

Updated Environment Management Framework



Executive Summary

December 2014

Department of Water Supply and Sanitation, Punjab

Executive Summary

The Government of Punjab (GoP) has prioritized RWSS as a key area of its development agenda. Over the past few years, significant capital allocations to the RWSS sector (about US \$ 50 to \$ 55 million annually or 2.5% of the total outlay) have been made, which indicates the high priority accorded to the sector. Government of India too supports the RWSS sector reforms and provides significant financial assistance to Punjab through its centrally sponsored programs such as NRDWP, TSC and NBA now SBM (Swachh Bharat Mission). More than 83% of the villages currently receive a basic service level of 40 lpcd water through public water schemes. Another 15% villages have piped water supply schemes but with service level less than 40 lpcd and the remaining 1-2% villages do not have access to any public water system. Water quality in about 35% of villages is affected by fluoride, salinity, iron, heavy metals, pesticides or uranium. About 75% households have latrines and 90% of the household members use it on regular basis. Drainage facility is available in 95% habitations. Sewerage systems are also being implemented in 98 villages on pilot basis. Despite these efforts, several issues related to Water supply and Sanitation are on hand to be tackled.

Earlier DWSS (Department of Water Supply & Sanitation) was providing new schemes with limited or no participation of the end users in decision making or service management. Thus, those institutional, operational and financing arrangements presented constraints and challenges in achieving service improvements or ensuring long term sustainability. With high O&M costs and low O&M cost recovery from the users, the water supply systems were becoming unsustainable. As a result, in the year 2006, GoP thought of taking a step ahead under good governance initiatives to involve the community in capital cost sharing, planning, construction and operation & maintenance of the RWSS infrastructure. Since the sector needed significant improvements in the quality of rural water and sanitation service delivery requiring both additional investments and reforms, the RWSS program was taken up with the support of World Bank by adopting Sector Wide Approach (SWAp).

Now, GoP intends to scale up and consolidate the gains of the first project and progressively raise the water supply and community sanitation service standards and also raise the coverage of high standards by seeking The World Bank assistance for the PRWSS II project with estimated cost of INR 2200 crores. The PRWSS II Program will be implemented in the rural areas of all the 22 districts of Punjab State. Selection of villages in the project will be made by adopting a self-selection process, a pre-requisite of demand-responsive development. In this background, GoP intends to undertake Environmental and Social Assessment Studies for PRWSS II project.

Key Objectives of Environmental Assessment

To conduct Environmental Analysis (EA) with a view to identify the critical environmental concerns in the RWSS sector and address them as an integral part of project design.

The following specific objectives would contribute to the above stated key objective:

- Identify and assess the environmental issues related to the water supply, sanitation and sewerage, surface and ground water pollution etc.
- To assess existing status of environment in the state and identify threats and issues
- Identification of environmental issues associated with implementation of individual RWSS schemes and developing environmental codes of practices that need to be followed during various stages of the prospective project.
- Identifying generic environmental issues which are beyond the scope if individual RWSS schemes, but related to the sector and recommend remedial measures to address the issues as part of the project,
- Updation of Environmental Management Framework including environmental management, monitoring plans, and environmental codes of practices to adequately

address the issues and enhancement of the positive environmental impacts of various tasks and activities under the proposed project.

- Environmental Management Framework including well-defined performance indicators for addressing the identified issues, and strategy for implementation of various activities / tasks under the proposed project to achieve sustainable sources for water supply and environmental sanitation benefits

M/s. Mott MacDonald Pvt. Ltd. has been assigned the Environmental Assessment (EA) study, with a mandate to identify the critical environmental concerns in the RWSS sector related to single village and multi village schemes involving water treatment plants, sanitation facilities and sewerage schemes including sewage treatment plants and to put forth a mechanism to address these issues, by preparing Updated Environmental Management Framework (EMF).

The proposed 2nd RWSS project is to provide good water quality and better sanitation facilities in the rural areas of 22 districts of the Punjab. For the identified environmental impacts for the project, environmental monitoring and supervision will be undertaken based on the key environmental issues associated with such type of work.

The assignment will provide the client with clear understanding of the prevailing and expected environmental issues and their probable causes, which have to be considered while preparing and implementing the RWSS schemes. Environmental Codes of Practices will be prepared, which need to be followed during various stages such as planning, design, construction and operation and maintenance of the proposed RWSS schemes.

The Updated Environmental Management Framework (EMF) will provide the client, with well-defined performance indicators for addressing the identified issues, through various activities/task under the proposed project, and strategy for its implementation to achieve sustainable sources for water supply and sanitation benefits within the proposed project districts.

Existing EMFs

A Sector Environment Assessment (SEA) including preparation of Environmental Management Framework (EMF) was carried out by Feedback Venture Group in 2006 for the proposed water supply schemes to be executed under PRWSSP. Key environmental issues identified during the study are Water Availability, Water quality (Canal water and Ground water), and Environmental Sanitation.

Subsequently, in 2010, M/s. Consulting Engineers Services (India) Private Limited (CES) were appointed as consultant by the SPMC to assist in implementation of PRWSS project and to prepare an updated EMF in light of the proposed sewerage schemes. The main objective of that study was to update the key environmental issues, key elements of the EMF, development of ECoPs, Environmental screening, monitoring and evaluation and development of responsibility matrix.

Need for Updating the current Environmental Management Framework

Sector Environment Assessment (SEA) for PRWSS project was prepared by Feedback Turnkey Engineers in September 2006. The main focus of the report was water supply schemes. In 2010, Consulting Engineers Services updated the 1st EMF in the light of sewerage schemes. The present study includes updation of existing EMF on environmental issues in the context of PRWSS Project- II, including environmental sanitation and rain water harvesting techniques and its integration with water supply and sewerage schemes, proposed Institutional Arrangements, water quality monitoring, water and waste water sampling procedure, environmental concerns and management proposals, capacity building etc. In line with state policy, demand responsive approach, active involvement and participation of PRIs and beneficiary communities through all

stages of the project implementation and its sustained operation and maintenance will be the key features of this EMF.

In view of the limited awareness among the community/planners/engineers on environmental management issues; there is a need to devise an EMF for the environmental sustainable development of water supply schemes and sewerage schemes with proper disposal of solid and liquid waste. This EMF will be a ready reference for GPWSC and engineers/planners to carry out environmental screening of the project interventions, impact evaluation, and adopting the mitigation measures in the design stage itself. This will further help to reduce the intensity of impacts at planning stage as well as during implementation and post implementation phase of the project.

Policy, Legal and Administrative Framework

The State has Rural Water Supply and Sanitation Policy (2014) in line with the national policy on water and sanitation, which emphasizes participation by the PRIs. It lays emphasis on integration of water supply and sewerage system and environmental sanitation including personal hygiene with emphasis on institutional capacity building. The State Water Policy accords high priority for providing sustainable options for drinking water and sanitation schemes underscoring the need for regular programme of monitoring and for protection of water sources.

The proposed project will address all the issues of concern as laid down in the OP 4.01 of World Bank on EA/EMF. Though there are no specific clearances required from the Ministry of Environment, GOI, all the provisions in the various Central and State Acts listed in the Chapter 2 relevant in the context of the proposed project would be incorporated during the implementation of the project.

World Bank Safeguard Policies

The below table describes the relevant safe guard policies of the World Bank and discusses their applicability to the project.

Policy	Applicability to this project
OP/BP 4.01 Environmental Assessment	Applicable to this project. The EMF includes a detailed description of assessment procedures for each of the activities proposed under the project.
OP/BP 4.04 Natural Habitats	Not applicable. Since schemes to be taken up under the project would not convert or degrade natural habitats.
OP 4.09 – Pest Management	Not applicable. No activity will support use of pesticides or related activity, hence policy is not triggered.
OP 4.10 / BP 4.10 – Indigenous Peoples	Not applicable to the project. • No indigenous people in Punjab.
OP/BP 4.36 Forestry	Applicable to the project. • Some of the schemes taken up under the Project will be located in forest areas. Assessment procedures and mitigation measures have been put into place through the EMP in accordance with the approval of the

Forest Department and guidelines for compensatory afforestation.

- The most important natural habitats in Punjab are in Urban areas, not in rural areas. The state has a history of intensive agriculture for hundreds of years, and most landscapes were severely modified. There are areas which could be termed as sacred groves, but these are also areas that are not populated, and rural water supply do not come anywhere near any of these.
- The forest patches which exists in the state are legal forests, although not rich in bio-diversity – but necessitates recognition of the legal forest issues and rights.

The project will –in order of priority – first try to make the current sources and supplies more efficient; then might tap some additional ground water, and as the last resort try to tap some water from the irrigation canals (where water is fully allocated already) or seepage. The project does not intent to drain any river (even if the rivers could be termed as natural habitats).

OP/BP 7.50 – Projects on International Waterways

Applicable. The proposed project falls within the exception to the riparian notification requirement under Paragraph 7(a) of OP/BP 7.50.

BP 17.5 – Disclosure of Information

Applicable;

- Whenever the Bank requires an Environmental Assessment (EA), the proposed borrower prepares an EA report as a separate, free-standing document. The EA report is publicly available after the borrower has made the draft EA report available at a public place accessible to project affected groups and local NGOs in accordance with OP/BP 4.01.

Basis of Exception to OP 7.50:
Exception to Riparian Notification

As indicated at the outset, rural water supply, drainage and sanitation activities will be carried out in the watersheds of the Sutlej, Ravi and Beas rivers, or their tributaries, which are part of the Indus basin. With regard to ground water sources, this project will not finance any new bore wells as the state has achieved 100% water supply coverage already. All the villages in Punjab have water supply schemes. The project will result in a net reduction in ‘ground water extraction’ for drinking water in rural Punjab.

The project will finance activities aimed at improved efficiency and service delivery as described in the three components, including through the replacement of existing groundwater schemes with surface water supply. As shown in the table below, the state of Punjab already has an existing

scheme of canals and distributaries for surface water with a total stretch of approximately 14,500 km.

Sr. No	Name of the Canal	Length of Canal (km)	Capacity of Canal in Cusecs	Off-taking Point	Cultivable Area in Ha.
1	Sirhind Canal		12,620	Ropar Headwork	13.59 Lacs
2	Bhakra Main Line (Extension of Nangal Hydel Channel)	164	12,500	Nangal Barrage D/s of Bhakra Dam	
3	Narwana Branch	98	4500	Off-takes from Bhakra Main Line	
4	Bist Doab Canal	805	1452	Right bank of Sutlej river U/S of Ropar Headwork	1.99 Lacs
5	Upper Bari Doab Canal	3119	9000	Madhopur Head-works	5.73 Lacs
6	Rajasthan Feeder (Exclusively for Rajasthan)	149.53	18500	Harike Head-works	
7	Ferozepur Feeder	51.30	11192	Harike Head-works	
8	Sirhind Feeder	136.50	5264	Off-takes from Ferozepur feeder	3.6 Lacs
9	Eastern Canal	8.02	3197	Hussainiwala Head-works	2.16 Lacs
10	Makhu Canal	92.8	292	Harike Head-works	20,600
11	Shah Nehar Canal	24.23	875	D/s of Pong Dam	0.33

According to Indus Treaty (1960), all the waters of eastern rivers are for the unrestricted use of India and all the waters of western rivers are for the unrestricted use of Pakistan and the discharges in the rivers shall be regularly monitored by both the countries. For the supply of drinking water from surface water source based schemes, a feasibility study is being done and under this study, only eastern rivers with their extensive canal network, which are meant for the use of India, are only considered. The proposed project takes up the schemes formulated based on the surface water sources, i.e., the eastern rivers allocated for the use of India and the canals originating from the dams on these rivers (i.e., the Sutlej, the Beas and the Ravi) only. There will not be any interference with the waters in western rivers allocated for the use of Pakistan.

On the basis of a feasibility study that was conducted in six districts by the Drinking Water Supply and Sanitation Department of Government of Punjab, 20 schemes have been formulated covering 4005 villages. These will be supplied with drinking water from surface sources primarily, the Pong dam on the Beas River as well as a number of Headworks and dams on the

Sutlej River. In total, an ultimate water demand of 956.54 MLD is expected for the 4005 villages. This requirement of water works out to be approximately 0.45% of the identified surface water sources (rivers and canals), which is quite marginal and does not affect the current water requirement for irrigation or the downstream flows of the rivers. The Proposed project will consider some of the schemes conceived in the feasibility study on priority basis as per the need.

Taking into account the project's focus on improved efficiency and service delivery for already existing water supply and sanitation schemes in Punjab, it is the Team's assessment that the proposed activities will (i) not adversely change the quality or quantity of water flows to the other riparians, and (ii) will not be adversely affected by the other riparians' possible water use. Thus, the exception to the riparian notification requirement under paragraph 7(a) of OP 7.50 applies and no notification will be required.

Environmental Analysis

This covers the overview of the physical geography of the state, with special emphasis on water resources and sanitation amenities. This environmental baseline has been developed mainly on the basis of data collected through secondary sources, and has been supplemented by village level surveys of 6 representative sample villages. The physical, land use pattern, agriculture status, water resources environment are presented in the Chapter 3 for the study area along with issues pertaining to the existing conditions on water supply, sanitation, health and hygiene.

This section covers:

- Physical Environment (Location, Temperature, Precipitation)
- Drainage pattern (River system and Canals)
- Hydrology (Surface water, Ground water, Wetlands)
- Disasters (Floods, Droughts, Earthquake)
- Demographic status
- Land-use pattern and Land degradation
- Forests

Baseline Environmental Status

Water Supply

Surface Water

- Punjab, the name derived from the Persian words, Punj (five) and ab (water) is a land of five rivers which formed part of Indus basin till 1947. After partition of the country, India's right of usage was restricted to only three Eastern rivers namely Satluj, Ravi and Beas.
- The main canals from Satluj are Anandpur Hydrel Channel and Bhakhra Main Line (BML). BML further bifurcates into Narwana Branch and Bhakhra main branch.
- At Ropar Head-works two main canals, Sirhind canal and Bist Doab canal originate.
- At Harike Head-works, Satluj feeds water to Rajasthan feeder canal and Ferozepur feeder canal.
- The Bikaner canal originates at Hussainiwala Head works.
- Shah Nehar canal or Mukerian Hydrel channel originates from Shah Nehar Barrage on Beas river.
- From Ravi river, at Madhopur Head works, Upper Bari Doab canal off-takes.
- The total stretch of canals and distributaries including minors in Punjab is approximately 14,500 km.

Ground Water

- The annual Replenishable Ground Water Resource of the State has been estimated as 22.53 bcm and Net Annual Ground Water Availability is 20.32 bcm. The Annual Ground Water Draft is 34.88 bcm and stage of Ground Water Development (percentage of abstraction over availability) is 172%.
- Based on assessment, out of 138 blocks (Total 142 blocks of which 4 blocks status is not available), 110 blocks have been categorized as ‘Over-Exploited, 4 as ‘Critical’, 2 as ‘Semi-Critical, and 22 as ‘Safe’.
- The district wise stage of ground water development (i.e. Ratio of Annual Ground Water Draft and Net Annual Ground Water Availability) varies from 69% in Sri Muktsar Sahib to 283% in Sangrur.

Surface Water Quality

- In India, the Central Pollution Control Board (CPCB) has developed a concept of designated best use. According to this, out of the several uses of water of a particular body, the use which demands highest quality is termed as designated best use.
- Surface Water Quality of Beas River when it enters Punjab state at Talwara is fairly good and starts deteriorating near Mukerian as it receives effluents and sewage from town. Also, further downstream, water quality remains same due to discharge of industrial effluents and sewage from Goindwal town and industrial complex.
- Surface Water Quality of Satluj River is being monitored by Punjab Pollution Control Board (PPCB) for various physio-chemical parameters. Water quality of river at various sampling locations indicates that its quality with respect to BoD and Total Coliform starts deteriorating once it reaches Budha Nallah.
- With regard to Surface Water Quality of Ravi River, only one sampling point on the upstream side of Madhopur Head-works in Gurdaspur district is available and results of the analysis confirm water quality as Class A (Drinking Water source without conventional treatment but after disinfection) as per designated best use classification of CPCB.
- Surface Water Quality of river Ghaggar River over its entire stretch is of D category. The BOD values are very high at Chhatbir and remain very high through-out till its tail end at Sardulgarh.

Table 1.1: Primary Water Quality Criteria for Designated Best Use - Classes

Designated Best Use	Class	Criteria
Drinking Water source without conventional treatment but after disinfection	A	<ul style="list-style-type: none">● Total Coliforms Organism MPN/100 ml shall be 50 or less● pH between 6.5 and 8.5● Dissolved Oxygen 6mg/l or more● Biochemical Oxygen Demand 5 days 20° C, 2 mg/l or less
Outdoor Bathing (Organized)	B	<ul style="list-style-type: none">● Total Coliforms Organism MPN/100 ml 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, 3 mg/l or less
Drinking Water source after conventional treatment and disinfection	C	<ul style="list-style-type: none">● Total Coliforms Organism MPN/100 ml shall be 5000 or less● pH between 6 and 9● Dissolved Oxygen 4mg/l or more● Biochemical Oxygen Demand 5 days 20° C, 3 mg/l or less

Designated Best Use	Class	Criteria
Propagation of Wild Life and Fisheries	D	<ul style="list-style-type: none"> • pH between 6.5 and 8.5 • Dissolved Oxygen 4mg/l or more • Free Ammonia • Biochemical Oxygen Demand 5 days 20° C, 2 mg/l or less
Irrigation, Industrial Cooling, Control Waste Disposal	E	<ul style="list-style-type: none"> • pH between 6.5 and 8.5 • Electrical Conductivity at 25 C micro mhos/cm, maximum 2250 • Sodium Absorption Ratio, Maximum 26 • Boron, Max. 2 mg/l
	Below E	<ul style="list-style-type: none"> • Not meeting any of the A,B,C,D & E

Source: Central Pollution Control Board (CPCB)

Ground Water Quality

Based on Ministry of Drinking Water and Sanitation website as on 01/04/2014, summary of assessment is as given below:

- Iron – Amritsar, Ferozepur, Rupnagar, Gurdaspur & Hoshiarpur are worst affected.
- Fluoride – Patiala, Fatehgarh Sahib and Sangrur are mostly affected.
- Arsenic – Gurdaspur having major problem with Arsenic contamination
- Uranium –Ferozepur, Barnala and Moga are the worst affected districts.
- Nitrate – Ferozepur, Hoshiarpur, Fatehgarh Sahib and Jalandhar are the severely affected districts.
- Aluminium – Rupnagar, Pathankot, Hoshiarpur, Moga and Patiala are having major problems with Aluminium contamination.
- Lead – Patiala, Jalandhar and Ludhiana are affected.
- Selenium – Jalandhar, Ludhiana and Kapurthala are worst affected

Current Water Supply and Treatment Practices

- The existing rural water supply schemes essentially have three sources – tube well, canal and hand pumps.
- Out of total schemes of 9,302; 6,807 are tube well source based; 1,659 schemes are with India Mark II hand pumps and only 836 schemes are with canal based source.
- In tube well source based schemes, A chlorination unit/Silver Ionization plant is connected to the pumping main for disinfection of water. After chlorination, water is pumped to the overhead tank and subsequently supplied to the users through distribution network.
- In canal based schemes, water treatment is provided by filtration units followed by disinfection through chlorination and finally to the clear water sump, which is then pumped to overhead tank and subsequently to the distribution network by gravity flow.

Incidence of Water and Sanitation Related Diseases

- As per the assessment of Health Department done for the years 2008 to 2013, Jalandhar and Patiala were found to be the worst affected districts with 1,58,437 and 88,918 acute diarrhoea cases respectively.
- Jalandhar, Ludhiana and Gurdaspur were the districts having 31,477, 21,621 and 20,472 enteric fever cases respectively in last six years.
- Ludhiana, Sangrur and Moga are the worst affected districts with 1,577, 902 and 890 Hepatitis A & E cases respectively.

Sanitation Status

Toilet construction

- Moga and Ludhiana are the districts where more than 90% households are having IHHLs, whereas in Bathinda, Faridkot, Jalandhar, Patiala and Sangrur it is more than 80%.
- Amritsar is the only district where only 50% households are having IHHLs.
- As far as coverage of BPL households is concerned, special attention to be given in Amritsar, Nawansher, Kapurthala and Tarn Taran districts where less than 50% households are having IHHLs.
- In terms of APL households, IEC activities have to be taken up on regular basis in Amritsar, Barnala, Ferozepur, Hoshiarpur, Nawansher and Tarn Taran districts in view of less coverage of the section in the range of 60% to 70% households compared to other districts.
- Action to be taken to construct school toilets in the districts of Gurdaspur & SAS Nagar.
- To construct Anganwadis toilets in the districts of Amritsar, Ferozepur, Ludhiana & Sangrur.
- To construct Sanitary Complex in the districts of Barnala, Ludhiana, Mansa and Sri Muktsar Sahib.

Sewerage Schemes

According to Department of Water Supply and Sanitation and status as on November 2014, there are currently 97 sewerage schemes in 18 districts of Punjab State for which either work is in progress or they are commissioned.

Out of 97 schemes, 82 schemes are already commissioned and for remaining 15 schemes work is in progress. As far as sewer connections are concerned, people are still apprehensive in taking the connections, which observed to be the case of involvement of cost of connection and lack of awareness.

Waste Management

- Effective solid and liquid waste management is the key to create a clean environment. Effective management of SLWM includes management of bio-degradable and non-biodegradable waste, management of all grey water generated in the village and general cleanliness of the village.
- So far, only 87 Solid and Liquid waste management programmes have been implemented across all the districts of Punjab state, with none being reported in Amritsar, Fatehgarh Sahib, Gurdaspur, Jalandhar, Kapurthala, Nawansher, Rupnagar, SAS Nagar & Tarn Taran.

Field Survey & Study

Six (6) villages were selected from the geographically spread 6 representative districts (SAS Nagar, Sangrur, Sri Muktsar Sahib, Moga, Amritsar & Hoshiarpur) for field visits. Based on the field visit observations, discussions with local officials and community and secondary data collected, the Environmental Assessment and Updated Environmental Management Framework for the project area is prepared.

As per the village level survey and discussions with villagers and Sarpanch the following are the key issues related to water supply and sanitation.

Major Findings

Water Supply Key Issues:

- Since the supply of canal water is not available all 365 days a year, required storage is to be maintained to provide regular water supply during canal closure period. Due to high turbidity in canal water, slow sand filters get clogged up frequently and require the provision of pre-treatment.
- Operation of Pumps: Insufficient power supply and regular power cuts problems within the area supplying water through piped water supply scheme.
- Safe disposal of reject water from R.O plants.

- There is a possibility that, the coverage of habitations with contaminant removal units could be affected, once the O&M responsibility of these units by the contractor ends. In those habitations, piped water supply schemes with safe and sustainable source can be a better option, if people come forward to bear the costs of O&M of the scheme.
- Use of individual submersible pumps at household level by private people in their houses could lead to over draft of ground water.
- Use of small (Tullu)pumps to draw more water from the piped water supply scheme could affect other users.

Sanitation Key Issues:

- Where the sewer lines are already constructed, people are not willing to get connected; Lack of awareness and cost of connection
- No plantation surrounding STP and space constraint for plantation.
- Improper disposal of solid and liquid wastes

Environmental Concerns and Management Proposals

In order to ensure that the environmental issues are systematically identified and addressed in the various stages of the implementation of the schemes, an updated Environmental Management Framework (EMF) has been developed for this project. The following are the project related key environmental issues and management proposals.

■ **Water Supply Issues:**

- **Water Availability / Water Quantity:** Ground water has been the major source of rural drinking water and irrigation in Punjab. Owing to large scale extraction of ground water for irrigation, combined with increasing demands in other sectors due to population and industrial growth, the aquifers are prone to be under stress and some of the sources have become either unsustainable or contaminated.
- **Water Source Protection:** Drinking water from local drinking water utilities or an individual well comes from either ground water, streams, rivers or lakes in a watershed. Although most of the raw water requires some kind of treatment before its actually supplied for its intended purpose mainly for drinking, domestic or industrial use, protecting sources of water is an important part of providing safe drinking water to the public.
- **Water Quality (Surface water & Ground water):** A major canal network of The Punjab State is relatively free of industrial or municipal discharges, and the irrigation drainage flows are seldom routed into the canal system. The water quality in the main canals is generally better than that of the river courses. The quality problems with respect to surface water sources are more acute in the locations and during the periods when the flow in the river is not sufficient to cause acceptable level of dilution of the discharge effluents.

The shallow ground water quality in Punjab is poor owing to natural presence of salinity and pollutants at concentrations exceeding the permissible levels for drinking water use. In addition, the ground water quality may also indicate bacteriological and chemical contamination due to inadequate treatment of effluents from septic tanks or industrial discharges and disposal of sullage into stagnant pools of wastewater.

- **Leakage from Water supply:** Water is often wasted through leaking pipes, joints, valves and fittings of water supply system either due to bad quality of material used, poor workmanship, corrosion, age of installations, or through vandalism as well. This leakage leads to reduction in supply and loss of pressure. The leakages could either be visible or invisible. In the case of invisible leaks, sections of pipeline should be isolated and search to be carried out for location of leaks. Also, the lack of maintenance of pipeline may cause leakages in long run which has negative impact on the various attributes due to water stagnation in the village roads/streets/low lying areas.

- **Maintenance of Water Disinfection System:** The disinfection of potable water is almost universally accomplished by the use of gaseous chlorine or chlorine compounds. Other methods of disinfection are also available such as ozone, ultra-violet light, chlorine dioxide, silver ionization etc. Disinfection should be done continuously to maintain the residual chlorine in the distribution system.
- **Sanitation Issues:**
 - **Household Sanitation options and issues:** There are no provisions of sanitation facilities in 25% of the total rural households in The Punjab State. Amongst the 75% households who have access to a sanitary facility, about 94% have a toilet within their house, 4% households share a toilet with other households while about 2% households use a public toilet.
 - **Septic Tanks:** All the wastewater from the home should flow to the septic tank. Even waters from the shower or washing machine can contain disease causing germs or environmental pollutants. As wastewater flows into the tank, the heavier solid materials settle to the bottom, the lighter grease and fats float to the top and liquid flows out of the tank, which untreated can cause pollution.
 - **Site Selection for STP:** Site selection of a waste water treatment facility should be based on careful consideration on development patterns as well as social, environmental and engineering constraints. It is important to understand that the selection of a site for sewage treatment plant will have long lasting social, environmental and economic repercussions on the affected community and neighbourhood.
 - **Effluent Disposal & Utilization:** The effluent disposal of STP and its utilization should be planned at design stage otherwise its accumulation in the nearby areas leads to un-aesthetic view and becomes a breeding ground for mosquitoes. The effluent from the STP may be discharged in the water bodies such as ponds, streams or on land provided that it meets the PPCB criteria.
 - **Impact due to malfunctioning of the sewage lift pump:** Sewage pumping stations are designed to pump sewage from one place to another and are usually used for conveying raw sewage to sewage treatment plant, or conveying treated effluent to water receiving bodies. The malfunctioning of lift pumps or power failure will cause negative impact on the surroundings and environment.

Institutional Arrangements

The project envisages improving the existing institutional model on the front of environmental monitoring that enables demand driven community action. The following is a brief description of the model.

Village Level GPWSC:

GPWSC is a standing committee of the Gram Panchayat which is expected to shoulder full responsibilities for all activities including planning, implementation, operation, maintenance and management related to RWSS at the village level.

Division Level:

At Division level, there will be one environment officer, who will assist DWSS in monitoring and implementation of mitigation measures related to RWSS at village level, preparation of environmental appraisal for clearances, train GPWSC, community members and other stakeholders in implementation activities under EMF.

Circle Level:

At circle level, there will be an environment manager/environmental expert to assist DWSS in environment assessment and appraisal of RWSS schemes, monitoring activities of environment officers at division level and environment monitoring of the completed RWSS schemes.

Zone Level:

At zone level, there will be an Executive Engineer and an Environmental Expert, who will assist DWSS in environment assessment and appraisal of RWSS schemes, monitoring activities of environment managers at circle level, and to look after the training of environment staffs of circles and divisions.

State Level:

At the state level the DWSS(Head Office) prepares the environment policy and sets the guidelines for the EMF implementation, monitoring and evaluation. This office also liaises with other departments with regard to environment issues. The State level Officer of DWSS will be responsible for ensuring the implementation of the EMF across the state. At State level to assist State level Officer, there will be an Executive Engineer and an Environmental Specialist, who will ensure that environment management activities are in conformity with the EMF and that necessary guidance and budget is provided to implement these plans.

Table1.2: Proposed Institution Set-up with functions

Entity	Position	Functions
State Level	Environment (Executive Engineer Cadre)	<ul style="list-style-type: none"> • Monitor environmental activities of the project and ensuring compliance with EMF. • Assist DWSS in Environmental monitoring of the completed RWSS schemes/auditing of 15% of completed Category I RWSS schemes, Category II water supply schemes and Category II sewerage schemes • Assist in Environmental Capacity Building
	Environmental Specialist	<ul style="list-style-type: none"> • Assist DWSS in Environmental assessment and appraisal of RWSS schemes • Assist DWSS in obtaining approvals from other departments • Assist DWSS in monitoring activities of Environmental staff of the department • Assists DWSS in Environmental monitoring of the completed RWSS schemes/ auditing of 15% of completed Category I RWSS schemes, Category II water supply schemes and Category II sewerage schemes • Assist DWSS in water and wastewater quality monitoring of the completed RWSS schemes • Organize state/ circle level training programs
Zone Level	One Executive Engineer and Environmental Expert	<ul style="list-style-type: none"> • Assist DWSS in Environmental assessment and appraisal of RWSS schemes • Assist DWSS in monitoring activities of circle level Environmental Managers • Assist DWSS in Environmental monitoring of the completed RWSS schemes/ auditing of 15% of completed Category I RWSS schemes, Category II water supply schemes and Category II sewerage schemes • Train Circle / Division level Environmental staffs and operational staff of DWSS in implementing/supervising environmental mitigation measures and water& wastewater quality monitoring for completed RWSS schemes
Circle Level	Environmental	<ul style="list-style-type: none"> • Assist DWSS in Environmental assessment and

Entity	Position	Functions
	Manager	<ul style="list-style-type: none"> appraisal of RWSS schemes Assist DWSS in monitoring activities of division level Environmental Officers Assists DWSS in Environmental monitoring of the completed RWSS schemes Train Division level Environmental officers and operational staff of DWSS and GPWSCs in implementing/supervising environmental mitigation measures and water & wastewater quality monitoring for completed RWSS schemes
Division Level	Environmental Officer	<ul style="list-style-type: none"> Assist DWSS in monitoring and implementation of mitigation measures at village level for RWSS schemes. Assist DWSS in preparation of environmental appraisals for clearances. Train GPWSCs, community members and other stakeholders at village level in implementing activities under EMF. Propose/Report mitigation measures in case of any environmental issues encountered during execution.
Field Level / GP level	GPWSC members / SLC Community members	<ul style="list-style-type: none"> Awareness on environmental mitigation measures related to water supply and sewerage schemes in the GP Create environmental awareness among community members

Updated Environmental Management Framework

In order to ensure that the environmental issues are systematically identified and addressed in the various stages of the implementation of the schemes, an Updated Environmental Management Framework (EMF) has been developed for this project. EMF activities in the pre-planning, planning, implementation and O&M phases of the proposed project cycle for the project sponsored schemes are given in respective tasks. The key elements of EMF are as follows:

- **Environmental Data Sheets on Water Supply and Sewerage Schemes** - The EMF requires the basic environmental data pertaining to the proposed schemes be compiled at the field data collection stage. For this purpose, a simple Environmental Data Sheet (EDS) has been formulated on water supply, sanitation/ sewerage schemes.
- **Environmental Categorization of the Schemes** - At the Detailed Scheme Report (DSR) preparation stage, the available environmental information in the EDS will be evaluated and based on the level of expected environmental and public health impacts, the proposed scheme would be classified. In case of water supply schemes, the schemes shall be classified as either Category I (environmental data sheet to be prepared) or Category II (detail environmental appraisal is required). In case of sewerage schemes, the schemes shall be classified as either Category I (environmental data sheet to be prepared) or Category II (detail environmental appraisal is required).

Categories of Water Supply Scheme

Category I (Minimal Impacts where EMP not required)	Category II (Significant Impacts where EMP required)
<ul style="list-style-type: none"> • Water Supply involving pumping, construction of storage tanks and piped distribution networks, with source as tube well/bore well. • Water Supply with water source requiring minimum treatment such as disinfection. 	<ul style="list-style-type: none"> • Water Supply involving pumping, construction of storage tanks and piped distribution networks, with Surface water as a source. • Water Supply with water source requiring “Advance Treatment” for removal of arsenic, iron, fluoride, salinity, etc.
<ul style="list-style-type: none"> • Single Village Scheme (SVS) with either surface water or ground water source. 	<ul style="list-style-type: none"> • Multi Village Scheme (MVS) based on either surface water or ground water source.
<ul style="list-style-type: none"> • Water Supply with source in shallow aquifer in safe and semi-critical zone and with source in deep aquifer located in safe zone of exploitation. 	<ul style="list-style-type: none"> • Water Supply with source located in/very close to natural habitat/sensitive eco-systems such as National Parks, Wild Life Sanctuaries (requiring forest permission/clearance)
<ul style="list-style-type: none"> • No water quality issues with regard to ground water source. 	<ul style="list-style-type: none"> • Water Supply with water source from critical aquifers/over exploited zones. Ground water based scheme, if the water quality testing for deep groundwater source indicates unacceptable levels of pesticides or heavy metals.

Categories of Sewerage Schemes

Category I (Minimal Impacts where EMP not required))	Category II (Significant Impacts where EMP required)
<ul style="list-style-type: none"> • Sufficient land for STP is available easily 	<ul style="list-style-type: none"> • Advance technology is to be provided as the available area is less than the requirement.
<ul style="list-style-type: none"> • Location of STP is more than 200 m away from school/hospitals and residential areas 	<ul style="list-style-type: none"> • Location of STP is less than 200 m from school/hospitals and residential areas. • Water logged area.
<ul style="list-style-type: none"> • No major tree cutting is involved for sewerage system and STP 	<ul style="list-style-type: none"> • Major tree cutting is involved for sewerage system and STP. • Clearance of Forest Department is required
<ul style="list-style-type: none"> • No industrial/chemical effluent being discharged to the proposed sewerage system 	<ul style="list-style-type: none"> • Industrial/chemical effluent is mixing with sewage.
<ul style="list-style-type: none"> • No effluent disposal problem, i.e., disposal by gravity to nearby drain or water body 	<ul style="list-style-type: none"> • Effluent disposal problem requiring pumping for disposal.

Risk & Assumptions

The major risk factors along with some proposed management measures from the environmental point of view are given in table below, which are as follows:-

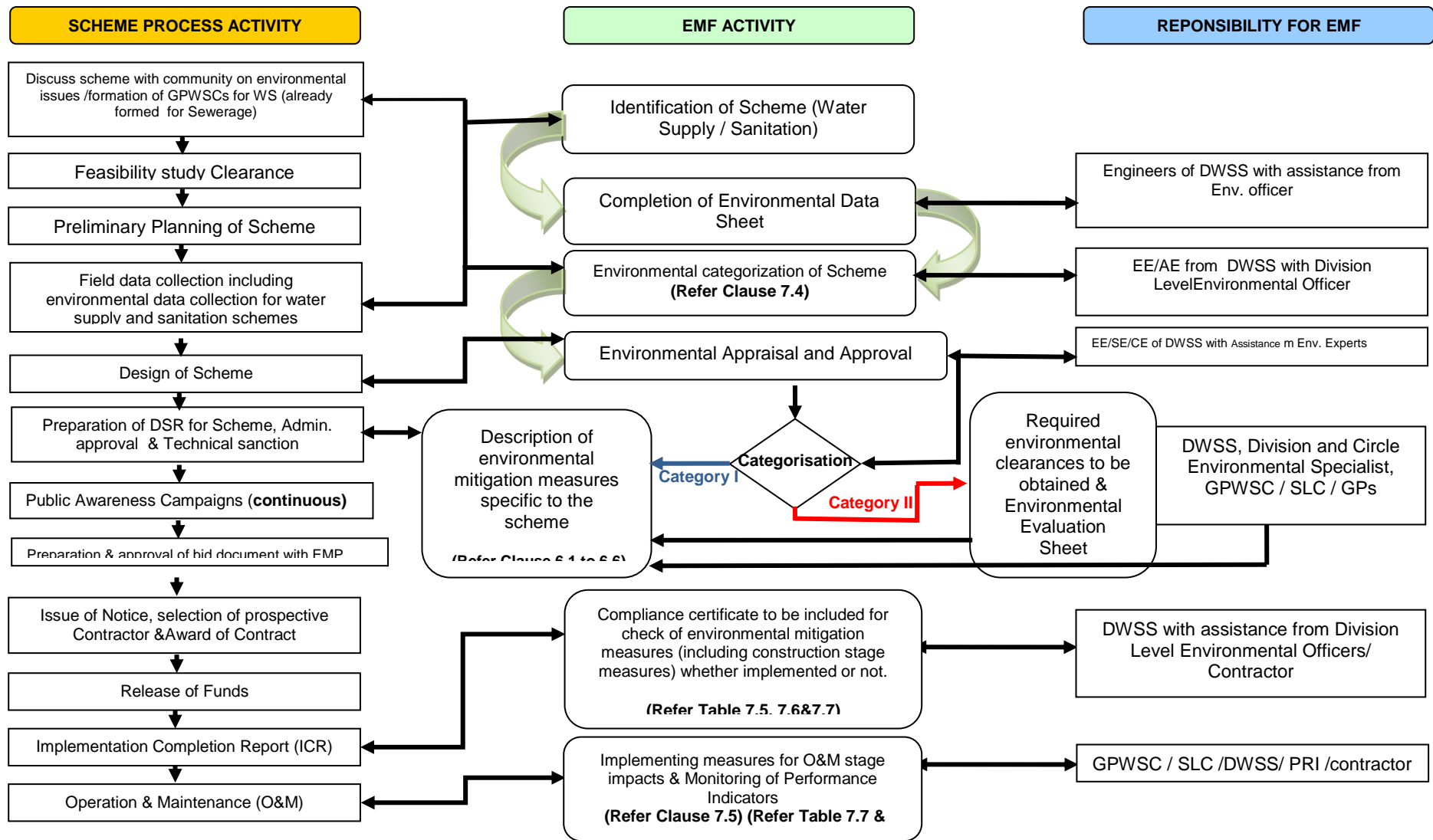
S. No	Environmental Risks	Management Proposals
1	Less yield from water sources	<ul style="list-style-type: none"> ■ Preventing water wastage ■ Draw out only planned quantity ■ Water augmentation ■ Water harvesting ■ Catchment area treatment ■ Alternative sources be explored
2	Natural Calamities like Flash Floods, Droughts & Earthquakes	<ul style="list-style-type: none"> ■ Installation of electrical & mechanical equipment above flood level. ■ Cordoning off the source works with protection walls (wherever possible to do so), prone to floods ■ Establishing diversions within the flood routes in order to protect the source at the downstream.
3	Lack of awareness in the community, especially regarding water quality and environmental sanitation	<ul style="list-style-type: none"> ■ Intensive awareness creation program. ■ Distribution of FTKs and ensuring its usages. ■ Identify convenient water quality testing centres.
4	Unsuitable location for STP and layout of STP	<ul style="list-style-type: none"> ■ Selected site should not pollute the downstream or nearby water supply source. ■ Proper design, construction and maintenance of STP should be ensured. ■ Treated effluent should be discharged in to natural drain by gravity
5	Absence of Proper waste management in the community	<ul style="list-style-type: none"> ■ Proper training regarding use of compost and garbage pits ■ Intensive IEC activities.

- **Environmental Appraisal and approval** - Based on the Environmental Categorization of the schemes for the proposed project, appraisals and approvals have to be obtained. With regard to land availability, as per World Bank guidelines land acquisition cost would not be financed through the World Bank, and land acquisition under this project should not be there. DWSS should ensure that the Gram Panchayat has the land required in their possession prior to conceiving a scheme.
- **Environmental Management Plan (EMP) for pre-planning, construction and O&M phase impacts** – EMP based on issues identified during the planning stage of the proposed project and necessary preventive and mitigation measures should be considered in the design. The contractor shall provide an undertaking for execution of the activities identified in the EMP. The EMP shall be initiated at the planning and design stage of project and the process shall involve addressing relevant environmental issues ranging from household to village level with appropriate detail.
- **Provision for Environmental Cost** - Provision of 2% of capital cost of water supply and sewerage schemes towards EMP is notional. If the cost of implementation of EMP is more than 2% then the actual cost to be factored in the cost of the scheme.

■ Approximate Provision of 2% Environmental Cost

Sr. No.	Description of Environmental Enhancement Measures	Budgetary Cost in % of Scheme	Implementations Agency
A. Water Supply Schemes			
1	Provision for air, noise and water quality testing during construction / Rain water Harvesting structures	1.75%	Prospective Contractor
2	Provision of Lawns and Tree plantation in water works	0.25%	Prospective Contractor
B. Sewerage Schemes			
1	Minor Repair and Cleaning of Drains	0.50%	Prospective Contractor
2	Provision for air, noise and water quality testing during construction/Rain water harvesting structures	1.00%	Prospective Contractor
3	Provision of Lawns and Tree Plantation around the STP sites	0.50%	Prospective Contractor

The following environmental frame work flow chart provides the understanding of the EMF activities to be taken up at various stages of the scheme including environmental monitoring with regard to performance indicators:



Environmental Management Plan for Water Supply Scheme

EMP for Pre-Construction Stage Impacts – Water Supply Schemes:

Sr. No.	Potential Environmental Impacts	Mitigation measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
1	Site Selection	<ul style="list-style-type: none"> The location of treatment plant site should be at least 200 m away from the nearest settlement The site should be isolated from the presently built-up areas or areas that have potential for future development. Large enough area for locating the plant will be helpful in maintaining the buffer area and fulfilling the needs for future expansion. The treatment plants should not be located within flood zones. 	DWSS/ GPWSC/ SLC		
2	Tree Cutting	<ul style="list-style-type: none"> Necessary clearance for cutting of trees should be obtained by SE prior to start work from the Forest Department A joint inspection of Forest Department officials and representative GPWSCs should be organized to identify the trees to cut for clearing the site. Trees to be cut should be clearly marked. 	DWSS		
3	Establishment of Contractor's Camp and site office	<ul style="list-style-type: none"> It should be located away from the residential areas/schools/hospitals/river banks/canals. Layout of construction camps if any should be approved from GPWSCs Construction camps, if any should have separate toilets for male and female workers, drinking water, cooking fuel and first aid facilities. 	Prospective Contractor	One Time	SLC/GPWS C/ Engineers of DWSS/ Environmental Officer
4	Construction water	<ul style="list-style-type: none"> Contractor will make his own necessary arrangement for procuring construction water –In case of community water source, Contractor should carry out consultations with GPs and obtain written permission for the utilization of water 	Prospective Contractor	One Time	SLC/GPWS C/ Engineers of DWSS

Sr. No.	Potential Environmental Impacts	Mitigation measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
		<ul style="list-style-type: none"> – In case of private source, Contractor should not utilize the water unless written consent is obtained from other owners of the land parcel. – In case of new bore wells, permits should be obtained as per requirements of State Ground Water Board regulations. – In case of surface water bodies, necessary permission from concerned department or administrative clearances should be obtained. • Water requirement for curing concrete should be optimized by pooling of water over concrete or covering it with gunny bags. 			
5	Disposal sites	<ul style="list-style-type: none"> • In consultation with GPs, disposal sites should be identified and got approved by SE in consultation with DWSS. 	Prospective Contractor	One Time	SLC/ GPWSC/ Engineers of DWSS

Environmental Management Plan for Construction Stage Impacts – Water Supply Schemes:

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
1	Site Clearance	<ul style="list-style-type: none"> • No illegal tree chopping should be allowed. • Vegetation clearance activity should be closely monitored 	Prospective Contractor	Once in a week	SLC/GPWSC
2	Excavation, laying and jointing of pipes	<ul style="list-style-type: none"> • Loose soil should be compacted properly after finishing the work • Damage to the roots should be prevented during trenching, placing, backfill, driving or parking heavy equipment, dumping of trash, oil, paint, and other materials detrimental to plant health • Excavation must be done during the lean season near water bodies, to avoid erosion and siltation of canals or 	Prospective Contractor	Daily	SLC/GPWSC

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
		<p>other water bodies in the area.</p> <ul style="list-style-type: none"> • Ensure prompt refilling of trenches and proper management and use/disposal of soil cover and wastes. 			
3	Public Safety	<ul style="list-style-type: none"> • Excavated areas should be clearly demarcated • Proper barricading should be placed along the excavated trenches • Warning sign boards should be provided along the construction sites in Hindi as well as local language • Trespassing of the construction sites should not be allowed 	Prospective Contractor	Twice in a month	SLC/GPWSC/ / Engineers of DWSS/ Environmental Officer
4	Access Management	<ul style="list-style-type: none"> • Proper access to the residents should be provided near the residential areas, schools, hospitals, and religious structures such as mosque, temples, etc. 	Prospective Contractor	Twice in a month	SLC/GPWSC/ Engineers of DWSS
5	Storage of Construction Materials	<ul style="list-style-type: none"> • All construction materials should be stored in secured places • Contractor should not be allowed to store the material at construction sites for more than 1 week. • No hazardous material should be allowed to store near the construction sites. 	Prospective Contractor	Once in a week	SLC/GPWSC/ Engineers of DWSS
6	Construction Sites	<ul style="list-style-type: none"> • It should be kept free of water logging • Protective guards should be provided across the areas where workers may fall or could face an impalement hazard. • Store tools and materials neatly and out of the way in storage bins or lockers and keep flammable or hazardous wastes, if any, in covered, segregated waste containers • Keep form and scrap lumber with protruding nails cleared away from work areas, passageways • No loose material should be allowed to leave unattended, and sites should be properly finished after completing the 	Prospective Contractor	Twice in a month	SLC/GPWSC/ Engineers of DWSS/ Environmental Officer

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
		work <ul style="list-style-type: none"> • Good housekeeping should be maintained at construction sites 			
7	Noise Pollution	<ul style="list-style-type: none"> • Machineries as well as equipment should be maintained properly • No high noise generating equipment which is not meeting SPCB requirements should be allowed at construction sites • Generator etc. should be properly enclosed, and proper padding should be placed below such machinery to reduce vibration. • Special care must be taken near religious structures, schools, hospitals etc. • Machineries/equipment/vehicles should meet the noise emission requirement of the State Pollution Control Board, Punjab 	Prospective Contractor	Twice in a month	SLC/GPWSC/Engineers of DWSS/Environmental Officer
8	Air Pollution	<ul style="list-style-type: none"> • Properly maintained vehicles and equipment should be used • In dusty areas, sprinkling of water should be done and especial care must be given during summer season • Construction debris should not be allowed to remain unattended at construction sites for longer time • Workers working in dusty areas such as concrete mixing equipment should use stringently nose masks. • Machineries/equipment/vehicles should meet the Air Pollution requirement of the State Pollution Control Board, Punjab 	Prospective Contractor	Once in a week	SLC/GPWSC/Engineers of DWSS/Environmental Officer
9	Water Pollution	<ul style="list-style-type: none"> • No washing of vehicles or equipment should be permitted near the water source • Construction debris should not be disposed to the water bodies 	Prospective Contractor	Daily	SLC/GPWSC/Engineers of DWSS

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
		<ul style="list-style-type: none"> • Contractor should arrange its own water for carrying out construction activities. 			
10	Soil Quality	<ul style="list-style-type: none"> • Excavated areas should be properly compacted • Loose earth should not be left unattended near the construction sites 	Prospective Contractor	Daily	SLC/GPWSC/ Engineers of DWSS
11	Construction Camps	<ul style="list-style-type: none"> • Proper cooking fuel should be provided to the labour residing in the camps. In any case, woods should not be used for cooking. • Proper sanitation facilities should be provided in the construction camps. • Potable drinking water should be provided to the workers. • Water logging conditions should not be allowed inside the camp. • For establishing construction camps, contractor should obtain NOC from the State Pollution Control Board 	Prospective Contractor	Once in a week	SLC/GPWSC/ Engineers of DWSS
12	Occupational Health & Safety	<ul style="list-style-type: none"> • Safe access to the job sites should be provided to all workers • Passage ways, walkways, and stairways should be kept free of materials, scraps or obstructions • First Aid box should be readily available at construction sites • Contact with nearest nursing homes/clinics/primary health centre should be maintained by the Contractor to deal with any emergency at site • A vehicle should be readily available at construction site to meet emergency situation • The contractor should comply with all the precautions as required for the safety of the workmen as per the International Labour Organization as far as those applicable to this project 	Prospective Contractor	Daily	SLC/GPWSC/ Engineers of DWSS

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
		<ul style="list-style-type: none"> The contractor should strictly follow the statutory child labour act Personal Protective Equipment such as helmets, hand gloves, safety shoes, nose masks, safety goggles should be provided to the workers. 			

Environmental Management Plan for Operation & Maintenance Stage Impacts – Water Supply Schemes:

Sr. No.	Potential Environmental Impacts	Mitigation measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
1	Hand Pumps	<ul style="list-style-type: none"> Routine inspections of hand pumps Source protection + treatment for arsenic/iron/fluoride etc. Regular cleaning and back washing of treatment units/filters in lined with hand pumps should be ensured. Enforce ground water act + monitor regularly ground water level 	Prospective Contractor / DWSS / GPWSC	Monthly	GPWSC/SLC/ Engineers of DWSS
2	Piped Water Supply Schemes	<ul style="list-style-type: none"> Chlorination level of water supply to ensure minimum residual chlorine of 0.5mg/l Regular water quality testing Preventive and corrective maintenance of water distribution system including checking of leakages. 	Prospective Contractor / Engineers of DWSS/ GPWSC	Daily Monthly Quarterly	GPWSC/SLC/ Engineers of DWSS GPWSC/SLC/ Engineers of DWSS/ Environmental Officer GPWSC/SLC/ Engineers of DWSS

Environmental Management Plan for Sewerage Scheme

EMP for Pre-Construction Stage Impacts – Sewerage Schemes:

Sr. No.	Potential Environmental Impacts	Mitigation measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
1	Site Selection	<ul style="list-style-type: none"> The location of wastewater treatment plant site should be at least 200 m away from the nearest settlement The site should be isolated from the presently built-up areas or areas that have potential for future development. Large enough area for locating the plant will be helpful in maintaining the buffer area and fulfilling the needs for future expansion. Enough area for local disposal of end products such as treated effluents, sludge should be available at the selected site. The treatment plants should not be located within flood zones. The site should be selected near a large water body or irrigable land capable of accepting the treated effluents. 	DWSS/GPWS C/SLC		
2	Tree Cutting	<ul style="list-style-type: none"> Necessary clearance for cutting of trees should be obtained by SE prior to start work from the Forest Department A joint inspection of Forest Department officials and representative GPWSCs should be organized to identify the trees to cut for clearing the site. Trees to be cut should be clearly marked. 	DWSS		
3	Establishment of Contractor's Camp and site office	<ul style="list-style-type: none"> It should be located away from the residential areas/schools/hospitals/river banks/canals. Layout of construction camps if any should be approved from GPWSCs Construction camps, if any should have separate toilets for male and female workers, drinking water, cooking fuel and first aid facilities. 	Prospective Contractor	One Time	SLC/GPWS C/ Engineers of DWSS/ Environmental Officer
4	Construction water	<ul style="list-style-type: none"> Contractor will make his own necessary arrangement for procuring construction water –In case of community water source, Contractor should carry out 	Prospective Contractor	One Time	SLC/ GPWSC/ Engineers of

Sr. No.	Potential Environmental Impacts	Mitigation measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
		<ul style="list-style-type: none"> consultations with GPs and obtain written permission for the utilization of water – In case of private source, Contractor should not utilize the water unless written consent is obtained from other owners of the land parcel. – In case of new bore wells, permits should be obtained as per requirements of State Ground Water Board regulations. – In case of surface water bodies, necessary permission from concerned department or administrative clearances should be obtained. • Water requirement for curing concrete should be optimized by pooling of water over concrete or covering it with gunny bags. 			DWSS
5	Disposal sites	<ul style="list-style-type: none"> • In consultation with GPs, disposal sites should be identified and got approved by SE in consultation with DWSS. 	Prospective Contractor	One Time	SLC/ GPWSC/ Engineers of DWSS

Environmental Management Plan for Construction Stage Impacts – Sewerage Schemes:

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
1	Site Clearance	<ul style="list-style-type: none"> • No illegal tree chopping should be allowed. • Vegetation clearance activity should be closely monitored 	Prospective Contractor	Once in a week	SLC/ GPWSC
2	Excavation, laying and jointing of pipes	<ul style="list-style-type: none"> • Loose soil should be compacted properly after finishing the work • Damage to the roots should be prevented during trenching, placing, backfill, driving or parking heavy equipment, dumping of trash, oil, paint, and other materials detrimental to plant health • Excavation must be done during the lean season near water 	Prospective Contractor	Daily	SLC/ GPWSC

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
		bodies, to avoid erosion and siltation of canals or other water bodies in the area. <ul style="list-style-type: none"> • Ensure prompt refilling of trenches and proper management and use/disposal of soil cover and wastes. 			
3	Public Safety	<ul style="list-style-type: none"> • Excavated areas should be clearly demarcated • Proper barricading should be placed along the excavated trenches • Warning sign boards should be provided along the construction sites in Hindi as well as local language • Trespassing of the construction sites should not be allowed 	Prospective Contractor	Twice in a month	SLC/GPWSC/Engineers of DWSS/Environmental Officer
4	Access Management	<ul style="list-style-type: none"> • Proper access to the residents should be provided near the residential areas, schools, hospitals, and religious structures such as mosque, temples, etc. 	Prospective Contractor	Twice in a month	SLC/GPWSC/Engineers of DWSS
5	Storage of Construction Materials	<ul style="list-style-type: none"> • All construction materials should be stored in secured places • Contractor should not be allowed to store the material at construction sites for more than 1 week. • No hazardous material should be allowed to store near the construction sites. 	Prospective Contractor	Once in a week	SLC/GPWSC/Engineers of DWSS
6	Construction Sites	<ul style="list-style-type: none"> • It should be kept free of water logging • Protective guards should be provided across the areas where workers may fall or could face an impalement hazard. • Store tools and materials neatly and out of the way in storage bins or lockers and keep flammable or hazardous wastes, if any, in covered, segregated waste containers • Keep form and scrap lumber with protruding nails cleared away from work areas, passageways • No loose material should be allowed to leave unattended, and sites should be properly finished after completing the work • Good housekeeping should be maintained at construction 	Prospective Contractor	Twice in a month	SLC/GPWSC/Engineers of DWSS/Environmental Officer

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
7	Noise Pollution	<p>sites</p> <ul style="list-style-type: none"> • Machineries as well as equipment should be maintained properly • No high noise generating equipment which is not meeting SPCB requirements should be allowed at construction sites • Generator etc. should be properly enclosed, and proper padding should be placed below such machinery to reduce vibration. • Special care must be taken near religious structures, schools, hospitals etc. • Machineries/equipment/vehicles should meet the noise emission requirement of the State Pollution Control Board, Punjab 	Prospective Contractor	Twice in a month	SLC/GPWSC/ Engineers of DWSS/ Environmental Officer
8	Air Pollution	<ul style="list-style-type: none"> • Properly maintained vehicles and equipment should be used • In dusty areas, sprinkling of water should be done and especial care must be given during summer season • Construction debris should not be allowed to remain unattended at construction sites for longer time • Workers working in dusty areas such as concrete mixing equipment should use stringently nose masks. • Machineries/equipment/vehicles should meet the Air pollution requirement of the State Pollution Control Board, Punjab 	Prospective Contractor	Once in a week	SLC/GPWSC/ Engineers of DWSS/ Environmental Officer
9	Water Pollution	<ul style="list-style-type: none"> • No washing of vehicles or equipment should be permitted near the water source • Construction debris should not be disposed to the water bodies • Contractor should arrange its own water for carrying out construction activities. 	Prospective Contractor	Daily	SLC/GPWSC/ Engineers of DWSS/ Environmental Officer
10	Soil Quality	<ul style="list-style-type: none"> • Excavated areas should be properly compacted 	Prospective Contractor	Daily	SLC/GPWSC/ Engineers of

Sr. No.	Potential Environmental Impacts	Mitigation Measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
11	Construction Camps	<ul style="list-style-type: none"> • Loose earth should not be left unattended near the construction sites • Proper cooking fuel should be provided to the labour residing in the camps. In any case, woods should not be used for cooking. • Proper sanitation facilities should be provided in the construction camps. • Potable drinking water should be provided to the workers. • Water logging conditions should not be allowed inside the camp. • For establishing construction camps, contractor should obtain NOC from the State Pollution Control Board 	Prospective Contractor	Once in a week	DWSS SLC/GPWSC/ Engineers of DWSS/ Environmental Officer
12	Occupational Health & Safety	<ul style="list-style-type: none"> • Safe access to the job sites should be provided to all workers • Passage ways, walkways, and stairways should be kept free of materials, scraps or obstructions • First Aid box should be readily available at construction sites • Contact with nearest nursing homes/clinics/primary health centre should be maintained by the Contractor to deal with any emergency at site • A vehicle should be readily available at construction site to meet emergency situation • The contractor should comply with all the precautions as required for the safety of the workmen as per the International Labour Organization as far as those applicable to this project • The contractor should strictly follow the statutory child labour act • Personal Protective Equipment such as helmets, hand gloves, safety shoes, nose masks, safety goggles should be provided to the workers. 	Prospective Contractor	Daily	SLC/GPWSC/ Engineers of DWSS/ Environmental Officer

Environmental Management Plan for Operation & Maintenance Stage Impacts – Sewerage Schemes:

Sr. No.	Potential Environmental Impacts	Mitigation measures	Implementing Agency	Monitoring Frequency	Monitoring Institution
1	Drain/Sewer Condition Assessment	<ul style="list-style-type: none"> • Routine inspections of drains and sewers • Regular cleaning of interception chambers/drains (removal of blockages, debris etc.) should be ensured 	Prospective Contractor / DWSS	Quarterly	SLC/GPWSC/ Engineers of DWSS
		<ul style="list-style-type: none"> • Leakages in sewers 		Yearly	SLC/GPWSC/ Engineers of DWSS
2	Sewage Treatment Plant	<ul style="list-style-type: none"> • Routine maintenance of plants should be organized. 	Prospective Contractor / DWSS	Twice in a month	SLC/GPWSC/ Engineers of DWSS
		<ul style="list-style-type: none"> • Influent & Effluent quality testing 		Quarterly	SLC/GPWSC/ Engineers of DWSS/Environmental Officer
		<ul style="list-style-type: none"> • In case of ponds, <ul style="list-style-type: none"> – Its characteristic changes in colour and odour should be observed. – The ponds should be cleared of floating mats of algae at the corners and sides. – All marginal growth of weeds and vegetation should be removed. It also helps prevent mosquito breeding. – The overgrown and dead grass should be removed. 		Every six months	SLC/GPWSC/ Engineers of DWSS

Environmental Data Sheet for Water Supply and Sewerage Schemes for DSR Stage

Format for Environmental Data Collection for Water Supply and Sewerage Schemes			
1. GENERAL			
1.1. Name of Village/Habitation:			
1.2. Gram Panchayat			
1.3. Block:			
1.4. District:			
1.5. Zone (North/Central/South)			
2. BASELINE ENVIRONMENT			
2.1. Topography (Plain/Rolling/Hilly)			
2.2. Type of Soil:	<input type="checkbox"/> Alluvial	<input type="checkbox"/> Silt	<input type="checkbox"/> Silty Clay
	<input type="checkbox"/> Sandy	<input type="checkbox"/> Sandy Clay	<input type="checkbox"/> other
2.3. Intensity of Rainfall	<input type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High
2.4. Temperature:	Min: ^o C		Max:
2.5. Natural Slope of the Land			
2.6. Predominant wind Direction			
2.7. Water Table (Depth Below Ground Level)	<input type="checkbox"/> Shallow (0-5m)	<input type="checkbox"/> Moderate (5-10m)	
	<input type="checkbox"/> Deep aquifer (10-20m)	<input type="checkbox"/> Very Deep (below 20m)	
2.8. Existing water body within village:	<input type="checkbox"/> River	<input type="checkbox"/> Canal	<input type="checkbox"/> Pond/Lake
	<input type="checkbox"/> Other (Specify)		
2.8.1.If pond, current use of it. (Please give the numbers of ponds)	<input type="checkbox"/> Drinking	<input type="checkbox"/> Cattle washing	<input type="checkbox"/> Irrigation
	<input type="checkbox"/> Sewage Disposal	<input type="checkbox"/> Others	
2.9. Water logging problem within village/villages: (Yes/No)	if yes,		
	a. Name of area/areas:		
	b. Area under water logging:		
	c. Period of water logging (Annually):		
	d. Population affected by water logging:		
	e. Contamination of Drinking water sources from water logging:		
2.10. Minimum and Maximum width of village roads (meters)			
2.11. Existing Roads in the village are metallic/un-metallic/Brick Paved			
2.12. Current Solid Waste Disposal System	<input type="checkbox"/> Combined Dust bin	<input type="checkbox"/> Door to door collection	<input type="checkbox"/> Drains <input type="checkbox"/> In Streets
2.13. Local Vegetation: (Mention Species)			
3. SOCIAL ENVIRONMENT			
3.1. Population			

Format for Environmental Data Collection for Water Supply and Sewerage Schemes			
3.2. Number of households			
3.3. Land use pattern of village	<input type="checkbox"/> Rural	<input type="checkbox"/> Urbanized Rural	
3.4. Historical/ Religious Importance	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
3.5. Major Source of Income	<input type="checkbox"/> Agriculture	<input type="checkbox"/> Business	<input type="checkbox"/> Service
	<input type="checkbox"/> Labor	<input type="checkbox"/> Others	
3.6. Is the proposed project likely to affect any natural habitats/cultural properties? 3.6.1.If yes, whether appropriate safeguards are proposed? (Write note)			Yes / No
3.7. Is the proposed project likely to infringe on the rights of the local people, including traditional land water rights? 3.7.1.If yes, whether appropriate mitigation measures have been proposed? (Write Note)			Yes / No
4. PUBLIC HEALTH ISSUES			
4.1. Any incident of Waterborne epidemic/ disease in the recent past	<input type="checkbox"/> Yes		<input type="checkbox"/> No
4.1.1.If Yes: Name of diseases (Waterborne)	<input type="checkbox"/> Diarrhea		<input type="checkbox"/> Gastro entities
	<input type="checkbox"/> Typhoid		<input type="checkbox"/> Others
4.2. Is there any vector borne disease	<input type="checkbox"/> Yes		<input type="checkbox"/> No
4.2.1.Name of Vector borne disease	<input type="checkbox"/> Malaria	<input type="checkbox"/> Dengue	<input type="checkbox"/> Filaria
5. WATER SUPPLY SCHEME			
5.1. Type of Scheme	Existing/New Scheme		
5.1.1.Whether the proposed water supply scheme is	<input type="checkbox"/> Single Village Scheme		<input type="checkbox"/> Multi Village Scheme
5.1.2.If new water Supply scheme is proposed, briefly give data on the current drinking water situation			
5.1.3.Source of drinking water supply:	<input type="checkbox"/> River	<input type="checkbox"/> Lake	<input type="checkbox"/> Groundwater
	<input type="checkbox"/> Canal	<input type="checkbox"/> Pond	
5.1.4.Water availability in lpcd			
5.1.5.Availability of Land for Intake/WTP site	<input type="checkbox"/> Panchayati Land	<input type="checkbox"/> Private land	<input type="checkbox"/> Forest land
5.1.6.Has the source of water quality been assessed, if yes attach a copy of the test report.	<input type="checkbox"/> Yes		<input type="checkbox"/> No
5.1.7.Mention the appropriate nature of the quality problem	<input type="checkbox"/> Fluoride	<input type="checkbox"/> Iron	<input type="checkbox"/> Heavy Metals
	<input type="checkbox"/> Bacteriological	<input type="checkbox"/> TDS	<input type="checkbox"/> Pesticide
	<input type="checkbox"/> Nitrate	<input type="checkbox"/> Others	<input type="checkbox"/> No Problem
5.1.8.Is there potential risk of contamination of source due to industrial contaminants, human waste discharge, solid waste dumping, use of agro chemicals (Fertilizers, pesticides etc?) 5.1.8.1. If yes, whether appropriate preventive/ corrective actions taken? (Write a note)			Yes / No
5.1.9.Does the proposed project involve provision of any bore well within 1 km of international border between India and Pakistan?			Yes / No

Format for Environmental Data Collection for Water Supply and Sewerage Schemes			
5.1.9.1. If yes, the project cannot be sanctioned.			
5.1.10. If Canal source, indicate the Treatment Technology proposed.	<input type="checkbox"/> Slow Sand Filter (SSF) <input type="checkbox"/> Package Treatment Plant	<input type="checkbox"/> Rapid Sand Filter (RSF) <input type="checkbox"/> Any other method	
5.1.11. If groundwater, indicate Technology proposed.	<input type="checkbox"/> R O Plant <input type="checkbox"/> Iron removal Plant	<input type="checkbox"/> De-fluoridation Plant (D F) <input type="checkbox"/> Any other method.	
5.1.12. Has disinfection system been provided			<input type="checkbox"/> Yes <input type="checkbox"/> No
5.1.12.1. If yes, type of disinfection method (Silver Ionization or Chlorinator)			
5.2. Provision Required from Generic EMF in the water supply scheme village			
5.2.1. Air, Noise and water quality testing & rain water harvesting			<input type="checkbox"/> Yes <input type="checkbox"/> No
5.2.2. Lawns and Tree Plantation in Water Works			<input type="checkbox"/> Yes <input type="checkbox"/> No
5.3. Anticipated Environmental Issues and Mitigation Measures during implementation			
5.4. Parameter	Issue	Mitigation measure	
5.4.1. Water availability			
5.4.2. Water quality			
5.4.3. Sanitation			
5.4.4. Construction			
5.4.5. Disposal of construction wastes			
6. SEWERAGE SCHEME			
6.1. Whether Proposed Sewerage Scheme is	<input type="checkbox"/> Single Village Scheme	<input type="checkbox"/> Multi Village Scheme	
6.2. Current Sanitation Practices *	<input type="checkbox"/> Septic Tank	<input type="checkbox"/> Septic Tank with Soak Pits	
	<input type="checkbox"/> Open Defecation	<input type="checkbox"/> Bore well/ soak pit type	
	<input type="checkbox"/> Others		
6.3. Usage of toilets in terms of number and percentage			
6.4. Percentage of households having septic tanks*			
6.5. Availability of water supply in toilets			
6.6. Current Drainage Pattern*	<input type="checkbox"/> Open Drains	<input type="checkbox"/> Partially covered with Open Drains	<input type="checkbox"/> No Drainage system
6.7. Does the wastewater from cattle sheds discharged into the open drains*	<input type="checkbox"/> Yes		<input type="checkbox"/> No
6.8. Does the grey water and black water mix*	<input type="checkbox"/> Yes		<input type="checkbox"/> No
6.9. Villagers feedback about current sanitation practice*	<input type="checkbox"/> Satisfied		<input type="checkbox"/> Unsatisfied
6.10. Approximate Wastewater Quantity in mld			
6.11. Method of treatment to be Provided			
6.11.1. Whether existing Ponds will be used as STP	<input type="checkbox"/> Yes		<input type="checkbox"/> No
6.11.2. Pond's distance from the nearest settlement (m)			
6.11.3. Whether distance from the nearest schools/primary health center/religious structure is more than 200 m.	<input type="checkbox"/> Yes		<input type="checkbox"/> No

Format for Environmental Data Collection for Water Supply and Sewerage Schemes					
6.11.4. Water Quality of Pond by visual inspection	<input type="checkbox"/> Good		<input type="checkbox"/> Very bad		
6.11.5. Current use of Pond proposed for STP	<input type="checkbox"/> Cattle Wash	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Sewage Disposal	<input type="checkbox"/> Aquaculture	<input type="checkbox"/> Any other
6.11.6. Is there any requirement of expansion of pond to use as a STP	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.12. Is there sufficient land available for expansion of the pond or new STP	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.12.1. If yes, current land use	<input type="checkbox"/> Agriculture		<input type="checkbox"/> Barren land	<input type="checkbox"/> Forest	
6.13. Is there plantation around pond site/STP	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.14. Environmental Features around the new STP site, i. Approximate area of land in ha. ii. Land use pattern iii. Distance from the nearest water body iv. Distance from the nearest settlement v. Accessibility of area vi. Is there stagnation of water takes place (Yes/No)			<input type="checkbox"/>		
6.15. Contamination of Drinking Water Source from the Pond/STP	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.16. Disposal of Treated Effluent	<input type="checkbox"/> Inland water body		<input type="checkbox"/> On to land for irrigation		
6.17. Is there potential risk of contamination of source of water? If yes, what are the appropriate preventive/corrective actions taken? (write note)					
6.18. Provision Required from Generic EMF in the Sewerage Scheme Village					
6.18.1. Provision of Lawns and Tree Plantation at the STP Site water works premises and STP site	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.18.2. Provision of Rainwater harvesting	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.18.3. Repair and Cleaning of Drains	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.18.4. Air, noise and water quality testing	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.18.5. Need of Public Awareness on health and hygiene	<input type="checkbox"/> Yes		<input type="checkbox"/> No		
6.19. Anticipated Environmental Issues and Mitigation Measures during implementation					
Parameter	Issues		Mitigation measure		
6.19.1. Site selection of STP					
6.19.2. Sewage Treatment Technology					
6.19.3. Disposal of Treated effluent					
6.19.4. Disposal of Sludge					
6.19.5. Construction Phase impacts					
6.19.6. Disposal of Construction debris					
7. Whether Cleaning of Pond is required	Yes		No		
Signature					
JE/FE					
EO/ EM/ Sr EM/ ES/ EMS					
EE (Approval as per ES Recommendation)					
SE					

Note: * In case of multi-village scheme, please attach the data for each village separately.

Key Performance Indicators

The performance indicators for water supply schemes and sewerage schemes are identified and the frequency of its monitoring and person responsible are indicated below:

Table 1.3: Performance Indicators for various Project Interventions / Components for Water Supply Scheme

Sr. No.	Project Intervention / Component	Performance Indicators	Frequency	Monitoring Agency
1	Water Availability / Water Quantity	Access to safe drinking water supply of a minimum of 70 lpcd to the target communities.	Monthly	State level Executive Engineer in-charge of environment cell and Environment Specialist/ Environmental Officers
2	Water Quality	<ul style="list-style-type: none"> Regular DWSS water quality testing Water Quality Surveillance 	Monthly Yearly	GPWSC/SLC/Environmental Officers At district laboratories by the state level Environment cell
3	Ground Water Tables	<ul style="list-style-type: none"> Need to be monitored in the schemes where ground water is the source of water supply. 	Yearly	Independent consultant

Table 1.4: Performance Indicators for various Project Interventions / Components for Sewerage Scheme

Sr. No.	Project Intervention / Component	Performance Indicators	Frequency	Monitoring Agency
1	Sanitation	<ul style="list-style-type: none"> Increased access of household to common sewerage / sanitation system. 	Half Yearly	State Environment Specialist
2	Sewer Condition Assessment	<ul style="list-style-type: none"> Interception chambers / manholes / leakage in sewers etc. 	Yearly	GPWSC/SLC/Environmental officers
3	Influent Characteristics	<ul style="list-style-type: none"> pH, BOD, COD, TSS, SAR, EC, RSC and Faecal coliform 	Quarterly	GPWSC/SLC//Environmental officers
4	Effluent Characteristics	<ul style="list-style-type: none"> pH, TSS, BOD, COD, SAR, EC, RSC and Faecal coliform 	Quarterly	GPWSC/SLC/Environmental officers
5	Sludge quality and compost quality	<ul style="list-style-type: none"> pH, BOD, COD, Sodium, potassium, nitrogen, phosphorous, alkalinity/acidity, and heavy metals such as Cd, Ag, Zn and Cu. 	Six Monthly	GPWSC/SLC/Environmental officers
6	Industrial waste discharge	<ul style="list-style-type: none"> Checking of pre-treatment of waste and its characteristics 	Monthly	GPWSC/SLC/Environmental officers
7	Sewage flow measurement	<ul style="list-style-type: none"> Check for leakages, additional flows if any 	Daily	Operator/GPWSC/SLC/Environmental Officers

Training and Capacity Building

The Training and Capacity Building programs has been proposed for the project, the aiming of this is building environmental awareness and environmental management capacity in the project administration structure as well as in the intended target communities.

Sr. No.	Training	Purpose of the Training	Participants	Duration	Resource Persons/Agencies
1	Introduction to Environmental Management in Proposed RWSS project including EMF	<p>Filling of EDS, procedural & technical aspects of Environmental Assessment</p> <p>To equip with knowledge and skills necessary for undertaking environmental appraisal as per the requirements of the EMF.</p> <p>To undertake periodic supervision of environmental performance of schemes</p> <p>To prepare for planning and monitoring implementation of environmental mitigation measures identified through the appraisal process.</p> <p>To equip with skills necessary for water quality testing using the field testing kits under the community based system for water quality monitoring and surveillance.</p>	<p>Field Staff – EEs, SDEs & JEs)</p> <p>SEs, EEs, SDEs, Environmental Experts – Lab Technicians</p> <p>–</p>	<p>Orientation Workshop – 1 day at circle level</p>	<p>Services of the experts from outside agencies such as PPCB and its affiliated Training and Research Institute, National Productivity Council (NPC) Delhi/ ESCI, Hyderabad etc., may be engaged.</p>
2	Training on Environment Management Framework	To equip with knowledge and skills necessary for undertaking environmental assessment, appraisal, practices, water quality testing as per the requirements of the EMF	SEs, EEs, SDEs, Environmental Experts	Training Programme – 5 days	Outside agencies such as National Productivity Council (NPC) Delhi/ ESCI, Hyderabad etc.,
3	Environmental Awareness and Sensitization	To build awareness on safe drinking water, water conservation, judicious use of water sources for competing demands, environmental sanitation and personal hygiene.	Environmental Staff – GPWSC/SLC members	<p>One day workshop at the village level</p> <p>One day workshop organized annually</p> <p>Total training programs will be about 176 for the project duration.</p>	
4	Orientation for Water Quality monitoring for PRIs	To build awareness on water quality monitoring amongst implementation agencies.	<p>Field Staff – EEs, SDEs & JEs)</p> <p>Env.Staff, GPWSC/SLC members</p>	<p>One day training at the circle level</p> <p>One day training to be organized annually.</p>	

Environmental Codes of Practices (ECoPs)

The details of relevant ECoPs for following activities are described in the report:

- Identification of Sources of Water Supply
- Site Selection for STP
- Identification of Quarry Sites / Borrow Areas
- Selection of location for Community Toilets
- Protecting Source water supply source and Ensuring its Sustainability

- Protecting Ground Water Supply Sources and Ensuring its Sustainability
- Selection of Safe Sanitation Technique Options at individual household and community level
- Solid & Liquid Waste Management at Individual Household and Community level
- Safe Sullage Disposal and Organic Waste Management
- Rain Water Harvesting Techniques
- Management of Water Supply System
- Rehabilitation of Construction sites / Supplementary Sites
- Schemes in Forest Areas
- Water Quality Monitoring and Surveillance
- Water and Waste Water Sampling Procedure
- Construction site management/ Labour Camp
- Occupational Health & Safety