ▶ To avoid external contamination, it is recommended everyone brings food from home;
- ▶ Please maintain Social Distancing during breaks and lunch;
- ▶ Cover coughing or sneezing with a tissue, then throw the tissue in the trash and wash hands. If no tissue is available, then cough/sneeze into your upper sleeves or flex elbow. Do not cough or sneeze into your hands;
- ▶ Clean your hands after coughing or sneezing thoroughly by using soap and water

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<sup>42</sup> Social distancing may not be practical for undertaking certain specific activities within the workplace. It is, therefore, important to review the work method statements for these types of activities to assess impact and how to find safe ways of doing it in line with best available guidance.

(minimum for 20 seconds). If soap and water are not available;

- ▶ The Contractor shall ensure adequate quantities of sanitizer and soap are made available at all locations including site offices, meeting rooms, corridors, washrooms/toilets, etc. as appropriate;
- ▶ Avoid touching eyes, nose, and mouth with your hands;
- ▶ To avoid sharing germs, please clean up after yourself. Do not make others responsible for moving, unpacking and packing up your personal belongings;
- ▶ If you or a family member is feeling ill, stay home;<sup>43</sup>
- ▶ Work schedules are adjusted to provide time for proper cleaning and disinfecting as required;
- ▶ Most importantly, the employees/ workers may be advised not to spread/believe in rumors or create panic;
- ▶ They may also be advised not to spit in working areas or public places;
- ▶ Use of Gutka should be banned at the work site/premises.

## 7. PREVENTION PRACTICES

### a) At Worksite

- ▶ At the start of each shift, confirm with all employees that they are healthy and fit to resume their work;
- ▶ Outside person(s) should be strictly prohibited at worksite;
- ▶ All construction workers will be required to wear cut-resistant gloves or its equivalent.
- ▶ Before the start of work, all Tools and Appliances should be sanitized;
- ▶ Use of eye protection (reusable safety goggles/face shields) is recommended. The supply of eye protection equipment to the workers is considered as a standard part of PPE during construction works;
- ▶ In work conditions where social distancing is impossible to achieve, the employees shall be supplied with standard face mask, gloves, and eye protection;
- ▶ All employees shall drive to work site in a single occupant vehicle. Staff shall not ride together

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<sup>43</sup> The workers with no sick-leave would be supported with additional leave while affected by COVID-19 by the Contractor. The workers who must stay home because of COVID-19 affected family member(s), the Contractor shall pay for the days for staying away from the work

in the same vehicle;

- ▶ When entering a machine or vehicle which you are not sure you were the last person to enter, make sure that you wipe down the interior and door handles with disinfectant (with 1% sodium hypochlorite solution daily) prior to entry. Adequate quantity of the disinfectant shall be provided by the Contractor at all such site-specific locations;
- ▶ Workers should maintain separation of 6 feet from each other;
- ▶ Multi person activities will be limited where feasible (two persons lifting activities);
- ▶ Gathering places on the site such as sheds and/or break areas will be eliminated, and instead small break areas will be used with seating limited to ensure social distancing;
- ▶ Contact the cleaning person of the worksite and ensure proper COVID-19 sanitation processes. Increase cleaning/disinfection visits to at least 2 times a day. Cleaning person(s) to be provided with gloves, gown and face mask for each cycle of cleaning. The Contractor shall make available adequate supply of cleaning material and disinfectant chemicals while the threat of COVID-19 continues;
- ▶ Clean all high contact surfaces a minimum of twice a day in order to minimize the spread of germs in areas that people touch frequently. This includes but is not limited to furniture, electrical, electronic equipment's and vehicles, etc. All the employees be encouraged to maintain good health by getting adequate sleep; eating a balanced and healthy diet, avoiding alcohol and by consuming plenty of fluids;
- ▶ Continuation of works in construction project with workers available on- site shall be encouraged;
- ▶ The site offices shall have adequate ventilation. The air conditioning or ventilation systems installed at the site offices should have high- efficiency air filters to reduce the risk of infection. The frequency of air changes may be increased for areas where close personal proximity cannot be fully prevented such as control rooms, elevators, waiting rooms, etc.;
- ▶ The Contractor shall carry out contactless temperature checks of the workers prior to entering the site, during working hours and after site works to identify persons showing signs of being unwell with the COVID-19 symptoms;
- ▶ The Contractor shall also ensure that the Project sites situated in the border areas of Himachal Pradesh, the employees and workers do not commute from the neighboring states without requisite permission from relevant authorities.

#### b) Washing Facility

- ▶ All worksites should have access to toilet and hand washing facility;
- ▶ Providing hand cleaning facilities at entrances and exits;
- ▶ There should be soap and water wherever possible or hand sanitizer if water is not available;
- ▶ Washing facility with hot water, and soap also at other water sources to be used for frequent hand washing for all onsite employees;
- ▶ All onsite workers must help to maintain and keep their working sites clean;
- ▶ If a worker notices soap or towels are running low or out, he/she should immediately notify supervisor(s);
- ▶ Proactively supervisor should make sure that shortage situation never occurs;
- ▶ Garbage bins will be placed next to the hand wash facility for discarding used tissues/towels with regular removal and disposal facility (at the end of each day).

#### c) Cleaning Procedures

Increase cleaning/disinfection at least two times a day.

Persons engaged in cleaning be provided with gloves, gown and face mask for each cycle of cleaning.

Each worksite including sheds, gates, equipment, vehicles, etc. should have enhanced cleaning and disinfection procedures that are posted and shared. These shall be posted at all entry points to the sites, and throughout the project site. These include common areas and high touch points like

- ▶ Taps and washing facilities;
- ▶ Toilet flush and seats;
- ▶ Door handles and push plates;
- ▶ Handrails on staircases and corridors;
- ▶ Lift and hoist controls;
- ▶ Machinery and equipment controls;
- ▶ Food preparation and eating surfaces;
- ▶ Telephone equipment / mobiles;
- ▶ Electrical and electronic equipment;
- ▶ Keyboards, photocopiers and other office equipment;

- ▶ Re-usable PPE should be thoroughly cleaned after use and not shared amongst the workers.

## 8. LABOUR CAMPS

Contractor shall follow a zero-tolerance policy on wearing of masks.

Masks to be provided to all the persons/labourers for use at the camp site as well as at the worksite. Increase cleaning/disinfection visits to at least 2 times a day. Persons engaged in cleaning to be provided with disposable gloves, gown and face mask for each cycle of cleaning.

### 8.1 Toilet Facility

- ▶ Restrict the number of people using toilet facility at any one time e.g. appoint one welfare attendant among the laborers;
- ▶ Wash hands before and after using the common facilities;
- ▶ Enhance the cleaning regimes for toilet facilities particularly door handles, locks and the toilet flush;
- ▶ Portable toilets should be avoided wherever possible, but where in use these should be cleaned and emptied more frequently;
- ▶ Provide suitable and enough trash bins for hand towels with regular removal and disposal.

### 8.2 Eating/Snacks Arrangements

- ▶ With eateries having been closed (restricted) across Himachal, providing permanent (till society is safe from COVID-19) on-camp/off-camp cook/helpers can be implemented. Make sure that the “Guidelines for Food Hygiene and Safety during COVID-19” issued by Food Safety and Standard Authority of India (FSSAI)<sup>44</sup> and its regular updates are being followed;
- ▶ Whilst there is a requirement for construction camps to provide a means of heating food and making hot water, these are exceptional circumstances and where it is not possible to introduce a means of keeping equipment clean between use, etc. must be removed from use;
- ▶ Dedicated eating areas should be identified at campsites to reduce food waste and contamination;
- ▶ Break times should be staggered to reduce contact, congestion always;
- ▶ Hand cleaning facilities or hand sanitizer should be available at the entrance of the room

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<sup>44</sup> FSSI guidelines can be downloaded from [www.fssai.gov.in](http://www.fssai.gov.in)



where people eat, and it should be used by workers when entering and leaving the area;

- ▶ Workers should sit 2 meters (6 feet) apart from each other whilst eating and should avoid all contact;
- ▶ Where catering is provided at camp site, it should provide pre-prepared and wrapped food only;
- ▶ Payments should be taken by contactless options wherever possible;
- ▶ Crockery, eating utensils, cups, etc. should be avoided wherever possible;
- ▶ Taps for drinking water should be provided with such mechanism that contact of hand is minimized (taps with long handle);
- ▶ Eating tables should be cleaned between each use;
- ▶ All rubbish should be put straight in the bin and not left for someone else to clear up; only covered pedal operated bins should be used and the bins should be cleaned regularly, with strict adherence to safety protocols for disposal and of maintenance of hygiene (including proper PPE's such as gloves, mask and apron worn by the waste handler/cleaner and disposal at a designated place);
- ▶ All areas used for eating must be thoroughly cleaned at the end of each break and shift, including chairs, door handles, etc.

### 8.3 Changing Facilities, Showers and Drying Areas

- ▶ Introduce staggered start and finish times to reduce contact, congestion always;
- ▶ Introduce enhanced cleaning of all facilities throughout the day and at the end of each day;
- ▶ Consider increasing the number or size of facilities available on camp if possible;
- ▶ Based on the size of each facility, determine how many people can use it at any one time to maintain two meters;
- ▶ Provide suitable and enough garbage bins in these areas with regular removal and disposal;
- ▶ Visitor logbook with record of thermal screening should be strictly maintained at the labour camps.

COVID-19 officer will always ensure compliance of preventive measures at the labour camps.

## 9.UPDATES ON COVID-19

The Contractor shall be in touch with the Department of Health & Family Welfare and Labour Department to identify any potential worksite exposures relating to COVID-19, including:

- ▶ Strictly follow the guidelines issued by Ministry of health, Govt. of India;
- ▶ Workers, vendors, inspectors, or visitors to the worksite with close contact to the individual;
- ▶ Labour Camps / Work areas such as designated workstations or rooms/sheds;
- ▶ Work tools and equipment;
- ▶ Common areas such as break rooms, tables and sanitary facilities.

Also refer the following websites from time to time for regular updates.

<https://www.mohfw.gov.in/>

<https://covidportal.hp.gov.in>

This document shall be updated from time to time based on the advisories or directions of the Govt.

## 10. TRAINING

- ▶ The representative of PMU/PIU to ensure all workers get training on above requirements before start of any construction activity after lockdown;
- ▶ During construction period frequent visual and verbal reminders to workers can improve compliance with hand hygiene practices and thus reduce rates of infection. Handwashing posters should also be displayed at work site and labour camps.

## 11. EMERGENCY CONTACT

- ▶ Provide emergency contact number(s) at work site and labour camp for reporting COVID-19 symptoms.

In case of any COVID-19 related emergency, please contact at the following helpline numbers:

- (i) Toll Free Helpline (COVID-19)-104;
- (ii) State Control Room (COVID-19)-1070;
- (iii) District Control Room (COVID-19)-1077 (Every district).

Ensure all staff uses the Aarogya Setu app (can be downloaded from Play Store), recommended by Govt. of India for tracking COVID-19 patients. In case a person does not have a smart phone, the use of Aarogya Setu IVRS (toll-free number 1921) facility shall be used.

"Relaxation is only given by Govt.

-Corona hasn't given relaxation"

**LIST OF DCCC/DCHC and DCH in Himachal Pradesh**

Sr. No	District	Dedicated Covid Care Centres (DCCC)	Dedicated Covid Health Centre (DCHC)	Dedicated Hospital (DCH)
1	Bilaspur	a) Shiva Engineering College (Boys Hostel) Chandpur, Nodal Officer- Dr.S.L.Verma, Mob-9418029652, Bed-100 b) Matri Anchal Sadan, Shri Naina Deviji Nodal Officer - Dr. Y.R.Ravi, Mob.9805447782, Bed-22	CH Ghumarwin, Nodal Officer Dr.Abhineet Sharma, Mob 9418070166, Beds-50	SLBSGMC Ner Chowk, Nodal Officer Dr. Devinder Kumar Sharma, Mob-9418106555 Beds-118
2	Chamba	a) District Ayurvedic Hospital, Balu, Chamba Nodal Officer-Dr. Man Singh, Mob-9418134994, Bed-20 b) Tribal Bhawan, Balu, Chamba, Nodal Officer- Dr.Karan Hiteshi, Mob-8219325633, Bed-70	CH Dalhosie, Nodal Officer- Dr. Vipin Thakur, Mob-7018188305, Beds-50	ZH Dharamshala, Nodal Officer Dr.Dinesh Mahajan Mob-9418122474, Beds-60
3	Hamirpur	Sai Marriage Palace, VPO Dugha, Near Bye Pass Hamirpur. Nodal Officer- Dr.R.K.Agnihotri, Mob 94180-96541, Bed-50	Charitable Hospital, Bhota Nodal Officer, Dr.Anil Verma, Mob- 9418245047, Beds-50	SLBSGMC Ner Chowk, Nodal Officer Dr. Devinder Kumar Sharma, Mob-9418106555 Beds-118
4	Kangra	a) Aggarwal Trust Dharamshala, Nodal Officer- Dr. Praveen Kumar, Mob-9418961025, Bed-50 Jawalamukhi. b) Panchayati Raj Training Institute, Baijnath, Nodal Officer- Dr.DilAwar Singh, BMO Mahakal, Mob 94180-93491, Bed-50 c) Water Sports Complex, Pongdam, Nodal Officer- Dr.Ranjan Mehta, Mob-98163-20163, Bed-100	ZH Dharamshala, Nodal Officer Dr.Dinesh Mahajan, Mob-9418122474, Beds-60.	ZH Dharamshala, Nodal Officer Dr.Dinesh Mahajan Mob-9418122474, Beds-60
5	Kinnaur	Sarai Bhawan, Recong Peo, Nodal Officer- Dr.Raj Kumar Negi, Mob- 7018939408, Beds Available-20	CHC Bhawanagar, Nodal Officer, Dr. Bharamjeet, Mob- 9418885097 Beds-16	DDUH Shimla, Nodal Officer Dr.Lokinder Sharma, Mob-94184-83962, Beds- 30
6	Kullu	a) District Ayurvedic Hospital, Kullu, Nodal Officer-Dr.Vikas Dogra, Mob-8091778010, Beds-20 b) Gurudawara, Akhara Bazar, Kullu, Nodal Officer- Dr. Hemant Kumar, Mob-7650002069, Bed-50	CH Tegubehar Nodal Officer, Dr.Sapna Sharma, Mob-7832088966 Beds:- 35	SLBSGMC Ner Chowk, Nodal Officer Dr. Devinder Kumar Sharma, Mob-9418106555 Beds-118
7	Mandi	a) Abhilashi Ayurvedic College, Chailechowk, Nodal Officer - Dr. Lalit Gautam, Mob-8219498913, Beds-60. b) IPH Training Centre, Chhipnu, Nodal Officer - Dr.Rajneesh, Mob-9418071766, Beds-50	SLBSGMC Ner Chowk, Nodal Officer Dr. Devinder Kumar Sharma, Mob-9418106555 Beds-50	SLBSGMC Ner Chowk, Nodal Officer Dr. Devinder Kumar Sharma, Mob-9418106555 Beds-118

8	Shimla	<p>a) New Wing CH Rohroo, Nodal Officer-Dr. Keshav Mob-9418468879, Beds-75</p> <p>b) State Institute of Educational Management &amp; Shamlaghat, Nodal Officer- Dr. Tanvi, Mob-8219735768, Beds-40</p> <p>c) PRTI Mashobra, Nodal Officer- Dr.Rakesh Goyal, Mob-9816289832, Beds-16</p> <p>d) State Agriculture Management &amp; Extension Training Institute, Mashobra, Nodal Officer -Dr.Rakesh Goyal, Mob-9816289832, Beds-28</p>	DDUH Shimla, Nodal Officer Dr.Lokinder Sharma, Mob-94184-83962, Bed-60	DDUH Shimla, Nodal Officer Dr.Lokinder Sharma, Mob-94184-83962 Beds-30*
9	Sirmaur	Yatri Niwas Trilokpur, Nodal Officer- Dr.Monisha Aggarwal, Mob-9418000306, Beds-100	CH Sarahan, Nodal Officer, Dr.Lavinder Kumar, Mob-94180- 44316, Bed-50	MMMCH Kumarhatti . Nodal Officer Dr. N.K.Gupta, Mob-98160-93746, Beds-30
10	Solan	<p>a) Labour Hostel Ramshehar Road Nalagarh, Nodal Officer- Dr.K.D.Jassal, Mob-9418142327, Bed-48</p> <p>b) Farmer's Hostel Dr.YSP UHF Nauni. Nodal Officer- Dr.Mukta Rastogi, Mob-9418456565 , Bed-104</p> <p>c) Old Private School, Vill Devnagar, Bathalag, Arki, Nodal Officer-Dr.Radha, Mob-9418825340, Bed-50</p>	ESI Model Hospital, Katha Nodal Officer, Dr.Anil Arora. Mob-9888237750, Beds:-54	MMMCH Kumarhatti . Nodal Officer Dr. N.K.Gupta, Mob-98160-93746, Beds-30
11	Una	<p>a) Skill Development Centre, Palkawah, Nodal Officer - Dr. Sanjeev Kumar, Mob- 7018429714, Beds-100</p> <p>b) Multipurpose Bhawan, Khad. Nodal Officer- Dr.Rajesh Kumar, Mob.8627849500, Bed-70</p>	CH Haroli, Nodal Officer Dr.Singara Singh, Mob- 9418455418, Bed-30	ZH Dharamshala, Nodal Officer Dr.Dinesh Mahajan Mob-9418122474, Beds-60

Director Health Services  
Himachal Pradesh

**DISTRICT -WISE CONTACT NUMBER OF EMERGENCY OPERATION CENTERS FOR COVID-19**

<b>S. No</b>	<b>District Name</b>	<b>Contact Number</b>
1	Bilaspur	01978-224901
2	Chamba	01899-226951
3	Hamirpur	01972-221277
4	Kangra	01892-229050
6	Kullu	01902-225630
8	Mandi	01905-226201
9	Shimla	0177-2800880
10	Sirmour	01702-226401
11	Solan	01792-220882
12	Una	01975-225045

**Annexure-C****COVID-19 Self-Declaration**

Please answer the following questions:

<b>Description</b>	<b>Yes</b>	<b>No</b>
Have you or has anyone you come into close contact with currently or in the last 14 days felt unwell, experienced any cold or flu-like symptoms such as a high temperature (at least 38 degrees C, 100 F), fever, coughing, sneezing, runny nose, sore throat, or had difficulty		
Have you been or has anyone you come into close contact with confirmed as having COVID-19 (Coronavirus)?		
Have you recently returned from overseas travel (28-45 days)		
Are you a healthcare worker and examined a COVID-19 confirmed case without protective gear		
Have you been in close contact with a person who has recently returned from overseas travel?		
Do you have a respiratory or a heart condition, high blood pressure, kidney problems or diabetes?		
I am and will continue to observe all the requirements of the lockdown as outlined by the Government		

I, ( ) from ( ) declare that I have answered the above questions truthfully and to the best of my knowledge and I will inform the authorities immediately of any changes to the above statements.

Signed:

Dated:

Countersigned by:

Contractors Representative

PDMSC/PIU Representative



### A. Google Imagery of proposed Water Treatment Plants

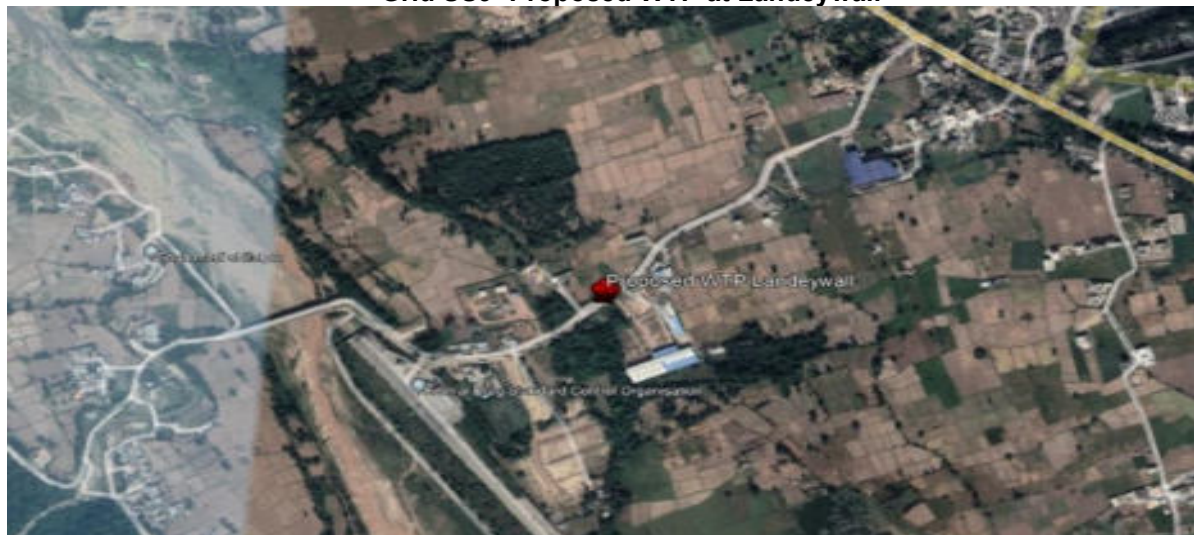
Grid SS1- Proposed Water Treatment Plant (WTP) at Kotla Barog Village



Grid SS9- Proposed WTP at Dumanwala



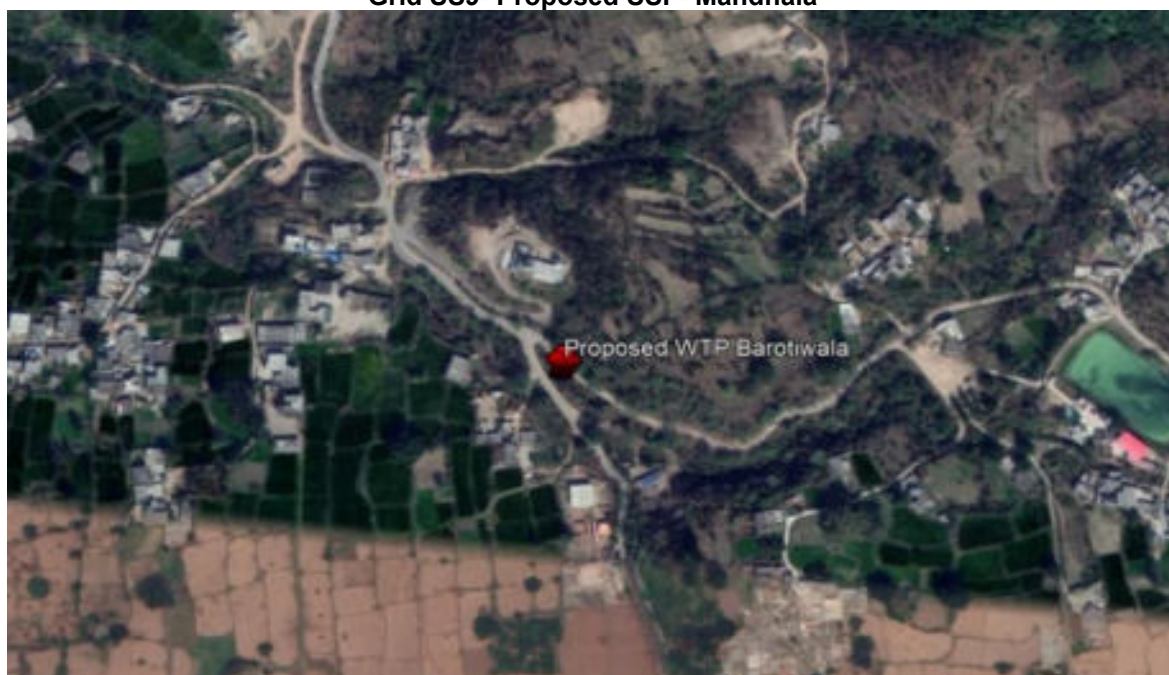
Grid SS9- Proposed WTP at Landeywall



**Grid SS9- Proposed WTP at Amroo Bawasni**



**Grid SS9- Proposed SSF- Mandhala**





### B. Google Earth Maps of Indicative proposed pipe alignment in Major Roads- SH/NH

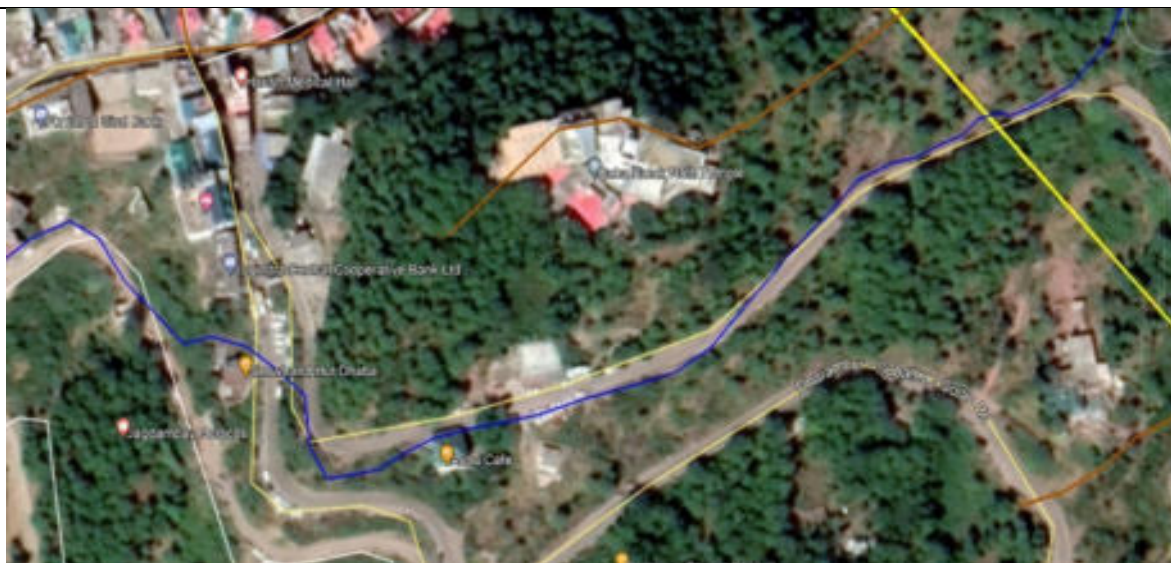
**SS1: Proposed Rising Main on State Highway 6 from Pump house near Proposed WTP at Giri River to Proposed Sump well Stage-2 Bigad, (200 mm)**



**SS1: Prop Rising Main from PH Dharampur to MBR Kasauli on National Highway 22 (200mm)**



**SS1: Proposed Gravity Main from MBR Kasauli to SR Moti kona on State Highway 10 (50MM – 150MM)**



**SS1: Proposed Distribution Network on SH6 near Hillock Guest House (25MM- 125MM)**



**SS1: Proposed Gravity Main on State Highway 6 from from MBR Kasauli to MBR Jhanger, (50 -150 mm)**





**SS1: Distribution Network on State Highway 6 Dharampur Subathu Solan Road, (25mm – 125mm)**



**SS9: Proposed Rising Main on State Highway 9 from From Source T/Well at Barotiwal To SR Damuwala-2, (50 mm)**



**SS9: Proposed Distribution network on State Highway, (25-125mm)**



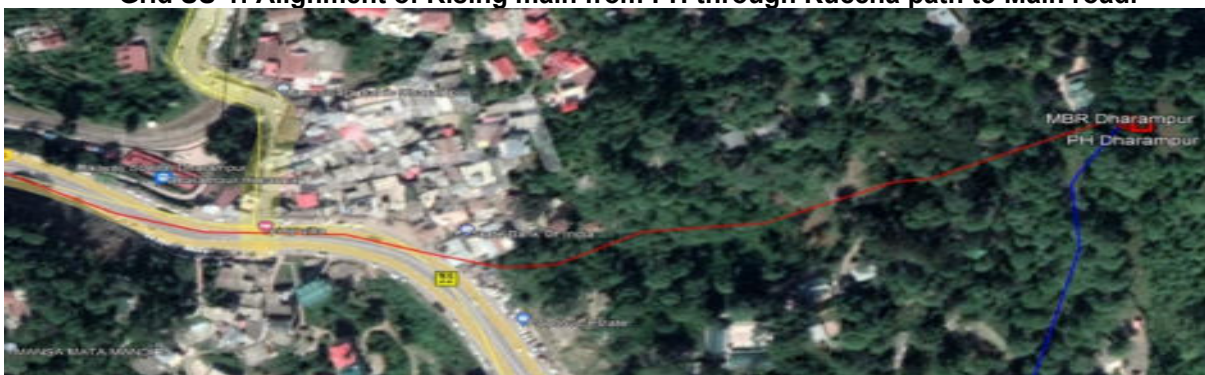


### C. Pipeline Alignments at Various Locations

#### Grid SS-1: Rising Main alignment



**Grid SS-1: Alignment of Rising main from PH through Kuccha path to Main road.**



**Grid SS 1: Alignment of Distribution Network through Kaccha pathways and Junctions**



**Grid SS 1: Alignment of Gravity Main from Source along with forest trails/ water stream**





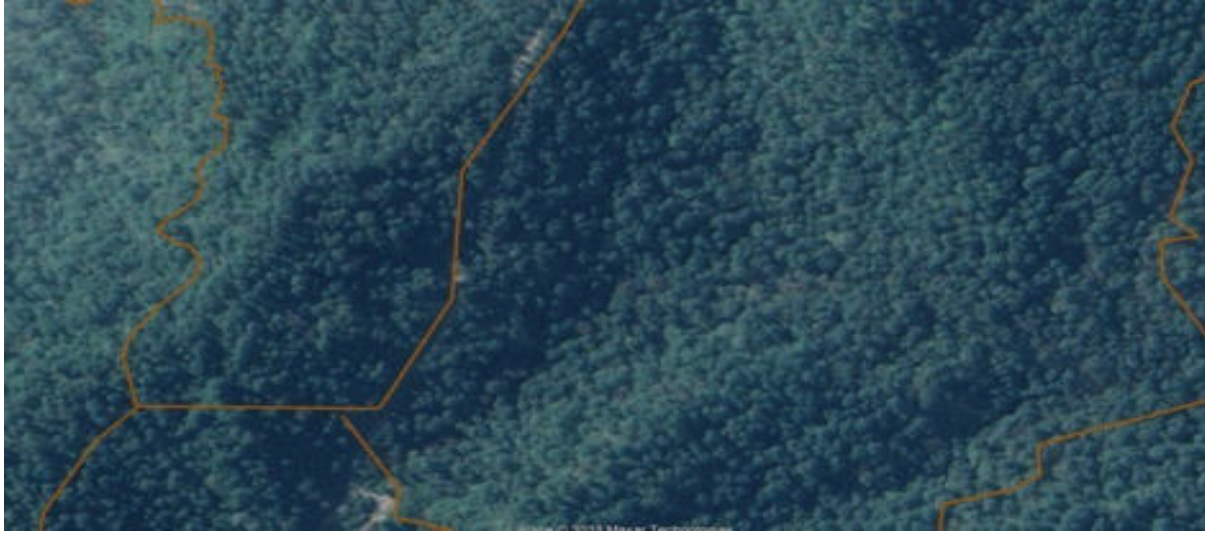
**Grid SS9: Indicative Alignment of Gravity Main crossing canal via bridge from WTP**



**Grid SS 9: Indicative Water Distribution Network through internal village roads**



**Grid SS 9: Indicative Distribution Network through internal Forest Trails at various junction points**





#### D. Market Place Analysis with Google Earth Images and Site Photographs

1.SS-1 : Indicative alignments of Distribution Network at Market Place in Village Banyad (40-65 mm)



**2. SS-1 :Indicative Alignments of Gravity Main (80-100 mm) and Distribution Network at Market Place near Attri Tent House (50 mm)**





**3. SS-1: Indicative Alignments of Distribution Network and Gravity Main at Market Place near Gram Panchayat office Chamian near. (40-50mm)**

