Initial Environmental Examination

Project Number: 42267-031
March 2020

IND: Rajasthan Secondary Towns Development Sector Project – Ratangarh Sewerage Subproject, District – Churu, Rajasthan

Prepared by Project Management Unit, Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited, Government of Rajasthan for the Asian Development Bank.

CURRENCY EQUIVALENTS
(As of 10 March 2020)

Currency unit	–	Indian rupee (₹)
₹1.00	=	$ 0.013434
$1.00	=	₹ 74.4370

ABBREVIATIONS

ADB	–	Asian Development Bank
AMP		Asbestos Management Plan
ASI	–	Archeological Survey of India
BOCW	–	Building and Other Construction Workers
CGWB	–	Central Ground Water Board
CLC	–	City Level Committee
CPCB	–	Central Pollution Control Board
CPHEEO	–	Central Public Health and Environmental Engineering Organization
CTE	–	Consent to Establish
CTO	–	Consent to Operate
DBO	–	Design-Build-Operate
DPR	–	Detailed Project Report
EHS	–	Environmental Health and Safety
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
FAO	–	Food and Agricultural Organization
FCO	–	Fertilizer Control Ordinance
FSSM	–	Fecal Sludge and Septage Management
GOI	–	Government of India
GOR	–	Government of Rajasthan
IEE	–	Initial Environmental Examination
IFC	–	International Finance Corporation
LPCD	–	Liters per Capita per Day
LSGD	–	Local Self Government Department
MLD	–	Million Liters per Day
MOEFCC	–	Ministry of Environment, Forest and Climate Change
NHAI	–	National Highways Authority of India
NOC	–	No Objection Certificate
PHED	–	Public Health Engineering Department
PIU	–	Project Implementation Unit
PMU	–	Project Management Unit
PWD	–	Public Works Department
REA	–	Rapid Environmental Assessment
RoW	–	Right of Way
RPCB	–	Rajasthan State Pollution Control Board
RSTDSP	–	Rajasthan Secondary Towns Development Sector Program
RUDSICO	–	Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation
RUDSICO - EAP	–	Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation – Externally Aided Projects

SBR	–	Sequential Batch Reactor
SEIAA	–	State Environmental Impact Assessment Authority
SPS	–	Safeguard Policy Statement, 2009
STP	–	Sewage Treatment Plant
TEER	–	Treated Effluent Elevated Reservoir
TESR	–	Treated Effluent Storage Reservoir
ULB	–	Urban Local Body
WHO	–	World Health Organization

WEIGHTS AND MEASURES

^{o}C	–	degree centigrade
dB	–	decibels
dia	–	diameter
kg	–	kilogram
km	–	kilometer
kmph	–	kilometre per hour
ha	–	hectare
LPCD	–	liters per capita per day
m	–	meter
mg	–	milligram
mm	–	millimeter
sq.km	–	square kilometer

NOTE{S}

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

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EXECUTIVE SUMMARY

Rajasthan Secondary Towns Development Sector Project (RSTDSP), the fourth phase of investment projects financed by Asian Development Bank (ADB) and implemented by the Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited-Externally Aided Projects (RUDSICO), previously known as Rajasthan Urban Infrastructure Development Project (RUIDP). RSTDSP will support the ongoing efforts of the Government of Rajasthan (GOR) towards improving the water and wastewater services in about 14 towns[1]. RSTDSP seeks to improve WSS services in secondary towns with populations between 20,000-115,000 through a sector loan modality. The project is aligned with the following impact(s): access to potable, affordable, reliable, equitable, and environmentally sustainable drinking water supply in all urban areas of Rajasthan improved;[2] and health status of urban population, especially the poor and under-privileged improved.[3] The project will have the following outcome: urban service delivery in secondary towns of Rajasthan improved. There are three outputs.

Output 1: Water supply infrastructure in project towns improved with climate-resilient and inclusive features. By 2027: (i) about 1,350 kilometers of water supply pipelines will be commissioned through a district metered area approach for effective NRW management, (ii) about 100,000 households will be connected to an improved water supply system (including at least 95% BPL households) with 100% functional meters allowing for the introduction of volumetric billing, (iii) 3 new water treatment plants will be commissioned with total capacity of at least 28 million liters per day and (iv) 2 water treatment plants will be rehabilitated.

Output 2: Sanitation systems in project towns improved with climate-resilient, cost-effective and inclusive features.[4] By 2027: (i) about 1,300 kilometers of sewers will be constructed, (ii) 19 STPs with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 million liters per day will be commissioned and 2 existing STPs will be upgraded to meet current effluent standards, (iii) about 103,000 new household connections (including at least 95% BPL households) to sewer system will be installed, (iv) 1 fecal sludge treatment plant with total 10 kilo liters per day capacity will be commissioned, and (v) agreements for reuse of wastewater mainly for industry or agriculture will be signed in at least 5 project ULBs.

Output 3: Institutional and human capacities strengthened for service improvements, gender equality and sustainability. Under the sector project: (i) at least 500 women will gain professional experience through an internship program at RUDSICO, (ii) about 500 staff and 500 elected representatives of project ULBs, including 80% of eligible women, will report increased knowledge on O&M of WSS services, CWIS, financial sustainability and GESI action plan implementation, (iii) about500 girls will report enhanced knowledge in conducting water audits in schools and households, and (iv) data platforms will be established in all project towns.[5]

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[1] Secondary towns under consideration are Abu Road, Banswara, Didwana, Fatehpur, Khetri, Kuchaman, Laxmangarh, Ladnu, Mandawa, Makrana, Pratapgarh, Ratangarh, Sardarshahar, and Sirohi

[2] Government of Rajasthan. 2018. *Rajasthan: Urban Water Supply Policy.* Jaipur.

[3] Government of Rajasthan. 2016. *State Sewerage and Waste Water Policy*. Jaipur.

[4] Climate resilient and inclusive features included are: improvements in the distribution system to reduce losses; rainfall water harvesting; energy-efficient pumps; solar panels at project facilities; pressure control mechanisms in the water system to help avoid losses through pipe bursts; and wastewater reuse for productive uses.

[5] Includes supervisory control and data acquisition system, hydraulic model, geographic information system, and

Ratangarh sewerage subproject is one of the subprojects proposed under the investment component of RSTDSP. At present, there is no sewerage system in the town. Due to lack of sewerage system, most of the households depends on septic tanks for disposal of sewage. Effluents from septic tanks and sullage are let off into open drains which ultimately accumulates in low lying areas and natural drains in the outskirts of the town.

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 Sewerage. 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 Ratangarh sewerage subproject.

Categorization. Environmental assessment has been conducted for the Ratangarh sewerage subprojects based on (i) preliminary detailed design, and (ii) most likely environmentally sensitive components. The environmental assessment used ADB's rapid environmental assessment (REA) checklists for sewerage works and "No Mitigation Scenario Checklist". The environmental assessment of the Ratangarh sewerage 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.

Ratangarh sewerage subproject 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.

It is designed to develop a comprehensive sewerage system in Ratangarh Town to collect, treat, and dispose/reuse the domestic wastewater safely. This is being provided in a combination of underground sewerage system including treatment facility, and Fecal Sludge and Septage Management (FSSM) system in areas that are not fully developed at present and not feasible to provide sewer network. About 82 percent of the total base year population (2021) is proposed to be covered by sewerage system, while the rest 18 percent will be covered by FSSM. Proposed subproject components include: (i) 159 km of sewer network (200-700 mm diameter), including manholes & 11.71km trenchless, (ii) house sewer connections –13,100 numbers, (iii) two Sewage Pumping Stations (SPS) of capacity – 3.80 MLD and 4.60 MLD, (iv) Construct 3.5km of sewage pumping mains (400mm and 450mm diameter of DI material) (v) two Sewage Treatment Plants (STP) of capacity – 3.80 MLD and 6.10 MLD based on sequential batch reactor (SBR) process, (vi) two treated effluent storage reservoirs (TESR) of capacity 470 KL and 270 KL, (vii) two treated effluent elevated reservoirs (TEER) of capacity 240 KL and 140 KL with 22 m staging, (viii) outfall sewers from STPs to discharge point, to discharge excess/unused treated effluent, (ix) mobile

drinking water and treated wastewater quality monitoring system.

tankers with suction and discharge arrangements to collect and convey septage from septic tanks in FSSM covered area.

Description of the Environment. Subproject components are located in Ratangarh Town and in its immediate surroundings which were converted into urban use for many years ago, and there is no natural habitat left at the proposed sites. There are no protected areas, wetlands, mangroves, or estuaries in or near the project locations. Nearest protected area is Tal Chhapar Sanctuary, which is about 55 km (aerial distance) south-west) of Ratangarh town. The climatic conditions in Ratangarh district is of semi-arid type. Due to desert region, natural drainage system is not well defined, and there are no channels / streams in the area. As per the seismic zoning map of India, Ratangarh falls under the Zone-II, which is the Low earthquake risk zone in India. This zone is termed as “Low damage risk zone”. No involuntary land acquisition of private land is anticipated for this project. The project sites are located in existing road right of way (RoW) and government-owned lands. Proposed STPs (2 nos) will be constructed on vacant municipal lands Sites are covered with sparse tree cover, shrubs and bushes, and no notable wildlife at these sites, and sites are away from habitation. SPS sites are proposed within the town, at lowest elevation point of catchment area to receive the sewage by gravity into the pumping station. One site is located next to the existing drainage pumping station, from where the untreated sewage accumulated is pumped out. These low-lying areas are filled with wastewater and solid waste, and present very unhygienic conditions.

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 already included in site planning and preliminary design. There are no environmentally or archeologically sensitive areas within Ratangarh Town.

Few trees (about10-15 numbers) in selected SPS and STP sites. Trees will be integrated into the layout plan of facilities during the detailed design as far as possible. If any trees required to be cut, compensatory tree plantation will be carried out in 1:3ratio. Two proposed STP sites are vacant lands away from habitations (235 to >500m distance) and surrounded by agricultural and barren lands. Both the SPS sites are close to residential/business area hence mitigation measures such as tree buffer zone, odour sensitive design and standby power arrangements are suggested. At STPs, proposed SBR technology is advanced, treats sewage in a compact aerobic process, therefore issue due to bad odour is minimal. It is proposed to design the STPs to stringent discharge standards suggested by CPCB in 2015. Following the Rajasthan Sewerage and Wastewater Policy, 2016, treated effluent from STPs will be reused in various feasible purposes, and a Reuse plan will be prepared during the detailed design. Various measures are suggested for safe reuse of wastewater and sludge. Excess/surplus of treated effluent will be disposed on land. At STP 2 in Guashala treated effluent will be fully utilized for irrigation within the Gaushala (cattle care centre) premises.

Potential impacts during construction are considered significant but temporary and are common impacts of construction in urban areas, and there are well developed methods to mitigate the same. Two SPS sites are selected in low-lying lands that are technically suitable for pumping stations. At both these places, sites are currently filled with wastewater and solid waste, clearance of which is necessary for construction of SPS. Considering the harmful conditions, and also the need to safely handle and dispose the waste, appropriate mitigation measures are suggested.

Except laying of sewer 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. Sewer laying works will be conducted along public roads in an urban area congested with people, activities and traffic. Therefore these works may have adverse, but temporary impacts arising mainly from the disturbance of residents, businesses and traffic due to construction work; safety risk to workers, public and nearby buildings due to deep trench excavations in the road; access impediment to houses and business, disposal of large quantities of construction waste etc. These are all general impacts of construction in urban areas and there are well developed methods of mitigation that are suggested in the EMP. Trenchless method will be adopted for sewers deeper than 3.5 m and also at main road/railway crossings in traffic areas.

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

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 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. A copy of the updated EMP/ SEMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance. To monitor the operation stage performance, there will also be longer-term surveys to monitor treatment efficiency of STP (raw and treated sewage quality), sludge at STPs. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan. The estimated implementation cost of the EMP is INR 30,490,600 (USD 435,580).

This 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. 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.

Implementation Arrangements. Government of Rajasthan's Local Self Government Department (LSGD) acting through the Rajasthan Urban Drinking Water, Sewerage and

Infrastructure Corporation (RUDSICO) will be the Project Executing Agency. The project management unit (PMU) is housed in RUDSICO's division for externally aided projects (EAP). There will be two Zonal Offices in Jaipur and Jodhpur, and project implementation units (PIUs) in each project town/Urban Local Body (ULB). PMU will be responsible for submitting environmental assessment and monitoring reports to ADB, monitoring of safeguards compliance, addressing safeguards issues, providing support and guidance to PIUs. The PIUs will be responsible for day-to-day monitoring of EMP implementation, information disclosure, consultations and other field-level activities. PMU has appointed a Project Officer for Environment and each PIU will deputize Assistant Safeguard Officers (ASOs). The PMU Environment Project Officer will be assisted by specialists from Project Management and Capacity Building Consultants(PMCBC) and Construction Manag ement and Supervision Consultants (CMSC).

Consultation, Disclosure and Grievance Redress. The stakeholders were involved in developing the IEE through discussions on-site and a public consultation workshop at city level, after which views expressed were incorporated into the IEE and in the planning and development of the project. Apart from on-site public consultations, a stakeholder meeting of City Level Committee (CLC) was held and CLC 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 RUDSICO-EAP 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 CMSC, 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. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted RUDSICO-EAP/PMU websites.

Conclusions and Recommendations. The citizens of the Rajasthan will be the major beneficiaries. The subproject is primarily designed to improve environmental quality and living conditions of Rajasthan Town through provision of sewerage. The benefits arising from this subproject include: (i) better public health particularly reduction in waterborne and infectious diseases; (ii) reduced risk of groundwater contamination; (iii) reduced risk of contamination of treated water supplies; and, reduced dependence on fresh water resource due to reuse of treated wastewater, and (iv) improvement in quality of water due to prevention of disposal of untreated effluent.

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 project as Category "B" is confirmed. The subproject is not covered by the GoI EIA Notification (2006).

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

(i) Obtain all statutory clearances at the earliest time possible and ensure conditions/provisions are incorporated in the detailed design;
(ii) Include this IEE in bid and contract documents;
(iii) Ensure that the project sites are cleared of solid waste and other nuisance materials disposed in designated disposal sites per Solid Waste Management Rules 2000 and its amendment;
(iv) Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2000 and its amendment) and solid waste disposal should have a designated site (dumping on vacant lot is not allowed);
(v) Update the asbestos management plan per site-specific conditions;
(vi) Update/revise this IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location;
(vii) Conduct safeguards induction to the contractor upon award of contract;
(viii) Strictly supervise EMP implementation;
(ix) Ensure contractor appointed qualified EHS officers prior to start of works;
(x) Documentation and reporting on a regular basis as indicated in the IEE;
(xi) Continuous consultations with stakeholders;
(xii) Timely disclosure of information and establishment of grievance redressal mechanism (GRM);
(xiii) Involvement of contractors, including subcontractors, in first-level GRM;
(xiv) Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation.

I. INTRODUCTION

A. Project Background

1. Rajasthan Secondary Towns Development Sector Project (RSTDSP), the fourth phase of investment projects financed by Asian Development Bank (ADB) and implemented by the Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited (RUDSICO), previously known as Rajasthan Urban Infrastructure Development Project (RUIDP). RSTDSP will support the ongoing efforts of the Government of Rajasthan (GOR) towards improving the water and wastewater services in about 14 towns[6]. RSTDSP seeks to improve WSS services in secondary towns with populations between 20,000-115,000 through a sector loan modality. The project is aligned with the following impact(s): access to potable, affordable, reliable, equitable, and environmentally sustainable drinking water supply in all urban areas of Rajasthan improved;[7] and health status of urban population, especially the poor and under-privileged improved.[8] The project will have the following outcome: urban service delivery in secondary towns of Rajasthan improved. There are three outputs:

Output 1: Water supply infrastructure in project towns improved with climate-resilient and inclusive features. By 2027: (i) about 1,350 kilometers of water supply pipelines will be commissioned through a district metered area approach for effective NRW management, (ii) about 100,000 households will be connected to an improved water supply system (including at least 95% BPL households) with 100% functional meters allowing for the introduction of volumetric billing, (iii) 3 new water treatment plants will be commissioned with total capacity of at least 28 million liters per day, and (iv) 2 water treatment plants will be rehabilitated.

Output 2: Sanitation systems in project towns improved with climate-resilient, cost-effective, and inclusive features.[9] By 2027: (i) about 1,300 kilometers of sewers will be constructed, (ii) 19 STPs with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 million liters per day will be commissioned and 2 existing STPs will be upgraded to meet current effluent standards, (iii) about 103,000 new household connections (including at least 95% BPL households) to sewer system will be installed, (iv) 1 fecal sludge treatment plant with total 10 kilo liters per day capacity will be commissioned, and (v) agreements for reuse of wastewater mainly for industry or agriculture will be signed in at least 5 project ULBs.

Output 3: Institutional and human capacities strengthened for service improvements, gender equality, and sustainability. Under the sector project: (i) at least 500 women will gain professional experience through an internship program at RUDSICO; (ii) about 500 staff and 500 elected representatives of project ULBs, including 80% of eligible women, will report increased knowledge on O&M of WSS services, CWIS, financial

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[7] Government of Rajasthan. 2018. *Rajasthan: Urban Water Supply Policy.* Jaipur.

[8] Government of Rajasthan. 2016. *State Sewerage and Waste Water Policy*. Jaipur.

[9] Climate resilient and inclusive features included are: improvements in the distribution system to reduce losses; rainfall water harvesting; energy-efficient pumps; solar panels at project facilities; pressure control mechanisms in the water system to help avoid losses through pipe bursts; and wastewater reuse for productive uses.

sustainability, and GESI action plan implementation; (iii) about 500 girls will report enhanced knowledge in conducting water audits in schools and households; and (iv) data platforms will be established in all project towns.[10]

2. A series of subprojects will be implemented under the Project, with each subproject providing improvements to water supply or sewerage or both in a project town. Ratangarh Town sewerage subproject is one of the subprojects proposed under RSTDSP. Water supply is currently intermittent and suffers with huge losses and quality issues. At present no proper sewerage system exists in the town. Most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage water is let off into open drains which ultimately collect in low lying areas and natural drains in the outskirts of the town. It is therefore proposed to improve sewerage in the town. 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 subproject.

B. Purpose of Initial Environmental Examination Report

3. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment (REA) Checklist for sewerage treatment (Appendix 1). Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the 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.

4. The Ratangarh sewerage subproject is proposed for implementation under the design-build-operate (DBO) modality, where in which 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 RUDSICO-EAP (PMU). The IEE was 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 was an integral part of the IEE.

5. 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.

[10] Includes supervisory control and data acquisition system, hydraulic model, geographic information system, and drinking water and treated wastewater quality monitoring system.

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

C. Report Structure

7. This Report contains the following eleven (11) sections including the executive summary at the beginning of the report:

(i) Executive Summary;
(ii) Introduction;
(iii) Description of the Project;
(iv) Analysis of alternatives ;
(v) Policy, Legal and Administrative Framework ;
(vi) Description of the Environment;
(vii) Anticipated Environmental Impacts and Mitigation Measures;
(viii) Public consultation and information disclosure;
(ix) Grievance Redress Mechanism;
(x) Environmental management plan; and
(xi) Conclusions and Recommendations

II. DESCRIPTION OF THE PROJECT

A. Ratangarh Town

8. Ratangarh is a town in Churu district of Rajasthan in India. It is part of Shekhawati region. Ratangarh is situated 200 km off Jaipur in the north and connected by National Highway NH-52. There are so many temples in Ratangarh that it has earned the nickname "the Varanasi of Rajasthan". Salasar Balaji, the most famous and widely popular religious spot in the District is situated 45 km south-east of Ratangarh. Ratangarh is located at 28.08°N 74.6°E with an average elevation of 312 m above the mean sea level.

B. Present Status of Water Supply and Sewerage

9. **Water Supply**. The major source of drinking water for Ratangarh is tube well and open well. The Public Health Engineering Department (PHED) takes care of the water supply in the town. The present water supply capacity in the town is 44 liters per capita per day. The quality of the water supply at Ratangarh has been tested periodically and the recent test results show that it is of acceptable quality as per drinking water specifications, IS 10500 (2012).

10. **Sewerage.** At present, Ratangarh Municipality does not have any sewerage system. Presently the wastewater from kitchens and bathrooms is discharged into roadside drains. Open defecation is not uncommon. Most of the residential buildings, commercial buildings, and educational institutions have on-site septic tanks. The effluent from the septic tanks is directly let into the open drains. Untreated wastewater and septic tank effluent that is discharged into roadside open drains is accumulated in the low-lying areas in the outskirts of the town. Indiscriminate solid waste disposal is prevalent in the town. Low lying areas are filled with wastewater and solid waste.

11. In the absence of a safe collection and disposal system for sewage, the people of Ratangarh are facing unhealthy and unhygienic environmental conditions therefore public representatives are also demanding facilities of sewerage system on priority basis.

C. Proposed Sewerage Infrastructure in Ratangarh under RSTDSP

12. **Sewerage Works.** Under RSTDSP, it is proposed to develop a sewerage system in Ratangarh town to collect, treat, and dispose/reuse the domestic wastewater safely. This is being provided in a combination of underground sewerage system including treatment facility, and Fecal Sludge and Septage Management (FSSM) system in areas that are not fully developed at present and not feasible to provide sewer network. About 82% of the total base year population (2021) is proposed to be covered by sewerage system, while the rest 18% will be covered by FSSM. The objectives of the proposed sewerage works are:

(i) Construction of sewerage network, including house sewer connection and collection of wastewaters from point of generation;
(ii) Construction of energy efficient and mechanized Sewage Treatment Plant and electromechanical machinery;
(iii) Septage management and decentralized wastewater treatment systems in suitable areas;
(iv) Provision for reuse of treated effluent etc.;
(v) To ensure 100% house service connections for wastewater collection; and

(vi) To ensure sustainability of the project by implementing a comprehensive asset management plan focusing on an integrated approach to operation and maintenance to minimize lifecycle costs.

13. The sewer system will be designed as a separate sewer system that carries only the domestic/municipal wastewater. The open drain system that exists in the town will cater to storm runoff. No industrial wastewater will be allowed into the sewers. This subproject complies with the environmental subproject selection criteria (Appendix 2) agreed between the government and the ADB.

14. **Sewage treatment.** It is proposed to develop Sequential Batch Reactor (SBR) based sewage treatment facility that will treat the incoming sewage to stringent discharge standards specified in this IEE and included in the bid documents. SBR is a cyclic activated sludge treatment process and provides highest treatment efficiency possible in a single step biological process. Two treatment plants of capacities 3.80 MLD and 6.10 MLD proposed to meet the demand.

15. **Reuse of treated effluent.** The Rajasthan State Sewerage and Wastewater Policy, 2016, promotes the reuse of treated sewage for non-potable applications, and also to make sewerage projects environmentally sustainable. This policy:

(i) aims to ensure improved health status of urban population, specially the poor and under privileged, through the provision of sustainable sanitation services and protection of environment;
(ii) promotes the reuse and provides guidance on the same;
(iii) prioritizes reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry, and non-potable domestic reuse;
(iv) requires monitoring of treated wastewater quality, soil quality etc.;
(v) prohibits artificial recharge of aquifers using treated wastewater, and promotes construction of storage tanks to store treated wastewater to facilitate reuse;
(vi) prescribes that the detailed project report (DPR) of a sewerage project should clearly define the best reuse option specific to the town and prepare a Reuse Action Plan part of the DPR duly following the water quality norms and legal implications; and
(vii) suggests use of sludge produced from the treatment as fertilizer and soil conditioner after processing.

16. To further the implementation of the Policy, to promote the reuse and provide guidance to the stakeholders, the Local Self Government Department (LSGD) is currently in the process of publishing “Guidelines for Reuse of Treated Wastewater in Rajasthan 2019. These guidelines:

(i) promote the use the treated wastewater and envisages to maximize the collection and treatment of sewage generated and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources; and
(ii) promotes the use of treated wastewater as an economic resource.

17. Under the subproject, following the State Policy, treated effluent will be reused in applications such as agriculture, horticulture, development of urban forestry and industry as appropriate. A Treated Effluent Reuse Plan will be prepared by the DBO Contractor during the detailed design phase as envisage by the State Policy, and reuse modalities will be firmed up. To facilitate reuse and supply of treated effluent, A treated effluent storage reservoir (TESR), effluent

pumping station and a treated effluent elevated reservoir (TEER) are proposed at the STP in the subproject. Total storage capacity of TESR and TEER at STP1 is 20 % and for STP 2 is 7% of respective STP treatment capacity. Treated effluent will be chlorinated and prior to its entry into TESR/TEER.

18. **Discharge of treated wastewater**. The excess / surplus treated wastewater that is not reused will be discharged into nearby land, water channels/drains, and necessary facilities like pipelines and pumping requirements, will be developed. Ratangarh is in Churu district, which is located in western Rajasthan, part of Thar desert. Being a desert region, it is not part of any river basin, and the drainage pattern is not defined, therefore there are no notable natural drainage channels or stream. Soil is mostly sandy, and region receives low rainfall. At present, wastewater from the houses, and run off during the rains, accumulates in the low-lying areas in the town. There are drainage pumping stations set up by municipality in the low-lying areas in the town, from where accumulated wastewater/water is pumped to outside the town, and discharged on land, which again accumulates in low lying areas. Due to sandy soil, and high temperature, large proportion of accumulated water is lost due to evaporation and infiltration.

19. **Sludge treatment and disposal.** A Sludge Sump shall be provided to collect thickened sludge from SBR basins. Supernatant from the sump will be returned to inlet/equalization tank for treatment. Sludge from sump will be pumped to sludge thickener, and the thickened sludge will be pumped to mechanical sludge dewatering system (such as centrifuge). Dewatered sludge cake will further air dried in a sludge storage shed for 15 days and disposed in an identified site.

20. **Operation and maintenance (O and M) of Sewerage system**. The DBO contractor will operate and maintain the system for a period of 10 years after completion of construction and commissioning the new system. This will include the following:

(i) Sewage pumping system to pump sewage to STP including maintenance of entire system and maintaining the infrastructure (power charges to be paid by the Employer);
(ii) Sewage treatment plant (STP) including maintenance of entire system and maintaining the infrastructure (power charges to be paid by the Employer);
(iii) Managing the sewerage network for collection of sewage including maintenance of entire system from property chambers up to disposal outfall of Sewage to STP
(iv) Sampling treated effluent to ensure that it meets the guaranteed treatment parameters;
(v) Provide house connections for collection of sewage from house properties on approval or sanction by Employer;
(vi) Contractor will provide continuous on-the-job trainings that will start from the day the contractor gets mobilized, and other capacity building programs by the contractor as important regular activities for staff of the Employer, PHED and Nagar Palika Ratangarh; and
(vii) Maintaining environmental norms at entire system components.

21. **Fecal Sludge and Septage Management (FSSM)**. It is proposed to provide FSSM system in areas where the population density is low (less than 100 persons per hectare) and will not generate sewage in adequate quantity to convey by sewer network. FSSM will provide low cost sanitation in areas where sewer network is not an immediate requirement, will make septage collection, treatment and effluent management environment- friendly. Of the 35 wards in Ratangarh, there are 14 wards (Wards 1,2,3,9, 13,16,17,18,24,25,26,31,33 and 35) that have areas with scattered development and low population density. Total base year (2021) population

of these wards is 35,467, of which about 40% (14,005persons) will be covered with FSSM and rest will be covered by sewer network. This is about 18% of total projected town population of base year (79,358 persons) . Under the FSSM, fecal sludge / septage will be collected from the household level septic tanks using truck mounted mobile desludging equipment and transported to Sewage Treatment Plant (STP) for treatment. STP will have necessary provisions to receive and treat the septage along with the wastewater received via sewer network. STP will be designed accordingly by the successful bidder during the detailed design phase to comply with the treated effluent discharge standards specified in the bidding documents.

22. **Operation and maintenance (O and M) of FSSM**. The DBO contractor will operate and maintain the system for a period of 10 years. This will include the following:

(i) Desludging the septic tanks/pits from the individual houses using mobile truck mounted desludging equipment;
(ii) Transportation of the vehicle to STP and dispose-off septage to Inlet chamber/screen chamber of STP; and
(iii) Cleaning of the tank and proper garaging of the vehicle at designated place.

D. Proposed Subproject Components

23. Table 1 shows the nature and size of the various civil works components of this sewerage subproject in Ratangarh. Conceptual layout plans and alignments are shown in Figures 1 to Figure 17.

24. Subproject is proposed for implementation under (Design-Build-Operate) modality, wherein which the successful bidder will design the sewerage systems and components (based on the feasibility / preliminary design / standards / guidelines provided in the bid document), construct, commission, and operate for 10 years, after which it will be transferred to Ratangarh Nagar Palika. Therefore, at this stage, subproject is designed only in outline, and the details of components of the subproject provided in the table 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 the below table, and the IEE will be further updated during the detailed design phase.

Table 1: Ratangarh Subproject Components

Infrastructure	Function	Description	Location
Sewerage			
Sewage collection network including house connections	Collect wastewater from houses and convey by a combination of gravity and pressure pumping to pumping station and ultimately to the STPs	New 159 km of diameter 200-700 mm • 145.31 km HDPE DWC pipes • 1.8 km RCC pipes • 11.71 km HDPE PN6 pipes • Manholes • House sewer connections (13100 numbers)	Sewers will be laid underground in the roads and internal streets in the town. Sewers will be located in the centre of the road. The existing/proposed water pipes are located on side of the roads, and therefore sewers will be laid in the centre without distributing the water pipes. It is proposed that 10 km length of sewers will be laid by trenchless method; these will railway/main road crossings, and the sewers to be laid deeper

Infrastructure	Function	Description	Location
			than 3.5 m
Sewage Treatment Plant (STP)	Treatment of collected wastewater to meet stipulated discharge standards	*New – 2 STPs* • 3.80 MLD • 6.10 MLD Components • SBR (sequential batch reactor) based STP with primary, secondary, tertiary treatment • Disinfection of treated wastewater for reuse – chlorination tank • sludge management (sludge collection, thickening, dewatering and disposal) • Laboratory, and online testing facilities for BOD, COD, TSS etc.,) • Instrumentation, automation, SCADA etc.,	Proposed STP sites are located at: 1. STP1 (3.80 MLD): Near NH-11 Land owned by Nagar Palika. Total land required for STP) will be around 3500 sq mtr and sufficient land (3900 sqm) is available Lat.28°03'23.49"N, Lo74°38'13.18"E). 2. STP 2 (6.10 MLD)**:** Within Gaushala (a cattle care centre) premises on Churu road. Land owned by Gausala Trust.The land required for the STP will be around 4800 sq m and sufficient land (6000 sqm) is available .Gaushala Trust has provided a no objection certificate (NOC) for use of its land for this sub project component**.** Lat.28°5'5.31"N, Long 74°38'6.94"E.
Sewage Pumping Station (SPS)	Sewer pumping stations are used to move wastewater to higher elevations in order to allow transport by gravity flow until the sewage reaches treatment plant.	*New – 2 SPSs* • SPS 1 (3.80 MLD) • SPS 2 (4.60MLD) Components • Civil (including inlet structure), electrical, and mechanical works including Pumps, motors, internal piping, sluice valves, NRVs, Expansion joints, mechanical screen, screen conveyor, EOT/HOT Crane etc. • Instrumentation, automation, SCADA etc.,	1. SPS 1 (3.80 MLD): Near BSNL office; land is owned by Nagar Palika **Lat. 28°04'21.43"N** Long.74°37'34.46"E 2.SPS 2 (4.60MLD): Ward No-1,near Main Ginani; land owned is by Nagar Palika Lat.28°04'43.13"N, Long.74°36'40.28"E Total land required for SPS construction will be around 1500 sq m each and sufficient land is available.
Treated wastewater storage tanks	Store the treated wastewater for reuse, and also provide adequate pressure / elevation for supply	*New* • Treated Effluent Storage Reservoir (TESR)– 2 no.s (1 each at STPs) – 470 KL and 270 KL • Treated Effluent Elevated Reservoir (TEER) – 2 nos. (1 each at STPs) –	At two STPs – STP 1 (3.80 MLD) – (near NH 11) ▪ Treated Effluent Storage Reservoir (TESR) Capacity : 470 KL ▪ Treated Effluent Elevated Reservoir (TEER)

Infrastructure	Function	Description	Location
		240 KL and 140 KLwith 22 m staging • Provision for mobile tanker filling points and rising mains/ distribution system, bypass/overflow arrangements at the TEER to facilitate reuse • Instrumentation, automation, SCADA etc.,	Capacity : 240 KL with 22 mtr staging STP 2 (6.10 MLD – (at Gaushala**)** ▪ Treated Effluent Storage Reservoir (TESR) Capacity : 270 KL ▪ Treated Effluent Elevated Reservoir (TEER) Capacity : 140 KL, with 22 mtr staging
Outflow sewer	Disposal of treated effluent – surplus/excess treated effluent that is not put to reuse will be discharged through outflow sewer	• Outfall sewer / effluent discharge pipe • This will be designed during the detailed design phase	From STP outlets to government land through pipe along government owned vacant lands / existing roads
FSSM			
Truck mounted mobile desludging equipment	Desludging of septage from household pits/ septic tanks, transportation and discharge to STP	• mobile tankers (3500 Ltrs capacity) with suction and discharge arrangements – number of tankers to be procured will be estimated during the detailed design	Mobile equipment. FSSM has been proposed for Ward nos 1,2,3,9, 13,16,17,18,24,25,26,31,33 and 35 which are having low population density, unfavorable topography and safe disposal of waste water generation from these wards is also a major problem.

E. Subproject Benefits

25. The subproject is primarily designed to improve environmental quality and living conditions of Ratangarh Town through provision of sewerage. The benefits arising from this subproject include: (i) better public health particularly reduction in waterborne and infectious diseases due to improved sewerage system in town; (ii) reduced risk of groundwater contamination through appropriate sewer collection and treatment; (iii) reduced risk of contamination of treated water supplies; and (iv) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards

F. Implementation Schedule

26. After the completion feasibility study/preliminary designs, bids were invited in March 2019 for the subproject to be implemented under the DBO (design-build-operate) modality. Bids will be awarded in February/March 2020. Successful bidder then will carry out detailed designs and construction is likely to take about 36 months. After completion of construction and commissioning, scheme will be operated by DBO contractor for 10 years, and after which the operation and maintenance will be carried out by Ratangarh Nagar Palika.

Figure 1: Schematic Diagram of Proposed Works

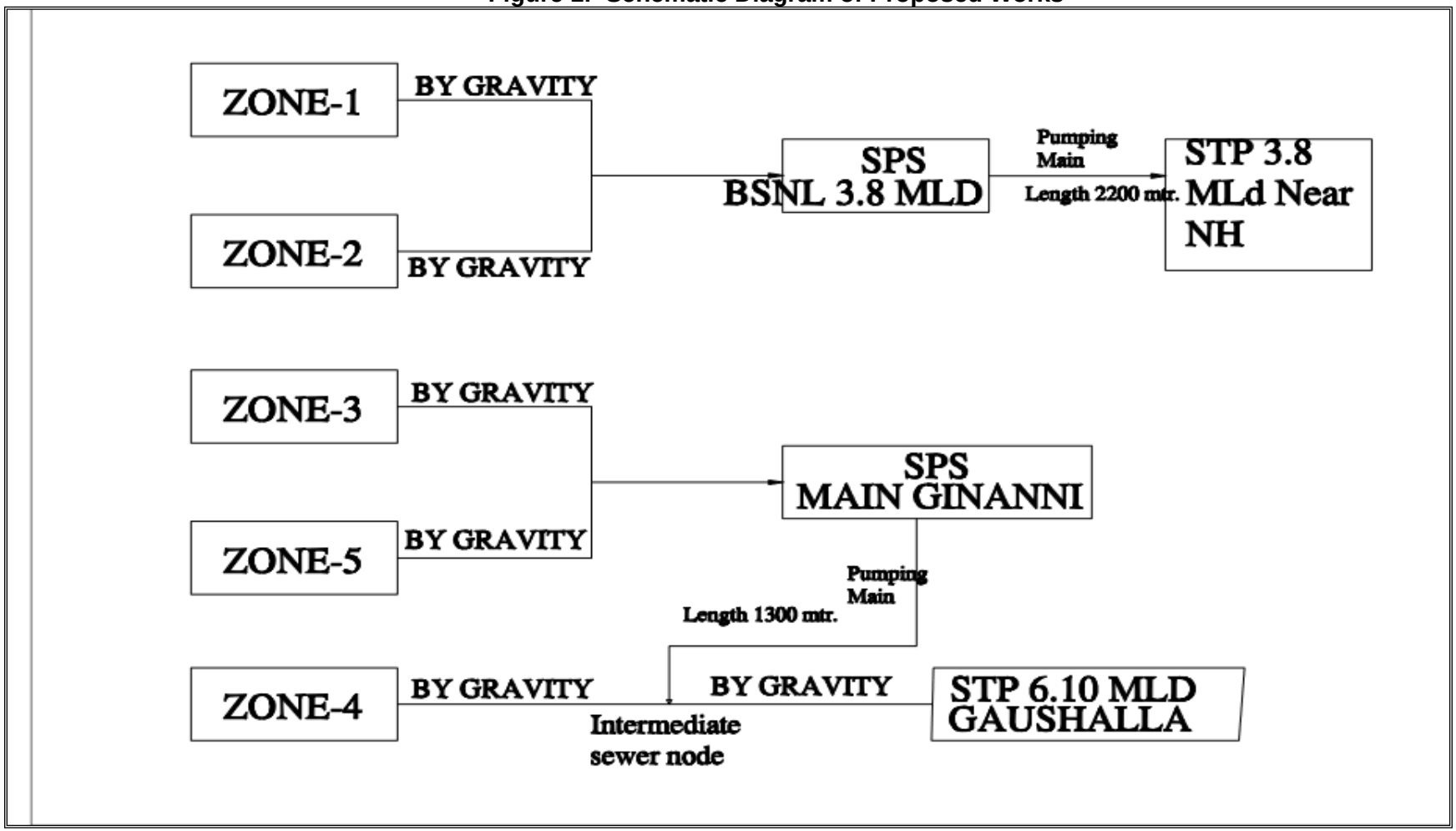


Figure 2: Proposed STP 1 Location near NH-11

Water body visible in the image is accumulated waste water of the town being pumped here

.

Figure 3: Proposed STP 2 Location at Gaushala

Figure 4: Proposed SPS I near BSNL Office

Figure 5: Proposed SPS-2 near Main Ginani

Figure 6: Proposed Project Components on SOI Toposheet

Figure 7: FSSM Coverage Areas of Ratangarh

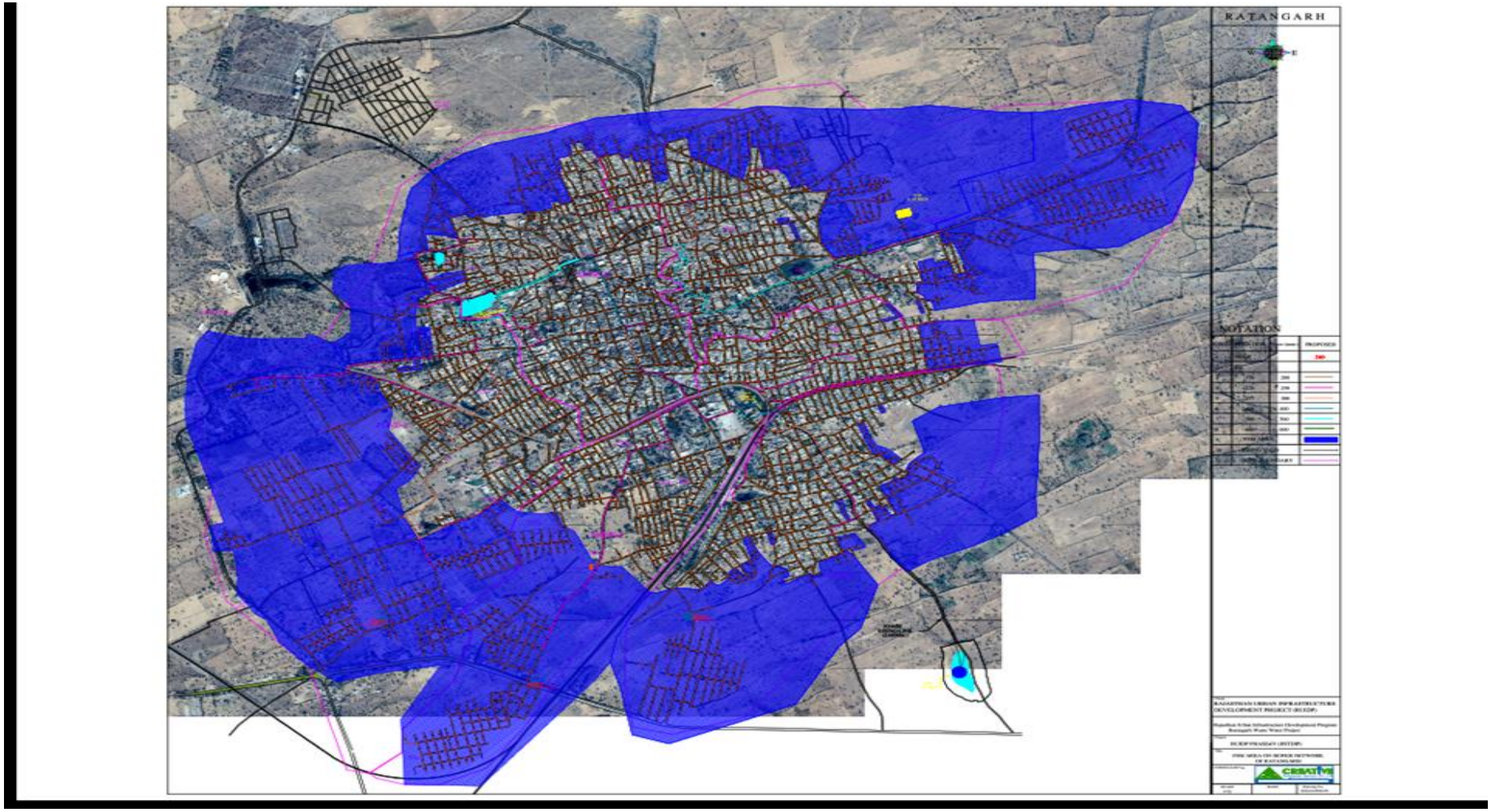


Figure 8 : Proposed Alignment from SPS1 to STP 2 2.Km (300 mm dia)

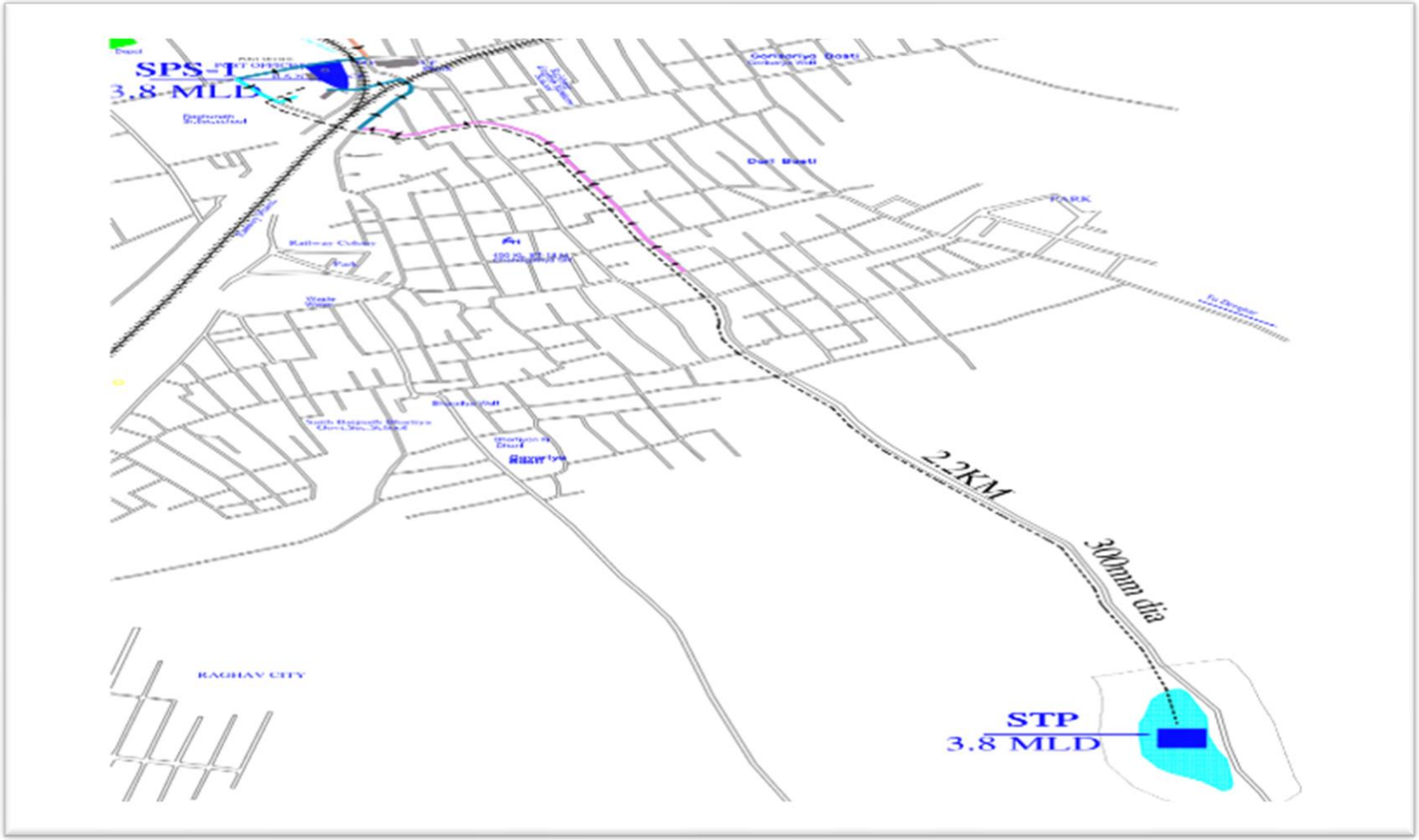


Figure 9: Proposed Alignment from SPS 2 to STP 2 - (dia 350 to 500 mm)

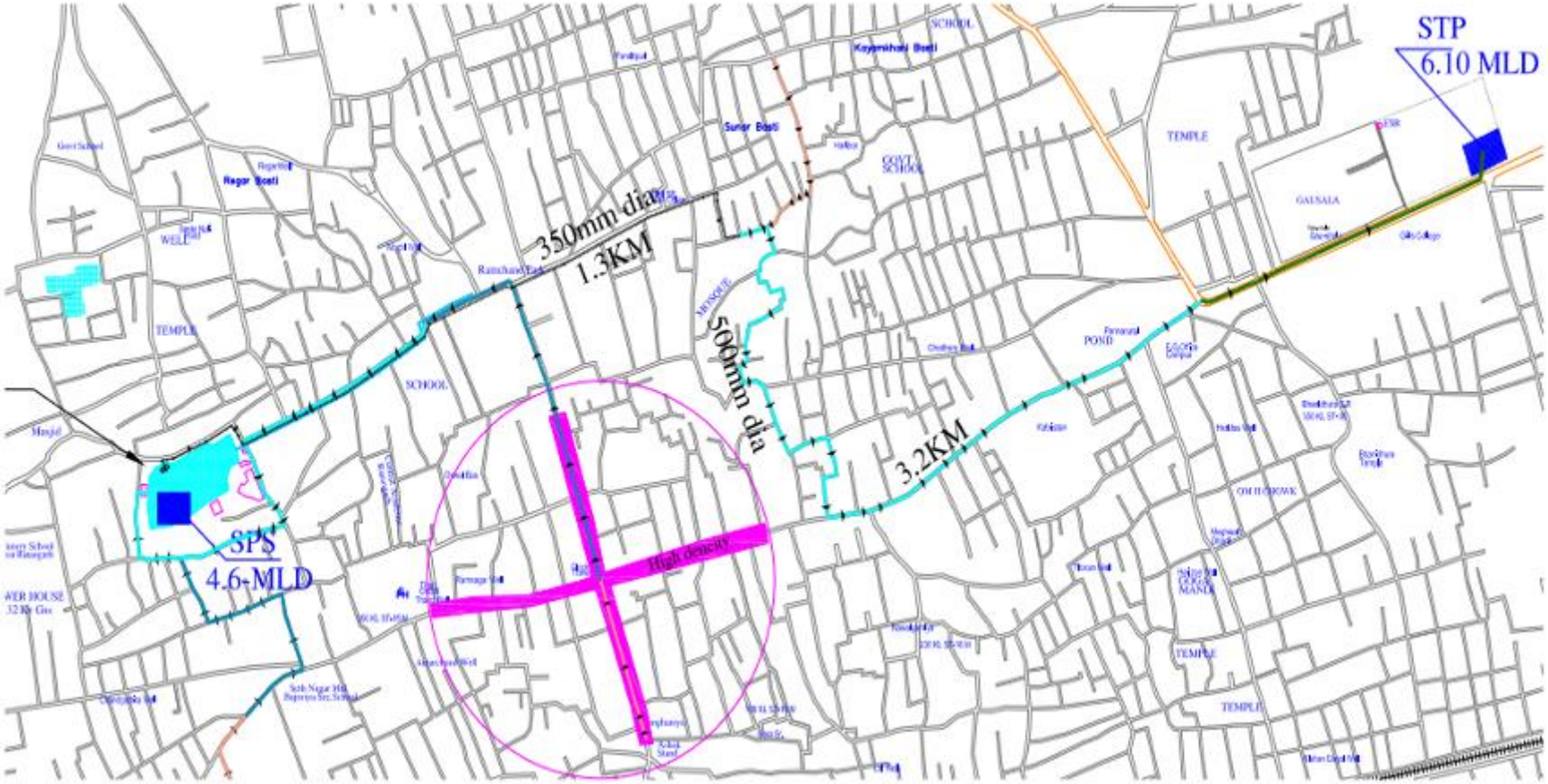


Figure 10: Proposed Sewer Network Coverage: High, Medium, and Low Density reas

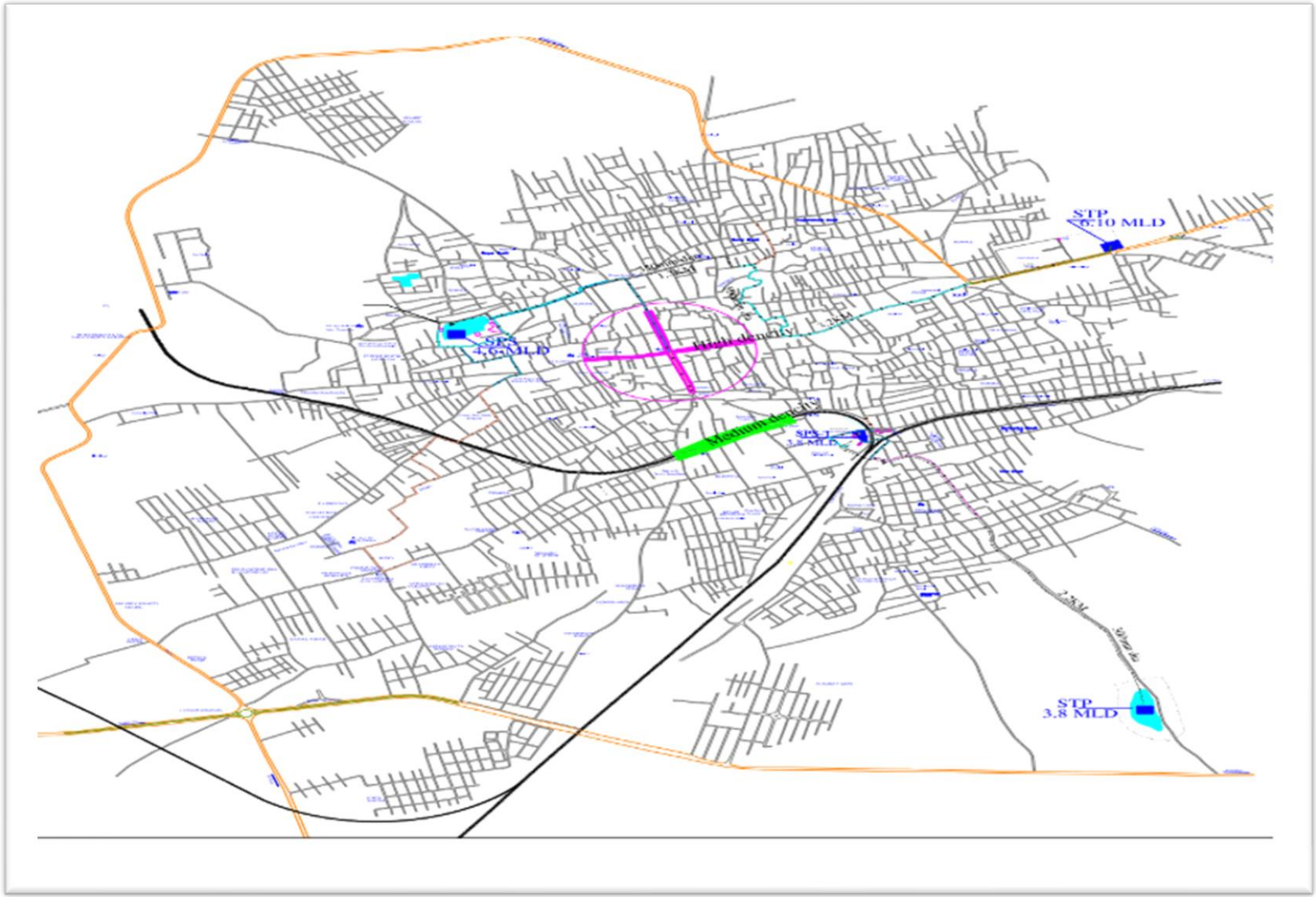


Figure 11: Schematic Layout of Proposed STPs

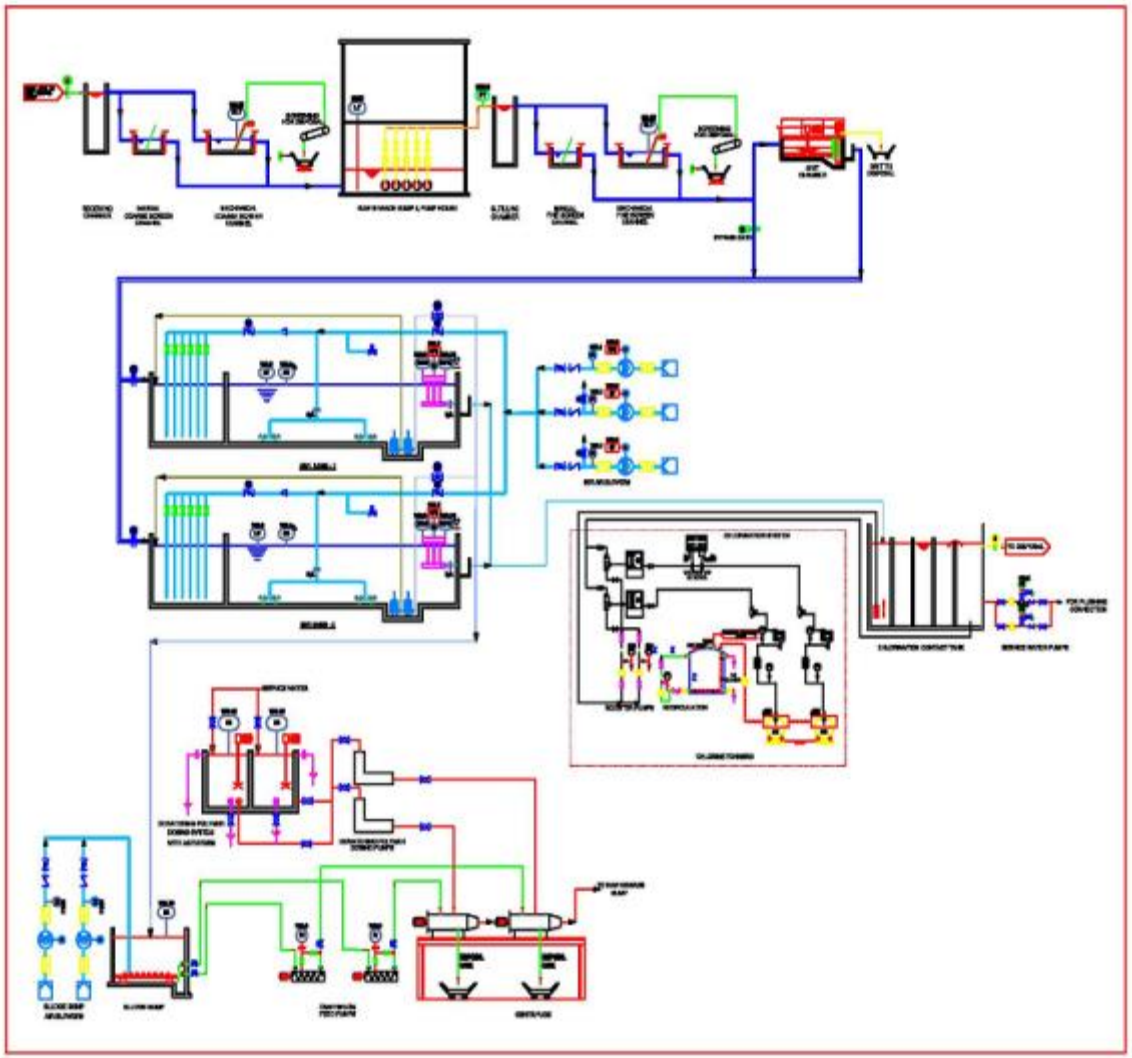


Figure 12: Layout Plan for Proposed STP) near NH-11

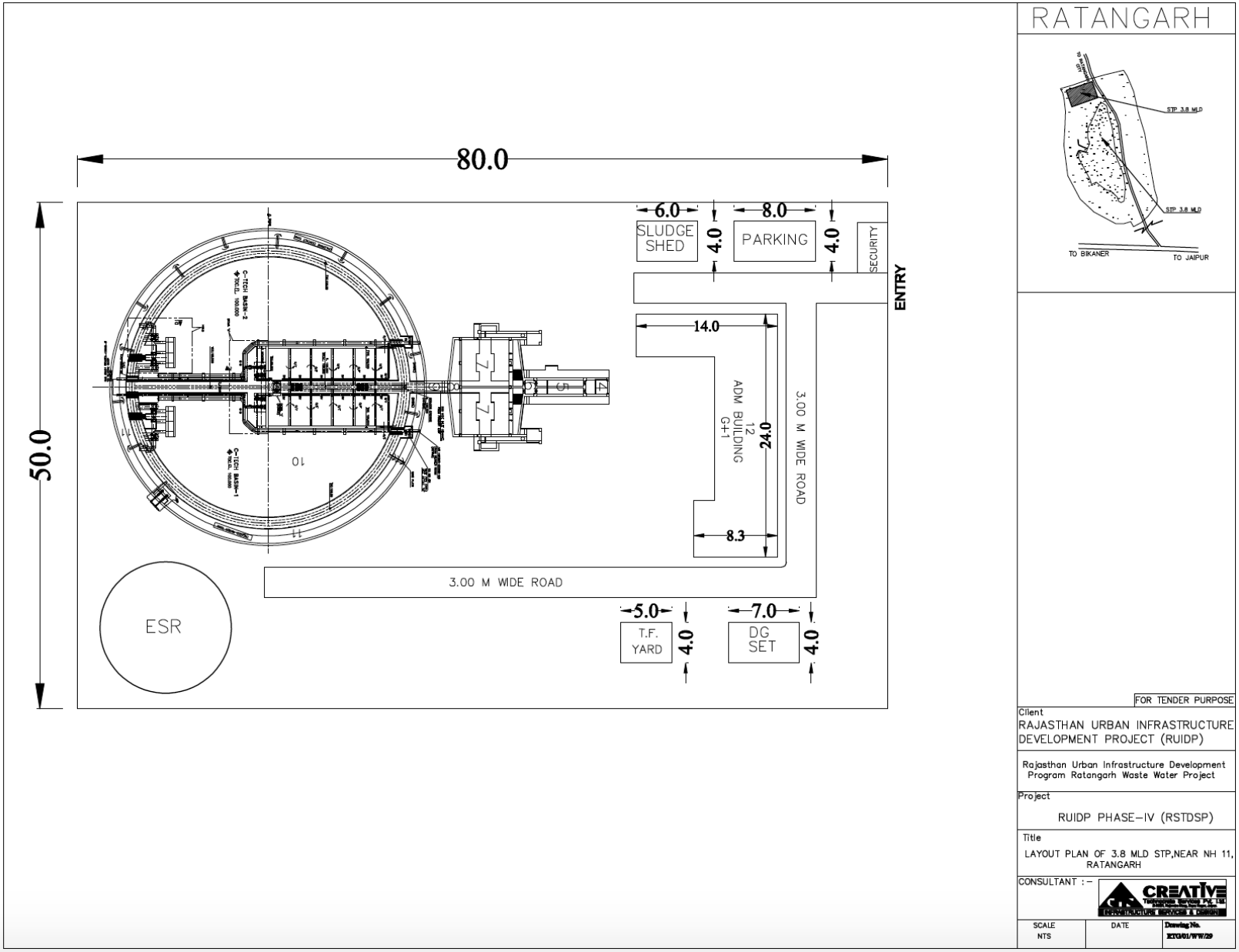


Figure 13: Layout Plan for Proposed STP 2 near Gaushala

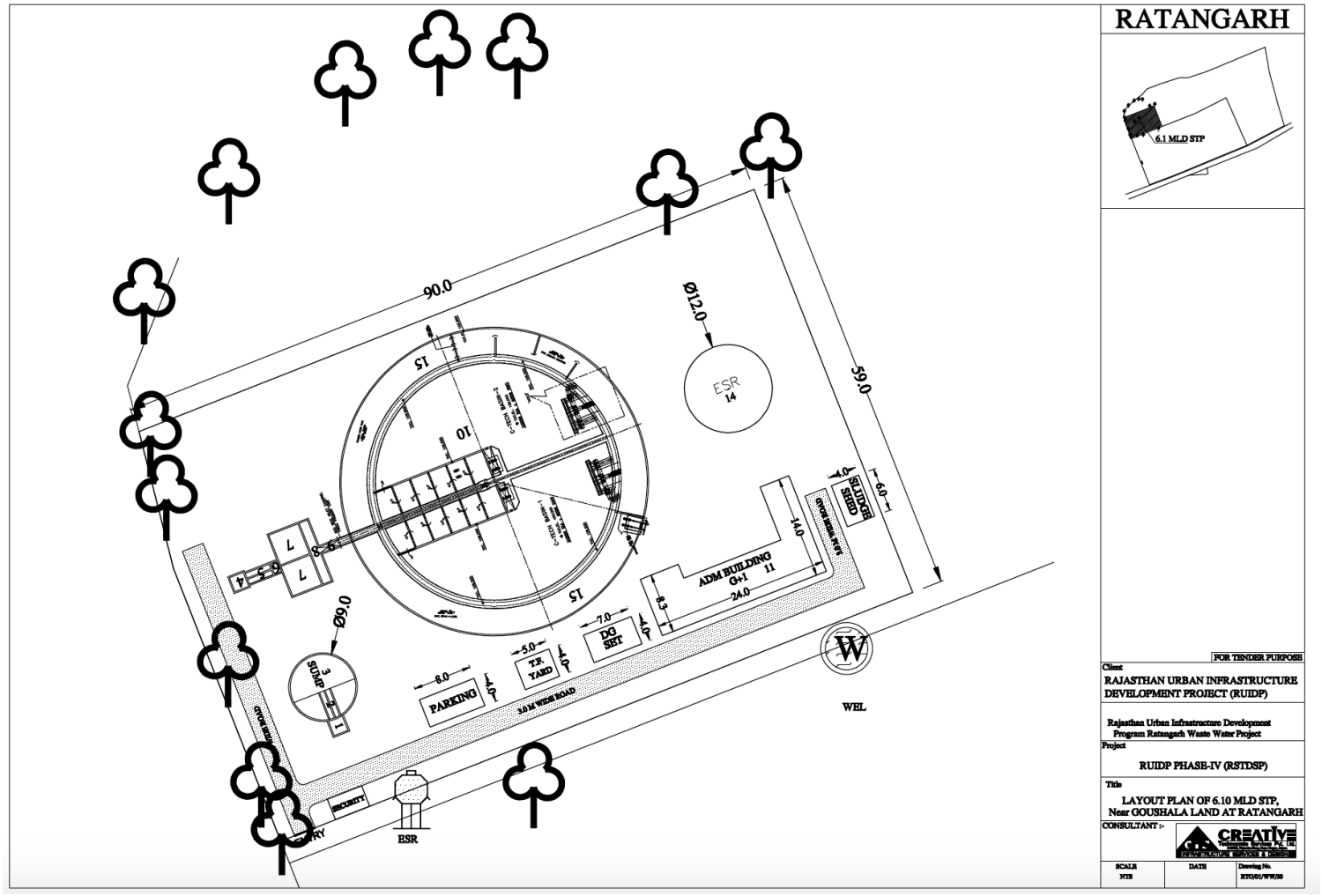


Figure 14: Layout Plan for Proposed SPS 1 near BSNL Office

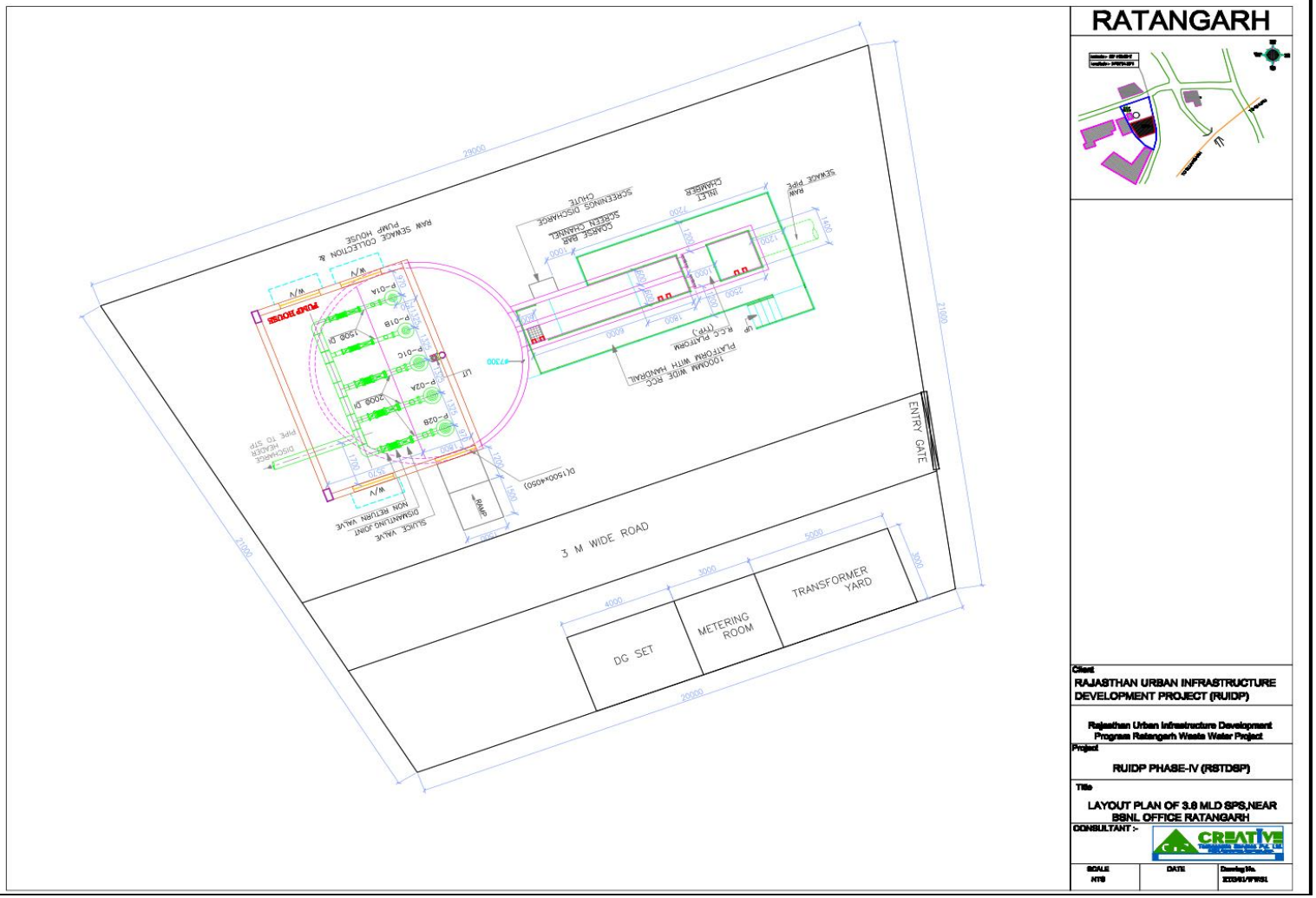


Figure 15: Layout Plan for Proposed SPS 2 near Main Ginani

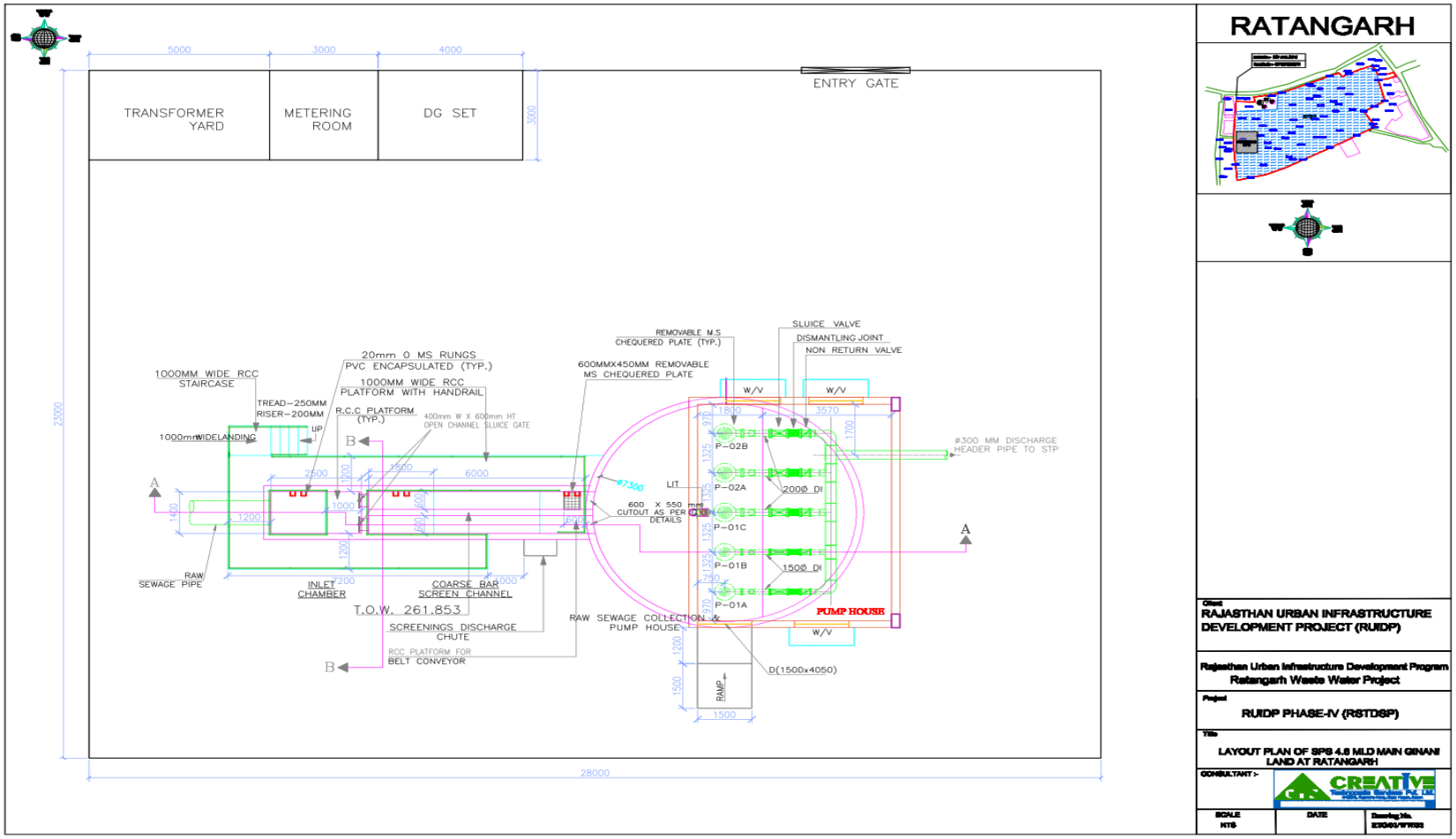


Figure 16: Layout of the Treated Effluent Elevated Reservoir (TEER)

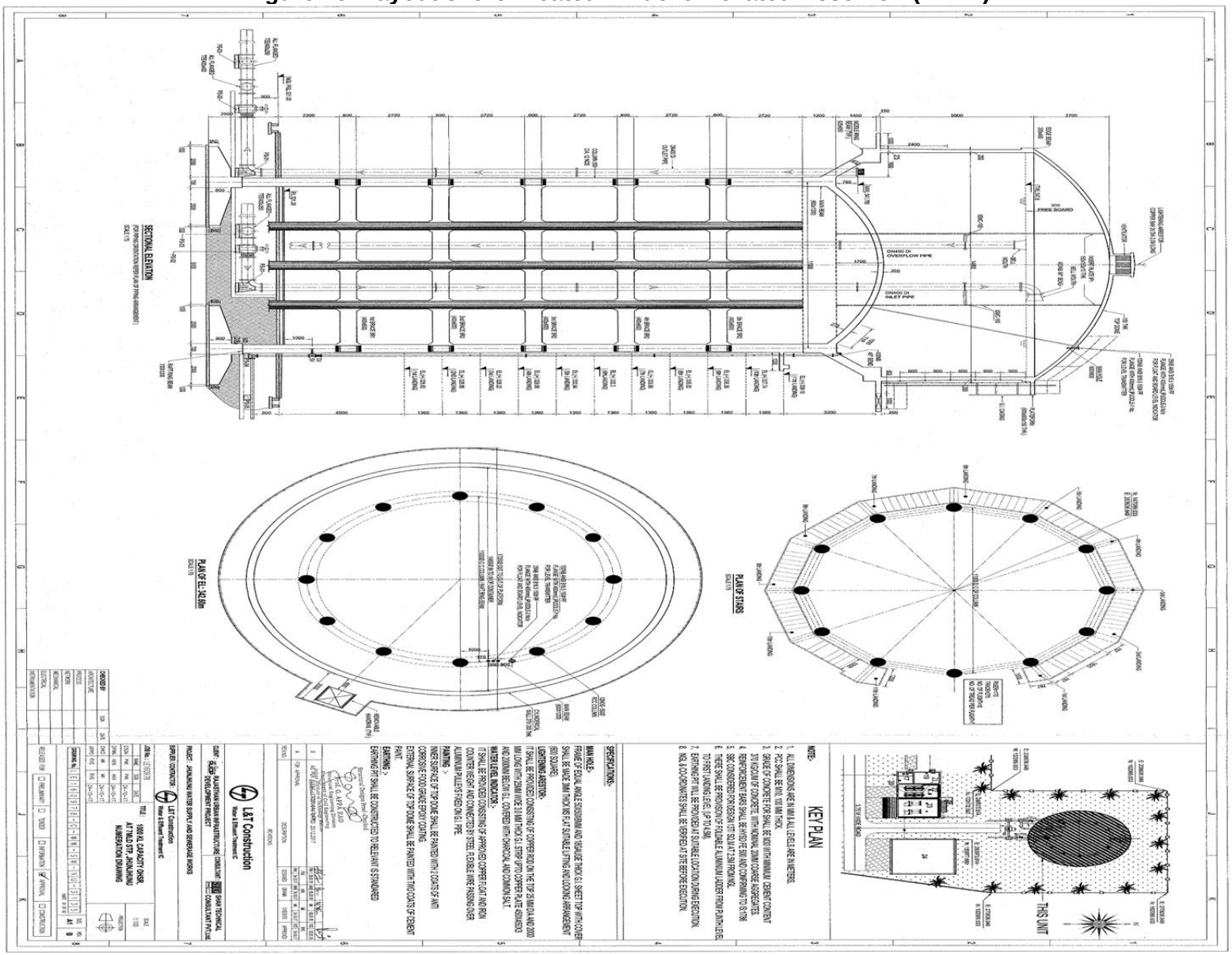
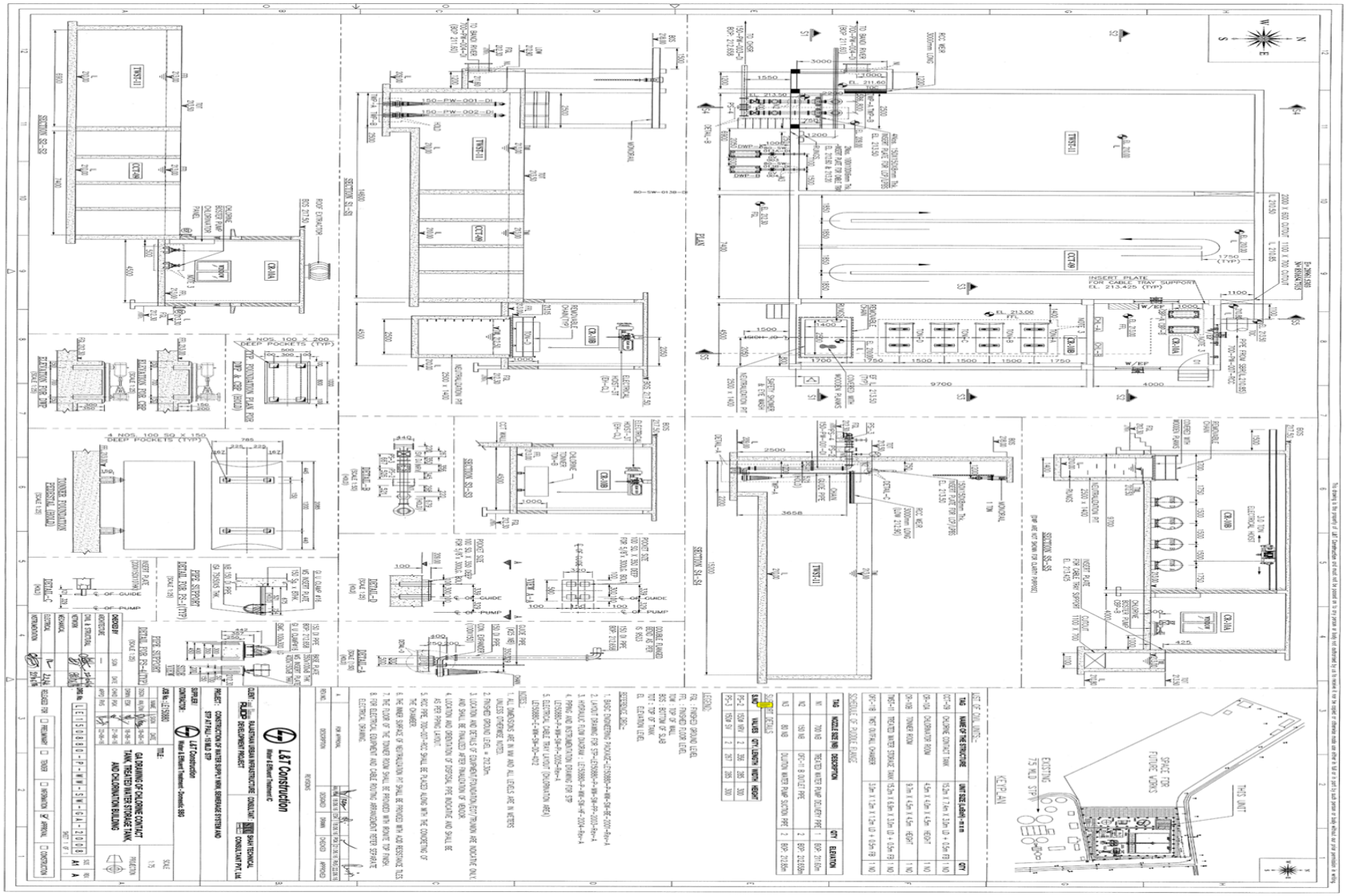


Figure 17: Layout of the Effluent Pumping Station (EPS)



III. ANALYSIS OF ALTERNATIVES

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

28. The proposed sewerage subproject component in Ratangarh includes sewage collection network, transmission, treatment, and treated wastewater reuse and disposal. Descriptions of various alternatives considered for critical components such as water source, sewage treatment, treated wastewater disposal etc., are presented in the following table.

Table 2: Analysis of Alternatives

1.	**Project Need – No Project Alternative**
Type of alternative	**'No project' / 'with project' alternative**
Description of alternatives	**<u>No project alternative</u>** Ratangarh subproject is proposed to improve the service levels of basic infrastructure – sewerage, which will ultimately improve At present, in Ratangarh Town residents suffer from inadequate, intermittent and low-pressure supply at a rate of 44 liters per capita per day (lpcd), which is considerably less than the norm of 135 lpcd. Water is supplied on alternative days, for a duration of just 1.5 hours. At present there is no sewerage system in the town; households depend on individual septic tanks or direct discharge into open drains that meant for surface drainage. There are no soak pits, and the effluent discharge into open drains. The untreated / partially treated sewage flow in the open drains through habitation areas and discharged into rivers/streams. Living conditions due to lack of proper water supply and sewerage, are poor, unhealthy, unhygienic. Lack of infrastructure is also causing environmental pollution, overall poor quality of life. Poor environmental quality affects the urban poor more. The project intends to provide following benefits to the town population, and the "no project" alternative will deprive people of these benefits: • better public health particularly reduction in waterborne and infectious diseases; • reduced risk of groundwater contamination through appropriate sewer collection and treatment; • reduced risk of contamination of treated water supplies; and, • improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards **<u>With project alternative</u>** The proposed RSTDSP, will support the ongoing efforts of the Government of Rajasthan (the government) towards improving water supply and sewerage systems in the project towns. The project will construct the sewerage network, new waste water treatment plants, and improve fecal sludge management, and decentralized waste water management systems in the project towns. The project is expected to increase

<table>
<tr><td></td><td>operational efficiency, improve service delivery, and result in a positive impact on health and quality of life for the residents of project towns in the state.

With the subproject, Ratangarh town population (71,124 - 2011 Census and 97,946 – 2051, projected) will have sewerage system. The sewerage system will remove the human waste from their homes safely and quickly As a result, good hygiene and sanitation practices will be promoted and there will be reduced health and safety risks.

Overall, the ‘with project alternative’ will bring about improved public health and living environment that will contribute to improved quality of life in the municipality. Improved sanitation will create an enabling environment for local economic development and improved social services that communities within the sphere of influence of the municipality will benefit from; thus, contributing to the overall economic development of the region.
.</td></tr>
<tr><td>Selected Alternative</td><td>Without subproject would yield the town to be continuously under-serviced 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 and basic sanitation.

Given the large-scale benefits to the population and environment, ‘with project’ alternative is considered appropriate</td></tr>
<tr><td>2</td><td>Sewage treatment process</td></tr>
<tr><td>Type of alternative</td><td>Sewage treatment technology</td></tr>
<tr><td>Description of alternatives</td><td>Various secondary treatment technologies have been considered in the sewage treatment process after the primary treatment consisting of screening and grit removal. Secondary treatment is the critical process that removes the organic putrescible organic matters and brings down the BOD of the effluent to meet the discharge standards. Following process technologies considered: Waste Stabilization Ponds; Aerated Lagoons; Up Flow Anaerobic Sludge Blanket (UASBR) + FAL; Conventional Activated Sludge Process; and Cyclic Activated Sludge Process/Sequential Batch Reactor (SBR)

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

<table>
<tr><th>Item</th><th>Conventional Activated Sludge</th><th>Extended Aeration</th><th>UASB followed by Facultative Aerobic Lagoon</th><th>Cyclic Activated Sludge Process / SBR</th></tr>
<tr><td>Performance (Typical)</td><td>Mostly stable</td><td>Mostly stable</td><td>Varying with temperature variations</td><td>Complete Stable</td></tr>
<tr><td>BOD</td><td><30 ppm</td><td><30 ppm</td><td><30 ppm</td><td><10 ppm</td></tr>
<tr><td>COD</td><td><250 ppm</td><td><250 ppm</td><td><250 ppm</td><td><100 ppm</td></tr>
<tr><td>Suspended solids</td><td><50 ppm</td><td><50 ppm</td><td><100 ppm</td><td><10 ppm</td></tr>
<tr><td>Total Nitrogen</td><td>No Treatment</td><td>No Treatment</td><td>No Treatment</td><td><10 ppm</td></tr>
<tr><td>Total Phosphorous</td><td>No Treatment</td><td>No Treatment</td><td>No Treatment</td><td><2 ppm</td></tr>
<tr><td>Coliform removal, %</td><td>60-90</td><td>60-90</td><td>-</td><td>99.99%</td></tr>
<tr><td>Re-use Options</td><td>can only be used for low end usages like</td><td>can only be used for low end usages like</td><td>can only be used for low end usages like</td><td>Can be used for low end usages as well as for</td></tr>
</table>
</td></tr>
</table>

	flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	high end usages without any tertiary treatment.
Land requirement (m2/person)	0.1-0.18	0.08-0.15	0.2-0.25	0.035-0.07
Process Power requirement (kWh/person/year)	12-15	16-19	4-5	6-8
Sludge handling	Sludge needs digestion prior to drying on beds or use mech. devices	Digested sludge, dry on beds or use mech. devices	Digested sludge, dry on beds or use mech. Devices	Digested sludge, dry on beds or use mech. devices
Equipment requirement (excluding screening and grit removal)	Aerators, recycle pumps, scrapers, thickeners, digester, dryers, gas equipment	Aerators, recycle pumps, sludge scrapers, (for large settlers)	Nil (gas collection optional)	Diffuse aeration system, recycle sludge and waste sludge pumps, decanters
Operational characteristics	Skilled Operation required	Simpler than activated sludge	Simpler than activated sludge	Complete automatic operation by computer and PLC. Negligible manpower Intervention required
Special features	Considerable equipment and skilled operation required especially if gas collection and usage involved. Method considered mainly for large sized plants	BOD removal high, effluent nitrified relatively high-power requirement, favoured for small and medium sized plants	Minimal to negligible power requirement of the system makes it an economical alternative if gas revenue is neglected land requirement is also relatively small but depends on type of past treatment adopted	Highest treatment efficiency with crystal quality power requirement is 50% of conventional technologies land requirement is less than 50% of conventional technologies

Selected Alternative	Selected processes: Sequential batch reactor (SBR) The genesis of selecting a suitable treatment process is primarily correlated with degree of treatment aimed to be achieved. In India, the latest court Order of April 2019 (NGT Order dated 30-04-2019) mandates all the civic authorities to adopt the treated sewage

<table>
<tr><td></td><td>characteristics applicable are as shown in table below:

<table><tr><th>Parameter</th><th>Standards</th></tr><tr><td>BOD, mg/l</td><td>10</td></tr><tr><td>TSS, mg/l</td><td>20</td></tr><tr><td>COD, mg/l</td><td>50</td></tr><tr><td>Nitrogen-Total, mg/l</td><td>10</td></tr><tr><td>Phosphorus- Total, mg/l</td><td>1</td></tr><tr><td>Fecal Coliform (MPN/ 100 ml)</td><td>100 (permissible 230)</td></tr></table>
SBR provides highest treatment efficiency possible in a single step biological process. The system is operated in a batch reactor mode this eliminates all the inefficiencies of the continuous processes. A batch reactor is a perfect reactor, which ensures 100% treatment. Separate modules are provided to ensure continuous treatment. The complete process takes place in a single reactor, within which all biological treatment steps take place sequence. The complete biological operation is divided into cycles. Each cycle is of 3 – 5-hour duration, during which all treatment steps take place.</td></tr>
<tr><td>4</td><td>Treated wastewater disposal</td></tr>
<tr><td>Type of alternative</td><td>Treated wastewater disposal – reuse applications</td></tr>
<tr><td>Description of alternatives</td><td>(i) Discharge of treated wastewater into water bodies / on land
(ii) Reuse the treated wastewater in non-potable uses

Rajasthan is a water scarce region and receives low rainfall. Recognizing the importance of treated wastewater in reducing the demand on water, Sewerage and Wastewater Policy, 2016, of Rajasthan promotes the reuse of treated sewage for non-potable applications, and also to make sewerage projects environmentally sustainable. This policy prioritizes reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry and non-potable domestic reuse. Policy suggests construction of storage tanks to store treated wastewater to facilitate reuse. Policy prescribes that the detailed project report (DPR) should clearly define the best reuse option specific to the town and prepare a Reuse Action Plan part of the DPR following water quality norms and legal implications.

Accordingly, it is proposed to utilize the treated wastewater for non-potable uses. A detailed Reuse Action Plan will be prepared during the detailed design phase, and, implemented.

It is also proposed that the excess / surplus treated wastewater which is not being utilized in reuse will be discharge into nearby land, local drains/streams and necessary facilities – pipelines and pumping facilities, will be developed.

The excess / surplus treated wastewater that is not reused will be discharge into nearby government land, and necessary facilities like pipelines and pumping requirements, will be developed. Ratangarh is in Churu district, which is located in western Rajasthan, part of Thar desert. Being a desert region, it is not part of any river basin, and the drainage pattern is not defined, therefore there are no notable natural drainage channels or stream. Soil is mostly sandy, and region receives low rainfall. At present, wastewater from the houses, and run off during the rains, accumulates in the low-lying areas in the town. There are drainage pumping stations set up by municipality in the low-lying areas in the town, from where accumulated wastewater/water is pumped to outside the town, and discharged on land, which again accumulates in low lying areas. Due to sandy soil, and high temperature, large proportion of accumulated water is lost due to evaporation and infiltration.</td></tr>
</table>

Selected Alternative	Reuse in non-potable applications and discharge excess/surplus on vacant government land
5	**Project Locations**
Description of alternatives	**Location of and Sewage Pumping Stations (SPS) and Sewage Treatment Plants (STPs)**: The site selection for these facilities mainly guided by technical feasibility, availability of suitable and adequate lands. Given that lifting stations and pumping stations are to be located at technically feasible locations (e.g., lowest point to where sewage can be conveyed from households by gravity) within or close to the residential areas which are being served by respective pumping/lifting station. Given the very limited land availability in urban areas like the project area, that too of government owned lands, locating the pumping stations ideally about 50 m away from the houses is not practical. in Ratagarh, sites for pumping stations were identified based on the technical suitability and availability of government owned land parcels to avoid land acquisition. Both the pumping stations are located in low lying area, where currently wastewater from the town is accumulated, and where there are existing drainage pumping stations. STP sites are identified in available vacant lands. One STP is located outside the town away from habitation on government owned land. The second STP is located STP site is located in a land owned by a Gaushala trust (cow shed /cattle care centre); this Gaushala is located in the town, but the STP site is located in a large expanse of land, there will be buffer distance all round. STP1 location. Near NH-11. Land owned by Ratangarh Nagar Palika (28°03'23.49"N, 74°38'13.18"E) STP 2 Location. At Gaushala, land on Churu road. Land owned by the Gausala Trust (28°5'5.31"N, 74°38'6.94"E) SPS 1: Near BSNL office; land owned by Nagar Palika (28°04'21.43"N,74°37'34.46"E) SPS 2**:** Ward No-1, near Main Ginani; land owned by Nagar Palika (28°04'43.13"N,74°36'40.28"E) Sewer lines.. Sewers will be mostly laid in the centre of the road, away from water pipes. It is proposed that 10.18 km length of sewers will be laid by trenchless method; these will include railway track /main road crossings, and the sewers to be laid deeper than 3.5 m,

IV. POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

29. 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.

30. **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 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 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.

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

32. **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.

33. **Environmental Audit of Existing Facilities.** ADB SPS requires an environmental audit, if a subproject involves facilities and/or business activities that already exist or are under construction, including an on-site assessment to identify past or present concerns related to impacts on the environment. The objective of this compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for borrowers/clients, and to identify and plan appropriate measures to address outstanding compliance issues.

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

35. **Consultation and Participation.** ADB SPS require borrower to conduct meaningful consultation[11] 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.

36. **Grievance Redress Mechanism.** ADB SPS require 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.

37. **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 until ADB issues a project completion report.

38. **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.

39. **Occupational Health and Safety.** ADB SPS requires the borrower[12] to ensure that workers[13] 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

11 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;1 (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues

12In 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

13Including nonemployee 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.

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.

40. **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.

41. **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.

42. **ADB SPS International Best Practice Requirements.** ADB SPS requires that, during the design, construction, and operation of the project, the executing agency shall apply pollution prevention and control technologies and practices that are consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. (IFC's General EHS Guidelines14 and Sector Specific (Water and Sanitation) Guidelines15). These standards contain performance levels and measures that are normally acceptable and applicable to projects. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

B. National Laws

43. The implementation of the subprojects will be governed by Government of India and State of Rajasthan 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,

14https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES

15https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES

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.

44. **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.

45. **Category A** projects require EC from the central Ministry of Environment, Forests and Climate Change (MoEFCC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEFCC prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEFCC considers the recommendation of the EAC and provides the EC if appropriate.

46. **Category B** projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study) and prepares ToR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

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

48. **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 3.

Table 3: Applicable Environmental Regulations

Law	Description	Requirement	Relevance to Project Phase
EIA Notification	Projects indicated in the schedule of this notification requires EIA study and environmental clearance.	None of the components of this subproject falls under the ambit of the notification; no EIA study or environmental clearance required	-
National Environment Policy (NEP), 2006.	NEP is a comprehensive guiding document in India for all environmental conservation programs and legislations by Central, State and Local Government. The dominant theme of this policy is to promote betterment of livelihoods without compromising or degrading the environmental resources. The policy also advocates collaboration method of different stakeholders to harness potential resources and strengthen environmental management.	RSTDSP should adhere to NEP principle of "enhancing and conservation of environmental resources and abatement of pollution".	All phases of project
Rajasthan State Environment Policy, 2010 including And Rajasthan Environment Mission and Climate Change Agenda for Rajasthan (2010-14)	Follows the National Environment Policy, 2006 and core objectives and policies are: -Conserve and enhance environmental resources; assure environmental sustainability of key economic sectors; and, improve environmental governance and capacity building - it recommends specific strategies and actions to address the key environmental issues: water resources, desertification and land degradation, forest and biodiversity, air quality, climate change: adoption and mitigation, mining, industry, tourism, energy, urban development, etc. - Establishment of Environment Mission under the chairpersonship of the Chief Minister and a Steering Committee under the chairpersonship of Chief Secretary, Government of Rajasthan Tasks force set up for six key areas	Project implementation should adhere to the policy aims of: conservation and enhancement of environmental resources, integration of environmental concerns into projects/plans, and capacity building in environmental management. Under water sector, major concerns, as the policy notes, are huge water losses and wastage, declining water availability, pollution. Relevant recommendations for the project include control of losses, integrated water resources management, control of raw water pollution[18], reuse and recycling. Avoid/minimize use of forest lands. With reference to climate change adoption and mitigation following should be considered in the project: (i) diminishing flows in surface water bodies, and groundwater depletion, and revival traditional water bodies as water sources (lakes/tanks); (ii) equal stress on demand side management in water; and (iii) minimize energy	All phases of project

Law	Description	Requirement	Relevance to Project Phase
		use - design energy efficiency systems.	
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 Rajasthan Pollution Control Board (RPCB) before starting implementation and Consent to Operate (CTO) before commissioning.	Proposed two STPs will require CTE (prior to start of construction works) and CTO (prior to start of operation) from Rajasthan State Pollution Control Board (RSPCB) All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the RPCB website. (http://environment.rajasthan.gov.in)	Construction and Operation
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	This Act was enacted to achieve prevention, control and abatement of air pollution activities by assigning regulatory powers to Central and State boards for all such functions. The Act also establishes ambient air quality standards. The projects having potential to emit air pollutants into the atmosphere have to obtain CFE and CFO under Section 21 of the Act from RPCB. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution.	The following will require CTE and CTO from RSPCB: (i) Diesel generators); (ii) Batching Plant hot mix plants; and (iii) stone crushers, if installed for construction. All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the RSPCB website (http://environment.rajasthan.gov.in) If ready mix concrete and hot mix bitumen is procured from third party, contractor to ensure that the plants, from where material is being purchased is having CTE/CTO and copy should be collected from third party and submitted in PIU	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	Not Applicable	-

Law	Description	Requirement	Relevance to Project Phase
	benefits arising out of the use of these resources and knowledge to the country and the people.		
Wildlife Protection Act, 1972 and amendment 1991	This overarching Act provides protection to wild animals, birds, plants and matters connected with habitat protection, processes to declare protected areas, regulation of wildlife trade, constitution of state and national board for wildlife, zoo authority, tiger conservation authority, penalty clauses and other important regulations.	Not applicable – none of the project components are located in or near protected areas. Nearest protected areas is Tal Chhaper Sanctuary, about 55 km (aerial distance) south–west of RatangarhTown.	Construction
Forest (Conservation) Act, 1980	The Forest (Conservation) Act prohibits the use of forest land for non-forest purposes without the approval of Ministry of Environment Forests and Climate Change (MoEFCC), Government of India	Not applicable; none of the components of the subproject are located in forest.	Construction
Environmental (Protection) Act, 1986 amended in 1991 and the following rules/notifications:	This is an “umbrella” legislation that empowers the Central Government to take all necessary measures to protect and improve the quality of the environment and prevent, control and abate environmental pollution. Empowers central government to enact various rules to regulate environmental pollution, including standards for quality of air, water, noise, soil; discharge standards or allowable concentration limits for environmental pollutants, handling of hazardous substances, locating/prohibiting industries, etc.,	There are rules / notifications that have been brought out under this Act, which are relevant to RSTDSP, and are listed below	Construction and operation
Environmental Standards (ambient and discharge).	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	Appendix 3 provides applicable standards for ambient air quality, emission limits and emission stack height requirements for diesel generators Appendix 4 provides STP discharge standards	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 6 provides applicable noise standards, and noise limits for diesel generators	Construction and operation
Indian Drinking Water Standards	Gives details of the permissible and desirable limits of various parameters in drinking water as per the Bureau of Indian Standards	Appendix 8 provides drinking water standards	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
Solid Waste Management Rules 2016	Responsibility of Solid Waste Generator segregate and store the waste generated in three separate streams namely bio-degradable, non- biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time; store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; (iii) No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.	Contractor to follow all the rules during construction works	Construction and operation
Construction and Demolition Waste Management Rules 2016	Every waste generator shall segregate construction and demolition waste and deposit at collection 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 and 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;	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 Nagar palika after mobilization of contractor (during SIP period) and can't be mentioned at this time. Contractor to follow all the rules during construction works. 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 6.	Construction
Hazardous and Other Wastes (Management and	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	Contractor to comply all the requirements of this Act, if there are any hazardous wastes, are generated, handled or managed during	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
Transboundary Movement) Rules, 2016,	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 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.	construction and operation works. However, it is unlikely that it will involve any hazardous waste. Sludge generated from STP, if the incoming sewage mixes with industrial wastewater, there is a possibility of STP sludge classified as hazardous waste. Proper measures will be included to avoid mixing of industrial wastewater into sewage.	
Wetlands (Conservation and Management) Rules, 2017	The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization, construction, dumping of untreated waste and effluents, and reclamation. The Central Government may permit any of the prohibited activities on the recommendation of Central Wetlands Regulatory Authority.	Not applicable as subprojects components are not located in or near to designated wetland area.	
Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Ancient Monuments and	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 Ratangarh Town In case of chance finds, the contractor/ PIU will be required to follow a protocol as defined in the Environmental Management Plan (EMP)	Construction

Law	Description	Requirement	Relevance to Project Phase
Archaeological Sites and Remains (Amendment and Validation) Act, 2010.			
The Building and Other Construction Workers (BOCW) Act 1996 and Rajasthan Building and Construction Workers Rules 2009	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 preconditions 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 workplace 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 workplace and approach Prevention of inhalation of dust, smoke, fumes, gases during construction works and provide adequate ventilation in workplace and confined space Safety in material handling and stacking/unstacking Safeguarding the machinery with flywheel of moving parts Safe handling and use of plants operated by compressed air Fire safety	Contractors are required to follow all the provisions of BOCW Act and Rajasthan BOCW Rules. Salient features of Rajasthan BOCW Rules are- Chapter III, section 17- Registration of establishments Chapter VIII, section 61- Hours of works, intervals or rest and spread over, overtime Section 62- weekly rest Section 63- night shift Section 67- registers of workers Section 68- Muster roll, wages register Section 70- latrine and urinal facilities Chapter XI- Safety and Health Section 78- fire protection Section 79- emergency action plan Section 80- fencing of motors Section 81- lifting and carrying of weight Section 82- H andS policy Section 83- dangerous and harmful environment Section 84- Overhead protection Section 88- eye protection Section 89- PPEs Section 90- electrical hazards Section 97- use of safety helmets and shoes Chapter XIII-lifting appliances and gears Chapter XV- transport and earth moving equipment Chapter XVI- concrete works Chapter XVII- demolition works Chapter XVIII-Excavation and tunneling	Construction

Law	Description	Requirement	Relevance to Project Phase
	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 m 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	Chapter XX- ladders and step ladders Chapter XXII- structural frame and formworks Chapter XXIV- medical facilities and first aid box	
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 (RUDSICO-EAP) 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 7 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.	Construction and operation
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	Applicable to all construction works in the project All construction workers should be paid not less	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	are scheduled employment.	than the prescribed minimum wage	
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
Rajasthan State Environment Policy, 2010 including And Rajasthan Environment Mission and Climate Change Agenda for Rajasthan (2010-14).	Follows the National Environment Policy, 2006 and core objectives and policies are: -Conserve and enhance environmental resources; assure environmental sustainability of key economic sectors; and, improve environmental governance and capacity building - it recommends specific strategies and actions to address the key environmental issues: water resources, desertification and land degradation, forest and biodiversity, air quality, climate change: adoption and mitigation, mining, industry, tourism, energy, urban development, etc. -Establishment of Environment Mission under the chairpersonship of the Chief Minister and a Steering Committee under the chairpersonship of Chief Secretary, Government of Rajasthan Tasks force set up for six key areas	-Project implementation should adhere to the policy aims of conservation and enhancement of environmental resources, integration of environmental concerns into projects/plans, and capacity building in environmental management -under water sector, major concerns, as the policy notes, are huge water losses and wastage, declining water availability, pollution - Relevant recommendations for the project include control of losses, integrated water resources management, control of raw water pollution, reuse and recycling -avoid/minimize use of forest lands With reference to Climate change adoption and mitigation following should be considered in the project: - diminishing flows in surface water bodies, and groundwater depletion, and revival traditional water bodies as water sources (lakes/tanks) - equal stress on demand side management in water -minimize energy use - design energy efficiency systems-	Operation
IS 11768: 1986/2005: Recommendations for disposal of asbestos waste	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, transportation and final disposal of	The crux is waste avoidance: the practice inculcated should focus the on minimal waste generation. Waste Collection: In the project circumstance,	Construction

Law	Description	Requirement	Relevance to Project Phase
material	final disposal of asbestos and asbestos containing products.	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.	
IS 12081: Pictorial Warning to be implemented on equipment containing Asbestos Contaminated Products.	The objective of the caution is to make the person handling to take all pre-cautionary measures and make them aware of all the possible risk.	The following signs and personal protective equipment shall be used in handling ACM.	Construction
IS 11451: Safety and Health Requirements related to Occupational Exposure to	This standard details the occupational exposure allowable and safety at work place to be enforced.	In the project the norms pertaining to limiting number of hours working with ACM will be 8.0 hrs/48 hrs a week and the medical examination has to be periodic, the environmental monitoring has to be done as per the protocol. The safety at work place shall be enforced.	Construction

Law	Description	Requirement	Relevance to Project Phase
Asbestos contaminated Products.			
IS 11768: Waste Disposal Procedure for Asbestos Containing Products.	The protocol pertaining to disposal of the waste is emphasized.	The collection of ACM powered will be in permissible plastic bags, which will be twisted tight at the neck so that the wear and tear due to abrasion will be minimum and the transportation of the asbestos waste has to be done by the authorized vendor to the approved landfill site.	Construction
The Rajasthan Monuments, Archaeological Sites and Antiquities Act, 1961; the Rajasthan Monuments, Archaeological Sites and Antiquities (amendment) Act 2007	Any construction/excavation work in the 'protected area' (as declared by GoR under the Act) requires priori permission of Department of Archeology and Museums -Application under the Rules shall be submitted to Director, State Archeological Department, at least 3 months prior to the work. Department provides conditional permission, including time for completion, procedures to be followed during the work and for chance finds etc.	Not applicable - there are no protected monuments in the town In case of chance finds, the contractor/ PIU will be required to follow a protocol as defined in the Environmental Management Plan (EMP).	Construction
Rajasthan Forest Act, 1953, and Rajasthan Forest Rules, 1962	This Act makes the basis for declaration of Reserved Forests, constitution of village forest committees, management of reserved forests and penalties and procedures.	Not applicable; none of the components / pipeline alignment are in forest areas.	Construction
International conventions and treaties			
Ramsar Convention, 1971	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. India is one of the signatories to the treaty. The Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans.	There are no Ramsar sites in or near Ratangarh Not applicable to Ratangarh sewerage subproject.	-
Convention on International Trade	India is a signatory of this convention which aims to control international commercial trade in endangered species	Not applicable in this project as no endangered species of wild fauna and flora is found in	-

Law	Description	Requirement	Relevance to Project Phase
in Endangered Species of Wild Fauna and Flora (CITES), 1973		project town.	
Montreal Protocol 1992	India is a signatory of this convention which aims to reduction in the consumption and production of ozone-depleting substances (ODS), while recognizing differences in a nation's responsibilities. Ozone depleting substances are divided in two groups Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbon 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 I of the Convention. CMS Parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II, and CMS encourages the Range States to conclude global or regional agreements.	Not applicable to this project as no migratory species of wild animals are reported in the project areas.	-

49. **Clearances / permissions to be obtained prior to start of construction.** Table 4 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 4: Clearances and permissions required for Construction activities

S. No	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
1	Land for project activity	Allotment and approval for specific land use	ULB	PMU
2	Use of construction area	Approval for use of city roads and shifting of utilities	ULB, PWD and other utility agencies such as BSNL, electricity department	PIU
3	Establishment of construction camps	Allotment and approval for specific land use	Contractor	PIU
4	Construction of new STP	Consent to establish and consent to operate under Water Act, 1974 from RSPCB	PIU & Contractor	PIU
5	Tree Cutting	State forest department/Revenue (Tehsildar)	PIU	PIU and PMU
6	Hot mix plants, Crushers, Batching plants and DG Set	Consent to establish and consent to operate under Air Act, 1981 from RSPCB	Contractor	PIU
7	Storage, handling and transport of hazardous materials	Hazardous Wastes (Management and Handling) Rules. 2016 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 from RSPCB	Contractor	PIU
8	Sand mining, quarries and borrow areas	Permission from District Collector/ State Department of Mines & Geology	Contractor	PIU
9	New quarries and borrow areas	Environmental clearance under EIA Notification 2006	Contractor	PIU
10	Use of vehicles and equipment	Pollution under control certificate (PUC) form RTO	Contractor	PIU
11	Temporary traffic diversion measures	Temporary traffic diversion measure including use of alternate road from District traffic police	Contractor	PIU
12	Use of Railways ROW for construction area/ crossing	Indian Railways	PIU	PMU

50. 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 DBO 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

Location, Area, and Connectivity

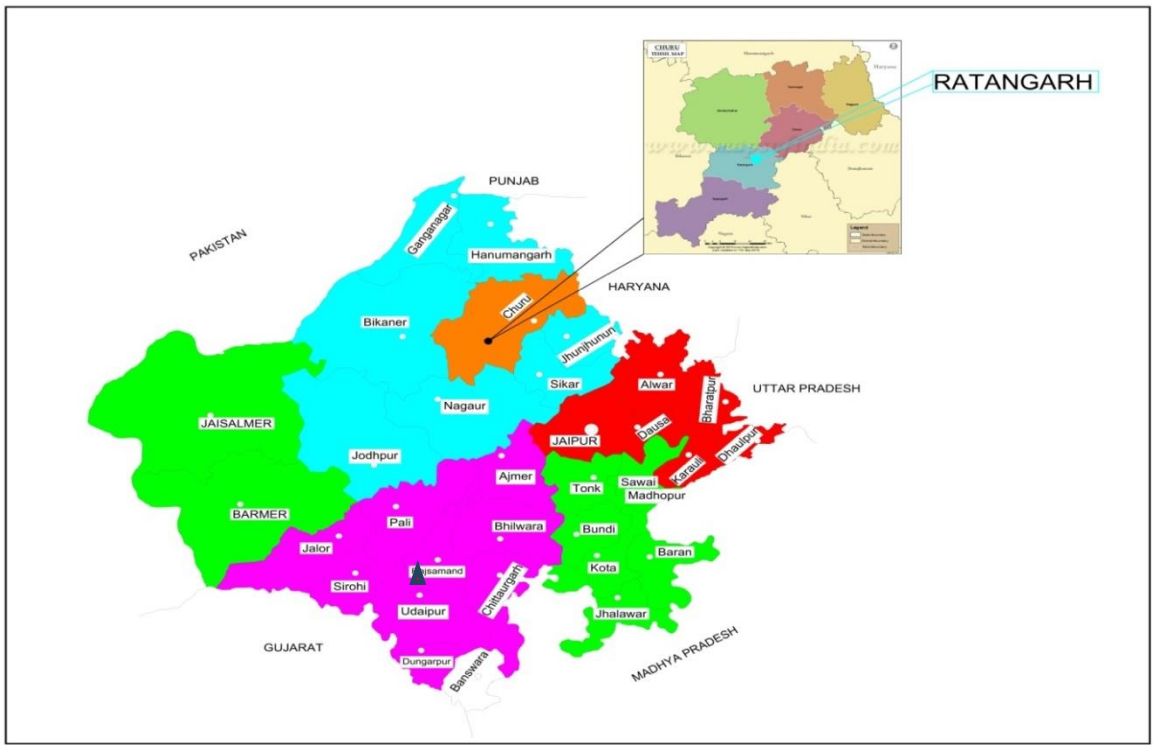
51. Recognized as an entry gate to the great Thar Desert, Churu is located in the desert area of Rajasthan. Churu district is located in the northern part of Rajasthan. It is bounded in the north by Hanumangarh district, in the east by state of Haryana and Jhunjhunun district, south by Sikar and Nagaur districts and by Bikaner district in the west. It stretches between 27º 24' 31.50" to 29º 00' 01.74" north latitudes and 73º 50' 39.45'' to 75º 40' 31.85'' east longitudes covering area of 13,844 sq km. The district does not have a properly evolved drainage system, except for a negligible part in the east which is part of Shekhawati River Basin, almost whole of the district is part of an 'Outside' Basin. Churu district is administratively divided into six blocks and total area of the district is 13,844 sq.km. It occupies nearly 4.92 percent of the area of the state and stands eight in respect of area amongst the districts of Rajasthan. The district covers 6 Tehsils Churu, Ratangarh, Taranagar, Havellies.

52. Churu district is part of arid region. The district has dry climate and the area is well known for both highest in the country and lowest in the peninsular India recording below freezing point temperature in the winters to over 50 ºC in the summer afternoons. There is a great variation in minimum and the maximum temperature of Churu. Average rainfall in the district is 353.9mm spread over three monsoon months of July to September.

53. Ratangarh is located at 28.08°N and 75.06°E. has elevation of 312 meters. The geographical area of the Ratangarh is about 1,601.9 sq. km. Ratangarh block has 103 towns and villages and occupies nearly 12 percent of the area of the district. Location map of District-Churu showing Ratangarh town is given in Figure-18.

54. Ratangarh is part of Shekhawati region. Ratangarh is situated 200 km off Jaipur in the north on NH-52. Ratangarh Junction is a major rail head in northern Rajasthan, connecting Bikaner and Jodhpur Ratangarh is the center as it connects all the major cities in Rajasthan including Jaipur, Bikaner, Sardarshahr and Sujangarh and many small towns.It also connects the northern tip of Rajasthan (Hanumangarh-Sriganganagar) to Jaipur and Ajmer through the High-speed State Mega highway

Figure 18: Location of Project Town in Rajasthan



Topography, Soils, and Geology

55. District Churu is a part of the great Thar Desert. It is covered with a thick mantle of sand, is characterized by 6 to 30 meter longitudinal dunes treading north east to south west. The general topographic elevation in the district is between 250 m to 300 m above mean sea level. Elevation ranges from a minimum of 199.2 m above mean sea level in Rajgarh block in the northeastern part of the district and maximum of 470.7 m above mean sea level In Sujangarh block in southern part of the district. .The general topography is almost an undulating plain area except some hillocks in south.. There is no big hill in the district expect some hillocks. There are no perennial rivers or streams in the district. Wells and ponds are the principal source of water supply.

56. In Ratangarh block elevation ranges from a minimum of 274.7 to 366.99 m above mean sea level.

57. Drainage. Ratangarh is in Churu district, which is located in western Rajasthan, part of Thar desert. Being a desert region, it is not part of any river basin, and the drainage pattern is not defined, therefore there are no notable natural drainage channels or stream. Soil is mostly sandy, and region receives low rainfall. At present, wastewater from the houses, and run off during the rains, accumulates in the low-lying areas in the town. There are drainage pumping stations set up by municipality in the low-lying areas in the town, from where accumulated wastewater/water is pumped to outside the town, and discharged on land, which again accumulates in low lying areas. Due to sandy soil, and high temperature, large proportion of accumulated water is lost due to evaporation and infiltration.

58. There are no river system in the district, except for a few short, intermittent and ephemeral channels. The largest drainage course is Kantli river which enters the district in the south-eastern side from Jhunjhunu district and disappears near Rajgarh, discharging storm runoff only in the period of high rainfall. Recent studies of landsat imageries has revealed the extension of present course of Kantli river, north of Rajgarh, upto district border, from where it has taken westward swing. The mosaic of landsat imagery has also indicated frequent shifting of Kantli river course from eastward to present situation which probably joined the river Saraswati course, passing from the nearby area in recent time.

59. **Geology.** The geology of the Churu district is largely concealed by windblown sand and has been worked out on the basis of scanty exposures, from dug well and borehole data. The area, a part of the Thar desert is basically a fluvio–aeolian depositional basin containing 255 m thick pile of Quaternary sediments. It is characterized by an undulating topography consisting of sand dunes interspersed with interdunal valley and linear depressions. The various rock types of the area belongs to the Delhi Super Group, Erinpura Granite, Malani Igneous Suite, the Marwar Super Group and the Tertiary sediments including the Palana Formation of Paleocene age. The oldest rock sequence in the area belongs to the Punagarh Group comprising of slate, phyllites, quartz-mica schist, ferruginous quartzite etc. of the Delhi Super Group. These rocks are well exposed in south of Bidasar and east of Pandurai Geologically, the area belongs to rocks of Delhi super group. Geological formations exposed in the district reveals that , a longitudinal faults, running at most parallel in NNE-SSW direction and passing from Bidasar-Bandhnau and Sandwa-Kitasar-Ranasar, divides the district into two distinct geological units. The area lying east of Bandhnaw- Bidasar fault which falls under up throw side is known as Sikar basin while the western fault is known as Bikaner basin. In the eastern part of the district due to upthrowing of the fault the Pre-Cambrian crystalline basement have been uplifted, causing practically total erosion of upper horizon of Marwar Super Group (Bhilwara and Nagaur group) and reduction in thickness of Palana series and Quaternary alluvium. The western part of the district which falls under the down throw side of fault have considerable thickness of Palana sediments and rock units of Marwar Super Group are preserved.

60. **Soils.**The northern part of the district is covered with sand dunes while southern part is occupied by desert soils. The desert soils are usually light yellowish brown to yellowish brown, calcareous sands with little clay. Their hydraulic conductivity goes up to 13.6 cm/h, while minimum available moisture recorded was 1.1 percent. The large fine sand fraction reflects their being mainly of aeolian origin.

61. The other kind of soil occurring in the district are red desert soils and saline soils of the depression. The project area is generally covered by sand to loamy sand, Aeolian in nature, belonging to mainly Entisols and Aridisols. The red desert soil occupy a narrow belt in southern and western part of the district (south of Sardarshahar and around Ratangarh). They are typically deep brown, non- calcareous, loamy sands and sandy loams, partially derived from sandstone and from alluvial deposit. The hydraulic conductivity of the profile examined near Fatehgarh ranged from 0.5 to 2.5 Cm/h. Minimum available moisture recorded 1.38 percent. The saline soils are found in low interdunal areas, and area of fine texture. Generally, they are saline or sodic having low permeability value and impeded drainage.

62. **Seismology.** As per the seismic zoning map of India, Ratangarh falls under the Zone-II, which is the Low earthquake risk zone in India. This zone is termed as “Low damage risk zone”. Based on available earthquake zone information Zone II is the least seismically active region. The earthquakes in this region had magnitudes of 5.0 or more in the past

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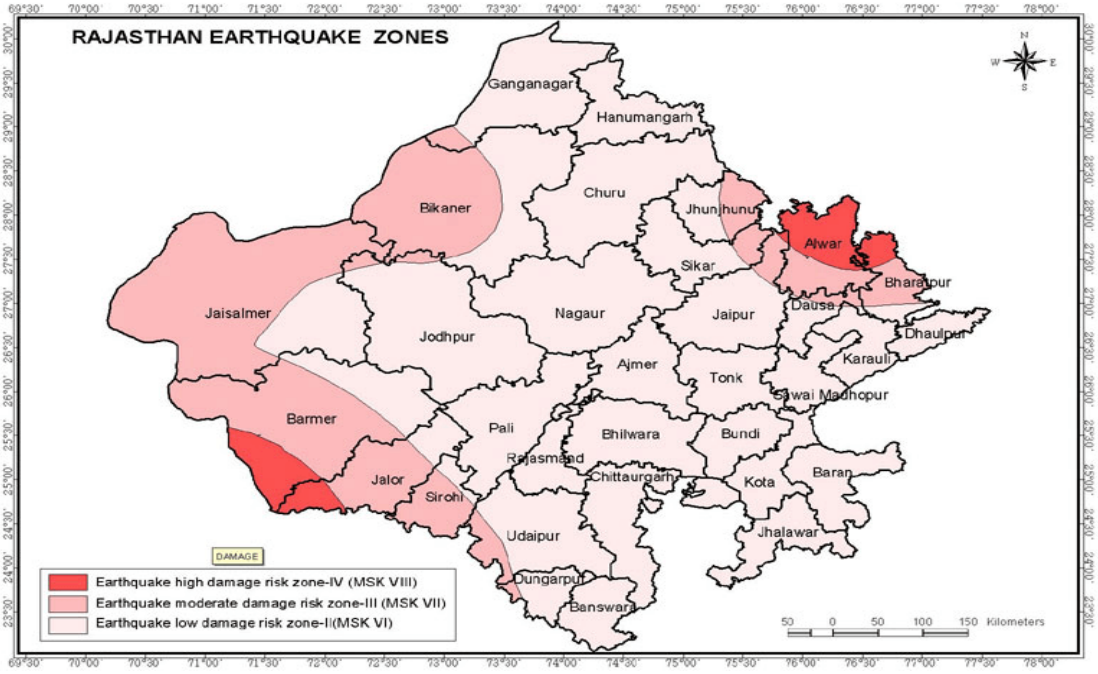
Figure 19: Earthquake Zoning Map of Rajasthan



Climatic and Rainfall

63. *Temperature:* The period from March to May temperature increases continuously. May is generally the hottest month with a mean daily maximum temperature of about 41.7°C and mean daily minimum of about 25.1°C. The weather is intensely hot in summer and on some days the day temperature may reach up to 46°C. The highest temperature recorded at Churu is 49°C on 26th May 1998. From November, both day and night temperatures begin to decrease rapidly. January is generally the coldest month with the mean daily maximum temperature at about 22.9°C and mean daily minimum at about 4.6°C. Minimum temperature sometimes drops down to sub zero temperatures and the lowest temperature recorded at Churu is -4.6°C on 16th January 1974.

64. *Rainfall:* The district received good rainfall in the year 2010. Rainfall is gradually increasing from Southwest to Northeast. The general distribution of rainfall range is 600 mm to 700 mm in which, it is covering maximum parts of the district. The annual average rainfall was 675.1 mm based on the data of available blocks while highest average annual rainfall was 777.7 mm in Rajgarh block. Lowest annual rainfall was lowest in Sujangarh block (456.9 mm). Rajgarh block has received highest maximum annual rainfall of about 947.2 mm..

65. *Relative Humidity:* Most humid conditions are found in the monsoons, followed by post-monsoons, winter and summer in that order.

66. By the proposed sewerage project, all the treated water will be used in beneficial purposes such as agricultural activities etc. that is the major component of the economic sector which is largely dependent on rainfall for agricultural activities. Adequate treated water from treatment plant will ensure the sustainability of more crops per drops in the area/regions and to make less dependent on precious groundwater resources in the area/region.

Surface Water

67. Ratangarh block is drained by River Kantli, which flows in northward direction. The river Kantli originates in Khandela hills of Sikar district, thereafter it flows through Jhunjhunu district before drying up in sand dunes of Ratangarh Tehsil of Churu district. There are some small ponds and reservoirs in Ratangarh, which are mostly filled after monsoon and used for irrigation by nearby agricultural fields.

Groundwater

68. Ground water occurs under water table conditions both in unconsolidated and consolidated formations. Its occurrence is controlled by topography, physiography and structural features of the geological formations. The movement of ground water in hard rock areas is governed by size, openness, interconnection and continuity of structurally weak planes while in unconsolidated rocks, ground water movement takes place through pore spaces between grains.

69. Water bearing formations in Churu district ranges from unconsolidated alluvium to semi consolidated sandstones and consolidated schistose rocks. The older and younger alluvium constituted of primarily sand of windblown and fluvial origin forms aquifers covering 71% of the district area. Next most prominent aquifers in the district are sandstones (17.5%) followed by schist (6.8%) and limestone (4.7%) aquifers. The hardrock aquifers are prominent in southern and partly in western part of the district. The shallow groundwater bearing aquifer formations in the desert area are mainly composed of aeolian sands of unconsolidated nature. Aeolian sediments are remarkably uniform in grain size distribution, textural characteristics and mineral composition over contiguous areas and generally lack stratification. Due to greater degree of sorting, the porosity and permeability of these deposits are respectively greater than the corresponding quantities for aqueous deposits of similar particle size. Fluoride in groundwater of this region is high mainly due to dissolution from fluoride-bearing minerals like hornblende and illite. X-ray diffraction study of the soil samples from this region states that apart from the causative minerals mentioned above, presence of calcite and dolomite may also have accelerated the leaching of fluoride to the groundwater. The arid climate with high evaporation and insignificant natural recharge might have accelerated the strengthening of fluoride concentration in the groundwater of this area.

70. Groundwater is the main source of irrigation and is utilized through dug wells, and tube wells. The depth to water level varies widely depending upon topography, drainage, bedrock geology etc. in the district. As CGWB Report on Churu District Groundwater Scenario, 2017, depth to water in pre monsoon of 2017 varied from less than 7.81m to more than 66.85m below ground level, while post monsoon varied from 6.66 m to 64.10 m below ground level. In Ratangarhi block, depth to water level ranges between 27.85 and 48.15 m below ground level in pre monsoon of 2017 while post monsoon varied from 27.88 m to 59.68 m below ground level. In terms of pre and post monsoon fluctuation in groundwater level in 2017, according to CGWB Report, there has been rise of more than 4 m in water level in northwestern part of Ratangarh block. Analysis of CGWB's long term water level data of Pre-monsoon (2007-2016) indicate declining trend in water level in most parts of Ratangarh block.

71. **Groundwater Utilization.** Ground water resources have been jointly estimated by Central Ground Water Board and Ground Water Department, Government of Rajasthan (As on 2013), excluding saline and hilly areas. Annually replenishable ground water resources of the district have been estimated to 141.8221 MCM, while the net annual ground water availability is estimated to be 134.7310 MCM. Total annual ground water withdrawal for all uses has been

estimated to be 124.7477 MCM. With the stage of development at 92.59 %, district is classified as ‘Critical” . In Ratangarh Block/Tehsil, while the estimated net annual groundwater availability is 27.01 MCM, the total utilization for all uses is estimated as 20.09 MCM (74.40% utilization). Ratangarh Block is classified as “SEMI CRITICAL” (74% utilization with long term decline in groundwater in some parts). CGWB recommend cautious groundwater development in Semi Critical areas,.

72. **Groundwater Quality.** As per CGWB report (2017) the quality of ground water is alkaline in major part of the district. Presence of excess fluoride, nitrate, iron and electrical conductivity in ground water has been reported from some pockets in the district. Fluoride in excess of maximum permissible limit has been observed in parts of Rajgarh,Sardarshahar, Ratangarh, and Sujangarh blocks.

Air Quality

73. Ambient air quality in Rajasthan is monitored by Rajasthan Pollution Control Board. However, at present there is no monitoring station in Ratangarhi, and therefore no data on ambient air quality available. The roads are not in good condition, traffic on these roads and winds are the main source of dust generation. Pollutants exist in the air during dry seasons. Air quality monitoring shall be conducted in the pre-construction phase (SIP period) by the contractor and shall be updated in IEE.

7. Noise Quality

74. As there are no major industries or other activities, which may create high noise in town, the main source of noise pollution in the city area is traffic only that also in main and busy roads and other inner and connecting roads are quite peaceful. Environmental monitoring for ambient noise has not been conducted during design period. Baseline Monitoring shall be done during SIP period by contractor and shall be updated in IEE.

B. Ecological Resources

75. There are no forest areas or environmentally sensitive areas within or near the municipal boundary of Ratangarh town. Project area mostly comprises urban and habitation areas, and agricultural, vacant and barren lands. Nearest protected area is Tal Chhapar Sanctuary, the boundary of which is 55km south-west(aerial distance) from RatangarhTown and project activities do not interfere with sanctuary. **Tal Chhapar Sanctuary** is a sanctuary located in the Sujangarh Tehsil of Churu District. of Northwestern Rajasthan in the Shekhawati region of India. It is known for blackbucks and is also home to a variety of birds. It lies on the Nokha-Sujangarh state highway and is situated at a distance of 85 km from Churu and about 132 km from Bikaner. The nearest railway station is Chappar which lies on Degana-Churu-Rewari line of North Western Railways. The nearest airport is Jaipur which is 215 km from Chappar. Screening of project areas is carried out based on Integrated Biodiversity Assessment Tool (IBAT) and IBAT proximity area report shows that there is no protected or key biodiversity area within 10 km of Ratangarh (Appendix 8).

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76. *Profile of sanctuary.* .,.The sanctuary is named after Chhapar village which is located at 27°-50' North and 74°-25' East. It is a flat saline depression locally known as a "tal" that has a unique ecosystem in the heart of the Thar Desert. Perched at a height of 302 meters (990 feet) above sea level. Tal Chhaper Sanctuary, with almost flat tract and interspersed shallow low-lying areas, has open grassland with scattered Acacia and Prosopis trees which give it an appearance

of a typical savanna. The word "tal" means plane land. The rain water flows through shallow low-lying areas and collect in the small seasonal water ponds.

77. The geology of the zone is obscured by the wind blown over-burden. Some small hillocks and exposed rocks of slate and quartzite are found in the western side of the sanctuary. The area between hillocks and the sanctuary constitutes the watershed area of the sanctuary. The whole sanctuary used to be flooded by water during the heavy rains but with salt mining going on in the watershed, hardly any rain falling on the hillocks reaches the sanctuary. Nearby villages are Jogalia, Jaitasar, Bidasar.

78. The forest of this region falls under major group "Tropical Forest" as per classifications of Indian forests by Champion & Seth. The forest of sanctuary area again falls under the group "Topical Thorn Forest" and sub group 6B/C "Desert Thorn Forests".

79. The sanctuary area is mostly covered by grasses with a very few trees. It lies on the passageway of many migratory birds such as harriers. These birds pass through this area during September. Birds commonly seen in the sanctuary are harriers, eastern imperial eagle, tawny eagle, short-toed eagle, sparrow, and little green bee-eaters, black ibis and demoiselle cranes, which stay till March. Skylarks, crested larks, ring doves, and brown doves are seen throughout the year. Desert fox and desert cat can also be spotted along with typical avifauna such as partridge and sand grouse.

80. Tal Chappar Sanctuary comes alive with the chirping of various migratory birds including Montagu's harrier, marsh harrier, pale harrier, imperial eagle, tawny eagle, short toed eagle, sparrow hawk, skylark, crested lark, ring drove, brown dove, blue jay, southern grey shrike, Indian spotted creeper, green bee eaters, black ibis and demoiselle cranes.

81. Among the other wildlife beauties then it is a fact that Tal Chhapar Sanctuary is famous for black-bucks. Talchhapar wildlife sanctuary is the sole place having a good population of Black buck in such a small area. The sanctuary is a home to nearly 1680 Black Bucks. Being a natural home of Blackbucks and one can easily see 500-700 animals in a single herd. It is the only sanctuary in India in which is having a good number of blackbucks in an almost tree-less, saline and flat-land. These black bucks have “Mothiya” for their food.

82. **Flora and Fauna in the study area**. *Forest:* Churu district is a part of the Indian Great Thar desert. The district has only 6663 hectare area under the forest which is only 0.46% of the total area of the district. The vegetation cover in the district is almost negligible due to extremes of temperature during winter and summer and scanty rainfall established sand dunes inside Grass Reserves of inside areas, free from biotic interference, contain very poor and open forest. Important trees found in the district are Khejara, Kikar, Neem, Hingotaker, Shisham, Rohira, Bhhui, Phog, Ask, Senia, Thor, Morali, Bura, Lampre, Kucha, Mural etc.. Fox, Blue, Bull, common hare, Jackal porcupine, Bats and Bush rats etc. are found here. The common birds found here are Bulbul, kite, Owl, Pigeon, Sand Grouse, Grey partridge, Godavan of Gurah

83. Common Flora in Ratangarh: Common trees found in Ratangarh are- Neem (Azadirachta indica), Dhak (Butea monosperma), Gulmohar (Delonix regia), Imli (Tamarindus indica), Pipal (Ficus religiosa), Ker (Capparis decidua Forsk.), Bargad (Ficus bengalensis Linn.), Babool (Acacia nilotica), Avla (Emblica officianalis Gaerth.), Siris (Albizia lebbeck), Vilayati babool (Prosopis juliflora) etc.

84. *Common Fauna of Ratangarh:* Common animals found in Ratangarh area are- Birds- Baya weaver (*Ploceus philippinus*), White-throated kingfisher (*Halcyon smyrnensis*), House swift (*Apus affinis sub sp. affinis*), Rock Pigeon (*Columba livia*), Indian peafowl (*Pavo cristatus*), Jungle crow (*Corvus macrorhynchos*), Mammals- Five strippedpalm squirrel (*Funambulus pennantii*), Common House Rat (*Rattus rattus*), Hare (*Lepus nigricollis*), Garden lizard (*Calotes versicolor*). It is also observed that the faunal species found in the study area are commonly found species. No rare, endemic & endangered species are reported in the core / buffer zone of project areas.

85. The avifaunal profile recorded in the quadrat studies is dominated by birds associated with open scrub such as Grey Francolin, Laughing Dove, Indian Robin, Common Stonechat, Brahminy Starling, Common Babbler and Yellow-eyed babbler. Some wetland associated species were also recorded on Main Ginani They include resident species such as little grebe, Asian Openbill and Red-wattled Lapwing, and no migratory species were seen during the visit. Birds associated with habitation, cultivation and gardens, including Indian Peafowl, Indian Roller, Common Pigeon, Common Myna, Red-vented Bulbul and Ashy Prinia are also

86. Migratory Avifauna. The subproject area is part of the massive avian migratory channel called the Central Asian Flyway (CAF), which spans the entire Indian subcontinent. Thus, the subproject area lies in the path of various winter migratory birds entering the Indian subcontinent from the north and headed farther south. With its diversity of habitats, the area in general is likely to be providing seasonal habitats or staging points to many of these visitors. Local people, public representatives and forest officials were consulted during the site visit confirmed that there are no migratory birds noticed in the water bodies in and around Ratangarh town. There is no notable wildlife presence / movement indicated during the consultations with locals and forest officials.

C. Economic Development

87. **Land use.** The geographical area under the Ratangarh Nagar palika was 2288 acre, out of which developed area is 1704 acre and the rest is mainly agriculture land.

Table 5: Existing Land Use of Ratangarh Town (2011)

Category	Area in Acres	Percentage to Total Developed Area	Percentage to Total Municipal Area
Residential	977	57.34	43.85
Commercial	39	2.29	1.75
Industrial	58	3.40	2.60
Public & Semi Public	16	0.94	0.72
Recreational	303	17.78	13.60
Transport & Communication	295	17.31	13.25
Total Developed Area	**1704**	**100**	**-**
Agricultural and vacant land	513	-	23.02
Water Bodies	11	-	0.49
Total Municipal Area	**2228**	**-**	**100**

Source: Ratangarh Master Plan, 2011-2031

88. *Industry and Agriculture.*Churu district offers all the important infrastructure facilities essential for economic and industrial growth like water, power, transport, industrial training, industrial area etc. Total numbers of registered units in district are 1800 out of which Forest Based 489, Miscellaneous & Service 337 (Hotel & Restaurants, laundry, tent house, Auto mobile workshop, Mobile repairing and maintenance, offset printing, printing press, transportation),

Cotton & Textile 251, Engineering & Metal 233, Non-Metallic Minerals Products 165, Agro & Food Processing 115. Micro & Small Enterprises products which have export potential and also being presently exported from the district are handicrafts items like wooden decorative pieces & article, leather jutis, sandal, guar gum, wood items etc.

89. In Ratangarh, there is no major industrial development in the project area and there are no large industries in the town. Only small and medium scale industries in Ratangarh. RIICO industrial area is developed on the Hanumangarh-Kishangarh Mega Highway, where there are 72 industrial units in operation. Main industries in Ratangarh are mini cement plant, wooden furniture and handicrafts, cement electric poles manufacturing, stone and steel furniture etc. Other industries in the town are stone door frames, wood furniture and handicraft, soap, ice, printing press, weaving, cement bags etc.

90. *Agriculture:* The climatic conditions (arid desert) of a region affect the agricultural cropping pattern of different areas. Thus, it produces different crops. Amongst a host of climatic factors i.e. rainfall, temperature, humidity, wind velocity and duration of sunshine etc. affect the cropping pattern in a significant way. Annual rainfall and its distribution over the entire year and the regimes of diurnal and annual temperatures are by far, the prominent factors affecting agriculture and the lifestyle of the people in the region. Two crops are grown in the area namely (i) Rabi in which crops like Wheat, Gram, Mustard, Moong, Garlic, Barley are grown during months of September-April (ii) Kharif in which crops like Maize, Jowar, Moong, Soya bean, Chilly, Ground Nut, Cottonseed, Rapeseed etc. are grown during months of April-October.

91. Millet, Kidney-bean, Moth, gram, mustard, Tara Mira and Ground Nuts are other crops cultivated in this area. The agriculture is mainly based on the monsoon but in some tehsils, irrigation is made by extracting water from wells . But the successes not satisfactory due to salty and deep water.

92. **Water Supply.** The major source of drinking water for Ratangarh is tube well and open well. The Public Health Engineering Department takes care of the water supply in the town. The present water supply capacity in the town is that of 44 liters per capita per day. The supplied water quality is good and testing is done periodically to ensure that the water treatment plant is operating effectively.

93. **Sewerage.** There is no functional sewerage system in Ratangarh town. Most of the residential and commercial buildings and educational institutions have on-site septic tanks and soak pits. The effluent from the septic tanks is directly let out in the open drains, which pollutes environment.

94. **Solid Waste Management.** Ratangarh Nagar Palika collects solid waste via door-to-door collection systems through an NGO under supervision of Nagar Palika stafsf from all municipal wards. Nagar palika is having 25 auto tipper, 6 tractors for collection of solid waste in the city. Coverage is about 90% population. Waste from community dust bins/open collection points is manually lifted into vehicles for transportation to the disposal site. Currently there is no solid waste processing facility and solid waste is dumped without any segregation in vacant government land at Loonch Ki Jodi area. The un-segregated waste collected from the city is disposed-off by crude open dumping method at the site. There is no landfill facility in the city. In the project sites, the estimated volume of solid waste is as follows:

Table 6. Solid waste estimates at project sites

Component	Design Capacity (MLD)	Volume of Solid Waste (cubic meters)
SPS-1	3.8	3250.72
SPS-2	4.6	21035.4
STP-1	3.8	4953.195

95. **Storm Water Drainage.** Drainage system in Ratangarh town is in the form of road-side open drains, and major drains that convey runoff from the city collector drains to natural water bodies through open nallah. Due to lack of sewerage system, these drains primarily carry sullage and sewage discharged by. As the city is located in Thar Desert region, there are no defined natural drainage pattern, there are no streams or channels in the town. Region receives low rainfall, runoff during the rains is accumulated in the low-lying areas, which is quickly lost to evaporation / infiltration. Wastewater from the town area is also accumulated in low lying areas in the town. Municipality constructed drainage pumping stations at few places, to pump out the accumulated wastewater to outside the town.

96. **Power Supply:** Thermal power is the main source of energy in Rajasthan, contributing nearly 90% of the electricity, compared to hydropower, which produces the remainder. State-level companies (Rajya Vidyut Utpadan Nigam Ltd, RVUN; and Rajya Vidyut Prasaran Nigam Ltd, RVPN) are responsible for power generation and transmission respectively, and distribution is provided by a regional company, the Ajmer Vidyut Vitaran Nigam Limited (AVVNL). Power is supplied from the central grid by overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. The power supply in the state is continuous and reliable, except in warmer months with periodic outages in warmer months, and large fluctuations in voltage. In Ratangarh town power supply is reliable and sufficient power is supplied to the town by the authorities.

97. **Transport.** Transport in the city is mainly by personal vehicles (cars and motorcycles) and motor-rickshaws. The Rajasthan State Road Transport Corporation (RSRTC) runs public buses to neighboring villages and towns. Ratangarh is situated in National Highway 11 (running between Bikaner, Jaipur, and Agra). Ratangarh is the center as it connects all the major cities in Rajasthan including Jaipur, Bikaner, Sardarshahr and Sujangarh and many small towns. It also connects the northern tip of Rajasthan (Hanumangarh-Sriganganagar) to Jaipur and Ajmer through the High-speed State Megahighway system; roads are in place between Hanumangarh and Ratangarh, and between Ratanagarh and Ajmer. Ratangarh Junction is a major rail head in northern Rajasthan connecting Bikaner and Jodhpur to Delhi via railways. Nearest domestic cum international Airport is Jaipur airport . 206 KM away from the town

D. Socio Cultural Resources

Demography

98. According to 2011 census, Ratangarhi Municipality has population of 71124 out of which 36,355 are males while 34,769 are females. Literacy rate of Ratangarh city is 75.76 % which is higher than the state average of 66.11%. In Ratangarh, male literacy is 86.70 % while female literacy rate is 64.48%. Population of Children with age of 0-6 is 10041 which is 14.12% of total population of Ratangarh. In Ratangarh Municipality, female Sex Ratio is 956 against state average of 928. Scheduled Caste (SC) population comprises 19.29 percent of the total population. Workforce participation rate in Ratangarh is 32 percent, which is higher the State level WPR of

29.6%. Largest proportion of population comprises Hindus followed by Muslims and Christians. Main languages spoken are Rajasthani, and Hindi.

History, Culture and Tourism

99. *History:* Churu district was founded in 1620 AD by the Nirban clan of Rajputs. Churu was a part of Bikaner district before the Independence of India. In 1948, it was separated from Bikaner when it was reconstituted.

100. According to historical documents Ratangarh was founded by Surat Singh, the maharaja of Bikaner in the year 1798 (Samvat 1855) while he was returning from Churu with his son Ratan Singh. He selected the place Kolasar and Rajia ki Dani for a new town and named it Ratangarh on his son's name. He handed over the responsibility to Purohit Hulashchand, Deepchand and Charan Sidayach Shankar to build Ratangarh as a modern 1812 (Samvat 1869) during the layout of Ratangarh. According to some old people, present Ratangarh was built at Kolasar village, and Asha Charni (Lado Bhuwa) constructed Raghunathji temple.

101. A historical Devali was found near village Hudera just three kilometers from Ratangarh. This is located at MEGA HIGHWAY near by 220KV GSS, Devali of Samvat 1309 was found in an old Sidhan Jogioan Nath math. According to historians this Devali is nearly 750 years old. As per a text written on Devali, This Devali is the wife of Rathoor Nahardass when she became satti on Baishak sudi 1, Samvat 1309. A similar Devali was also found in Rajaldeshar near Ratangarh. This Devali called Rajasi ki Devali is also 475 years old. Samvat 1581, Ashad Sudi 10 is written on the Devali. An artistic slab stone of 11th Centaury engraved with dancing figures was found in Ratangarh which is now placed in Government Museum, Bikaner.

102. In the year 1812 (Samvat 1869) Ratangarh fort was also completed. It is said that Ratangarh fort was attacked two times by Thakur Prithvi Singh the son of Churu with the support of Maharaval Laxman Singh of Sikar in the year 1815 and 1816 (Samvat 1872and 1873). In both attacks caretakers of Fort Lalshah Syed and Purohit Jethmal were killed. According to famous historian Gourishankar Hirachand Ojha, Maharaja Ratan Singh held a meeting with Cornel Velsin in 1834 to organize the Shekhawati Brigade of English army.

103. Ratangarh was planned before construction and its bazaar is laid out in the design of a cross with shops painted like the town. The massive fort (garh) was constructed in the middle of the town with a boundary wall around the city with four gates. A second small fort was built in the city. But now the original fort and also the second fort has nothing left except for a few ruined monuments and now used as offices of civil courts. A Clock Tower is at the main crossing of the bazaar called Ghantagar.

104. Ratangarh is a place of well-known businessmen, learned people, great saints, literary persons, poets, vaidyas, artists and great patriots. Ratangarh was also called second Kashi due to its center of learning. Shri Hanuman Prasadji Poddar founder 'Kalyan' is an international figure. Shri Jeevanand Anand freedom fighter, Social worker who worked whole life for promotion of Sanskrit, vedshastra and puran. he had also established the value of Sanskrit education in Rajasthan through Rajasthan Rishikul Brahamcharyaashram-

105. With the efforts of Maharaja Ganga Singh railway station built in 1910 and electricity was availed in 1930. Water Works was built and Water to houses was introduced in 1945 by Seth Durgadutt Anantram Thard. Seth Soorajmull Jalan, Sitaram bhuwalka, Seth Nagarmal Bajoria and

Seth Jethmal Dhanuka were the main contributors to develop the town in the present form. They laid network of roads(in 1945), opened hospital (1939), schools and colleges, public library, parks and several charitable societie

106. **Culture and Tourism.** Ratangarh region also remain the part of ancient culture. A 10th-century stone silalekh engraved with folk dance was found from an old temple now placed in Bikaner museum. Ratangarh Mathadish Sivalaya was supposed to be built 200 years before the foundation of Ratangarh. Bikaner maharaja Sujan Singh (Year 100- 1735) gifted Kolasar village (present Ratangarh) to Charan Mala of Nath sect for his Rajasthani literature ' Gari bat doye' . Charan Mala built 'Karniji temple' in Kolasar which now at the heart of the town. Sidhan Math of Nath sect in Hudera village is said to be built in early 10th century

107. There are so many temples in Ratangarh that it has earned the nickname "the Varanasi of Rajasthan". Some of the important temples are: Shree Talwale Balaji Mandir; Shree Chowk Wale Balaji, Churu Road; Panchmukhi Balaji; Mehandipur Balaji; Sankatmochan Balaji; Shirdi Sai Mandir.

108. Gugoji is a holy place about 16 km far away from Sadulpur (Ratangarh), it is also called as Dadrewa village in Churu district. Gugoji is known as the god of snakes and is visited throughout the year by people from different parts of the country many people from North and all over India come to pray here.

109. Salasar Balaji Temple - Located in the town of Salasar near Sujangarh, Salasar Balaji is the temple of Lord Hanuman. Fairs are organized every year on Chaitra Poornima and Ashwin Poornima at Salasar Balaji temple. The place also houses Rani Sati temple and Khatu Shyamji temple as well. Salasar Balaji is also known by the name of Salasar Dham. Salasar Balaji is about 75 kms from Ratangarh.

110. Tal Chhappar Sanctuary- Tal Chhappar sanctuary is located in the Shekhawati region of the state of Rajasthan. The sanctuary is known for its rare blackbuck. The Tal Chhappar sanctuary is located at the edge of the Thar desert on the Ratangarh-Sujangarh highway. Geographically, the sanctuary falls in Sujangarh Tehsil of Churu and is an amusement place for the visitors. The sanctuary is at a distance of 85 km from Churu city and at 55 km (aerial distance) from Ratangarh town.

E. Environmental Settings of Investment Program Component Sites

111. Subproject components are located in Ratangarh Town and in its immediate surroundings which were converted into urban use for many years ago, and there is no natural habitat left at the proposed sites. No involuntary land acquisition of private land is anticipated for this project. The project sites are located in existing road right of way (RoW) and government-owned lands. Proposed STPs (2 nos) , and SPS (2 nois) will be constructed on vacant municipal land. Two STP and one SPS sites are covered with sparse tree cover, shrubs and bushes, and no notable wildlife at these sites. There are no protected areas, wetlands, mangroves, or estuaries in or near the project locations.

112. Proposed STP sites are away from habitations (~235-500 m) and surrounded by agricultural lands. Treated wastewater will be reused for beneficial purposes (such as agriculture, horticulture, urban forestry, industry etc.,) a reuse plan will be prepared by the DBO contractor following the Sewerage and Wastewater Policy, 2016 and draft Guidelines Reuse of Treated Wastewater, 2019, of Government of Rajasthan. Necessary infrastructure like treated wastewater

storage tanks, including an elevated reservoir, and pumping station etc., is already included in the subproject at STP. The land allotted for construction of STP 2 by the Municipal Nagar Palika belongs to Gushala trust who is interested to use treated effluent from STP for agriculture and plantation within the campus. Water will be used throughout the year, and therefore no excess / surplus treated wastewater is expected from the STP for discharge.

113. Surplus/excess/unused treated wastewater from STP 1 will be disposed into government vacant land away from the STP.

114. In wider roads sewers will be laid in the road shoulder beside the tarmac, and in narrow roads, where there is no space, sewers will be laid in the road carriage way by break opening the tarmac. Roads in some part of the town are narrow. Roads are lined both sides with open drains. In narrow roads sewers will be laid in the middle of the road, which may affect the traffic. Bigger diameter trunk sewers will be laid along the main roads, which are wide and have adequate space. No tree cutting is anticipated as there is adequate space to lay the sewer in those roads. Site environmental features of all subproject sites and photographs are presented in the following Table. Geographical position coordinates of all project sites are given in Appendix 9.

Table 7: Site Environmental Features

S. No	Subproject component	Environmental Features of the Site	Photographs
1	STP-1 near NH-11 (3.80 MLD)	Site is located at Johar near National Highway-11. Total Area of the site is 3900 Sq.m of which 3500 sq. m. is allotted for construction of STP. Site is owned by the Municipal Board, Ratangarh Site is predominantly undulating, covered with sandy soil. Wastewater from the town is discharge near the site currently. Site is vacant, and has no notable tree cover, except few shrubs and bushes typical of desert land. Site is surrounded by agricultural and barren lands and is away from habitation. Nearest sensitive receptor, a house, is located at about 900m from the site.	
2	Outfall sewer alignment from STP 1 to discharge point	It is proposed to reuse the treated effluent for beneficial purposes (agriculture, horticulture, urban forestry etc.) and remaining surplus / excess treated effluent, if any, will be discharge on vacant government land / depression land near the STP site. A pipeline (440m length) will be laid from STP to the disposal point. Given the desert region, there is no defined natural drainage system, there are no rivers/streams or channels, in the area, rainwater is normally accumulated in the low-lying areas. Considering the scarcity of water, treated wastewater will be mostly utilized for beneficial purposes, and in remote case of excess/surplus, it will be discharged on the government vacant lands.	 Discharge point of treated effluent

S. No	Subproject component	Environmental Features of the Site	Photographs
3	STP 2 at Gaushala, land on Churu road (6.10 MLD)	Proposed STP site is located within a Gaushala (cattle care center) on Churu road, Total Area of the site is approx.6000sq.m Acre of which 4800sq. m. is allotted. Land is owned by Gaushala trust. Ratangarh municipality has entered into an agreement with the trust to provide land for the STP, and the trust will be allowed to use treated wastewater for agricultural purposes within the trust area. Site is predominantly flat, vacant, and site is surrounded by agricultural /vacant lands and is away from habitation.Nearest sensitive receptor, a house is located at about 235m and a girls college on churu road is at a distance of 200 m from the site. There are about 10 trees of local tree species (Khejri neem babool, Pipal and Shisham) in the selected site. During detail design, all efforts should be done to avoid tree cutting by integrating the trees into the layout design. If unavoidabke, trees will be removed, and tree plantation will be carried out as per replacement ratio of 1: 3	
4	Outfall sewer alignment from STP 2 to discharge point	Treated wastewater will be used within the Gaushala trust land for irrigation / agricultural purposes. Water will be utilized throughout the year, there will be no excess water discharge outside the trust land.	 Discharge site of treated effluent of STP

S. No	Subproject component	Environmental Features of the Site	Photographs
5	SPS-1 near BSNL office (3.89 MLD)	Site for SPS 1 is selected next to the existing drainage pumping station, near BSNL office in the town. This is a low-lying land, and currently accumulated with wastewater and solid waste. Part of the land will be cleared and SPS will be constructed next the existing drainage sump well. Due to lack of sewerage system, the wastewater from part of the town is currently accumulated at this low-lying land, and once the sewerage system becomes operational, there will be no flow of wastewater into this area. Site is vacant, and there are no trees. Site is located in the town area; houses are located close to the site. Proper buffer will be provided around the pumping station, as large vacant land is available. Land is owned by Ratangarh Municipality and has significant solid waste materials dumped on site, estimated to be 3250.72 cubic meters.	
	SPS-2 Ward No-1, near Main Ginani (4.60 MLD)	SPS 2 site is selected in a low lying in the town. and currently accumulated with wastewater and solid waste. Part of the land will be cleared and SPS will be constructed. Due to lack of sewerage system, the wastewater from part of the town is currently accumulated at this low-lying land, and once the sewerage system becomes operational, there will be no flow of wastewater into this area. Site is vacant, and there are few trees. Site is located in the town outskirts; houses are located close to the site on one side. However, large vacant land is available, proper buffer will be provided around the pumping station Land is owned by Ratangarh Municipality and similarly full of solid waste materials dumped on site. The estimated solid waste is 21035.47 cubic meters.	

S. No	Subproject component	Environmental Features of the Site	Photographs
11	Sewer network	The sewage collection networks will traverse through either middle of the city road or within ROW. Laying with Trenchless method for 10.18Km at critical junctions including railway track/main road crossings, are proposed. No impacts on structures (temporary nor permanent) and CPRs16 is envisaged. However, during laying of pipeline, due to loss of access, temporary livelihood loss to roadside vendors, Kiosks, is envisaged. No tree cuttings will be required as per preliminary design.	 Road near railway track Near Kalimata Mandir Churu Bypass

[16]Common property resources include public resources, community-owned facilities or cultural property such as temples, shrines, public utility posts, etc, that the landless poor and vulnerable depend on for survival

Figure 20: Google Map Showing Proposed STP 1 Location (3.80 MLD) and Discharge Pont near NH-11

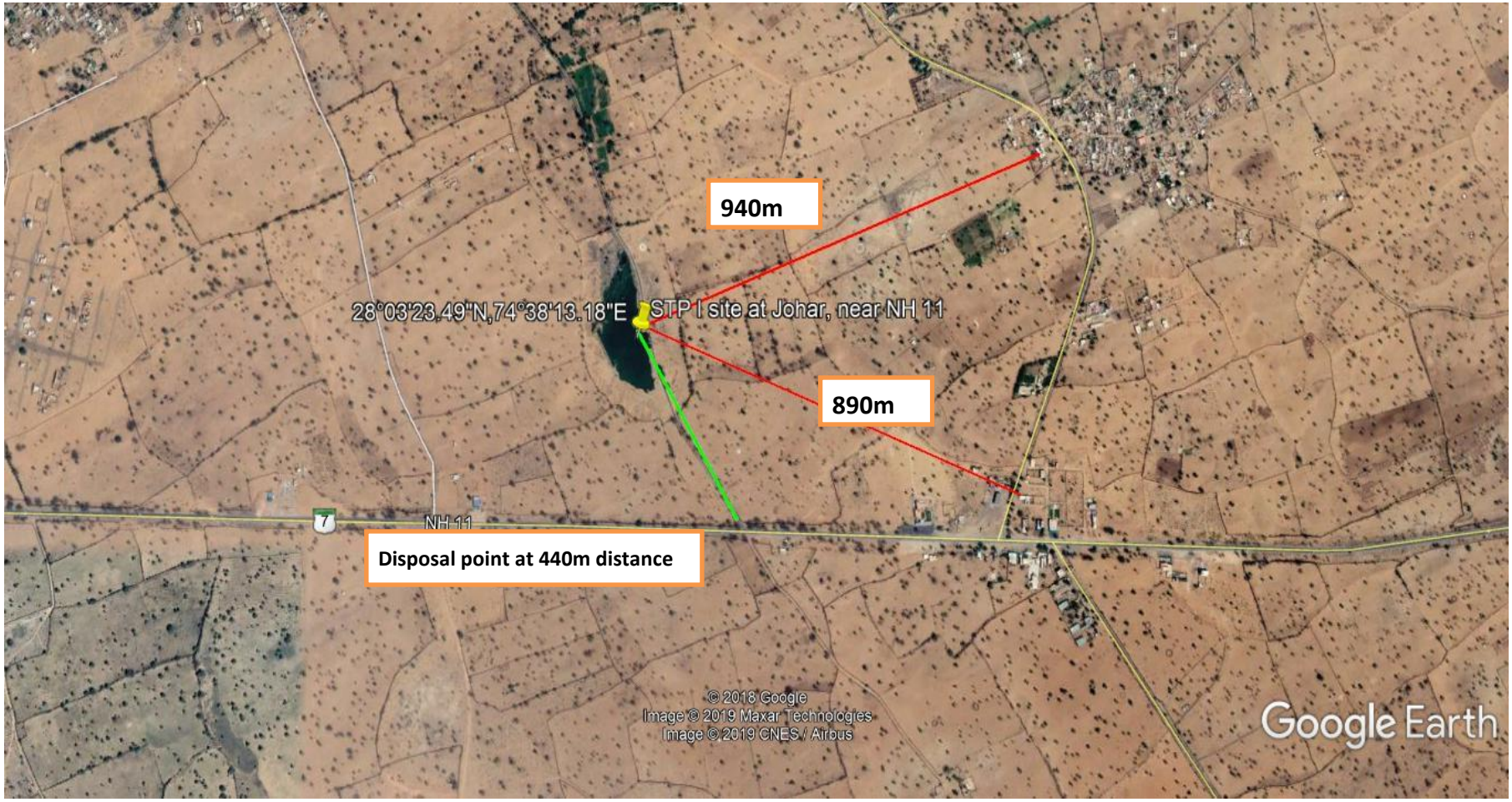
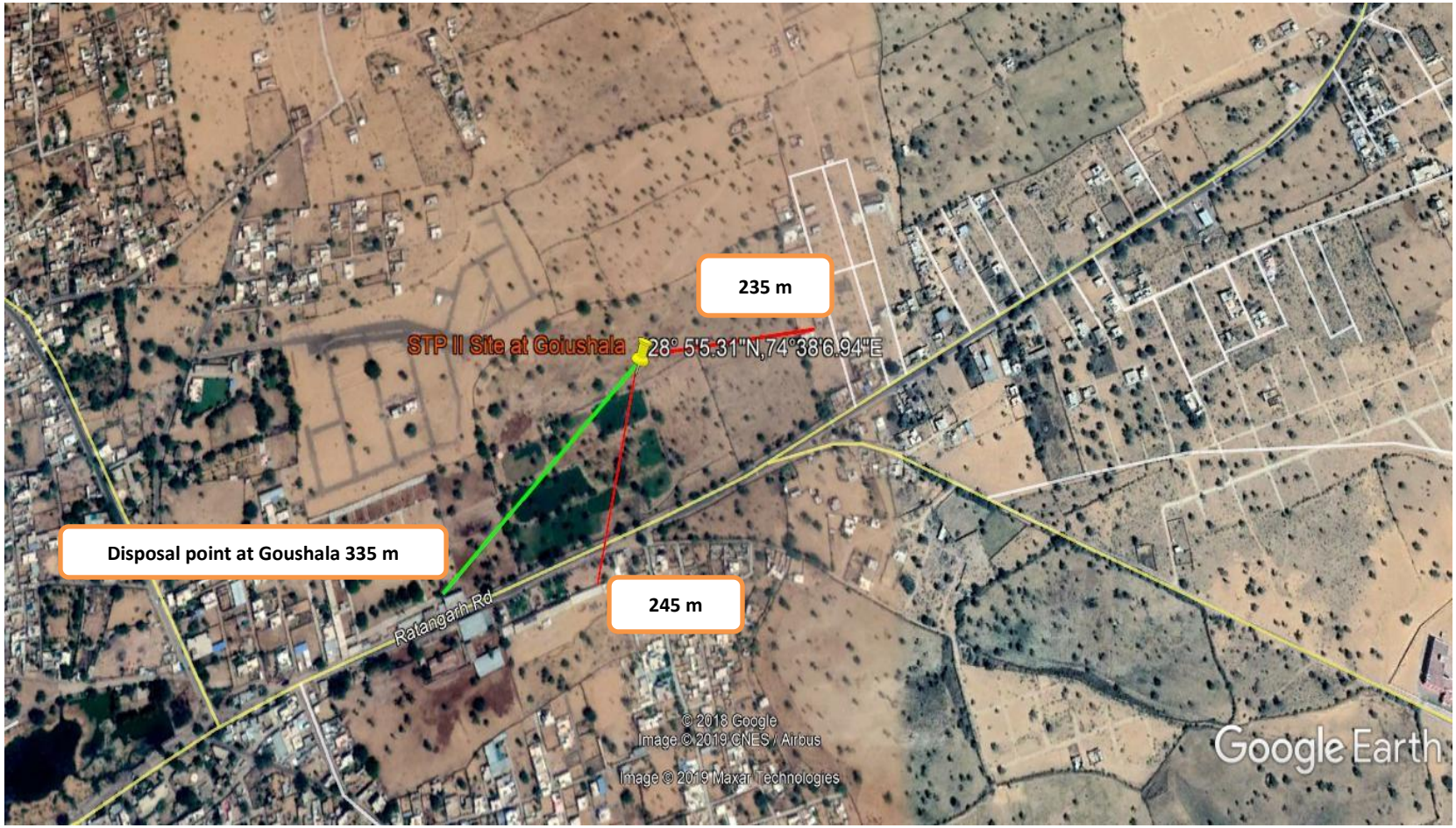


Figure 21: Google Map Showing Proposed STP 2 Location (6.10 MLD) and Discharge Pont in Goushala Land



VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

115. 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.

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

(i) **Location impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site;
(ii) **Design impacts** include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services;
(iii) **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; and
(iv) **Operation and maintenance (O and M) impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

117. 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).

118. 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.

119. The ADB Rapid Environmental Assessment Checklist for sewerage has been used to screen the project for environmental impacts and to determine the scope of the IEE.

120. In the case of this project (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) negative impacts associated with sewage facilities such as odour, treated wastewater discharge are already considered in design / siting of facilities, (iii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iv) being located in an urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

B. Pre-Construction Impacts – Design and Location

Location Impacts

121. **Odour Nuisance from STPs and SPSs** As presented in the baseline profile, the two proposed STP sites are identified away from habitation, (~235 to >500 m), and sites are currently vacant, and do not have any notable sensitive environmental features with no tree cover / vegetation. But both the SPSs sites are close to habitation and low laying areas where wastewater is accumulated. The proposed treatment technology, SBR, being an aerobic process and conducted in a compact and a closed system with automated operation, odour nuisance will be very minimal and negligible. Limited bad odors may be generated from wet well, primary treatment units and sludge treatment. However, to account for future development potential around the sites, and to enhance the environmental benefits following measures should be included in the STP/SPS site planning and design:

(i) Provide a green buffer zone of 10-20 m wide all around the STP, and 5-10 m around SPSs, with local varieties of trees intwo to three rows as far as possible. This will act as a barrier and visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation; and
(ii) Develop layout plan of SPS/STP such that odour generating units (such as sludge/solids handling facilities) are located away from the surrounding area with future development potential.

122. **Social and Cultural Resources.** There are no notable or significant archeological places or protected monuments or areas in Ratangarh 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 Archeological Department if a find is suspected and take any action, they require to ensure its removal or protection in situ; and
(iv) Prepare a chance find protocol (sample is provided in Appendix 10).

123. Tree cutting at project sites. At the proposed STP site at Gaushala and SPS site at Main Ginani, there are few (15 nos) medium sized trees of local species. These trees may be required to cut for construction. There are no notable tree cover or vegetation in other sites. Sewers will be laid along the road within road right of way. or at the middle of the road. There, are no notable trees in the alignment, therefore no tree cutting is envisaged. Following measures need to be implemented to minimize and/or compensate for the loss of tree cover.

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

124. **Handling and Disposal of accumulated Solid Waste at proposed SPS Sites**. As stated earlier, the selected low-lying lands for sewage pumping stations are filled with wastewater and solid waste, which needs to be cleared for construction of sewage pumping stations. Site clearance and removal of solid waste is part of the scope of DBO contract. The handling of this accumulated waste will involve occupational health and safety issues to the workers engaged for such work and also to the people residing close to the work site. This is because the waste handling and working conditions will be harmful and may also emit harmful gases. Proper health and safety precautions are necessary. Following measures are to be implemented during the handling/ transfer of solid waste and site clearance:

(i) Prepare a waste handling and management plan for the work, considering handling, disposal and occupational and public health safety;
(ii) Assess the working conditions, develop appropriate working method, and work shall be only conducted under continuous supervision of EHS supervisor;
(iii) Waste shall not be handled manually; use appropriate equipment;
(iv) All workers shall be provided with necessary personal protection equipment, including gloves, boots, face/gas masks. and oxygen cylinders in handy for emergency use etc.; if gas emission is suspected at any point of time, workers shall use gas masks with oxygen cylinders;
(v) Inform surrounding public about the work;
(vi) Fire control and safety equipment shall be provided at the work site;
(vii) Waste shall be properly covered during transport; and
(viii) Manage the solid waste as per the Solid Waste Management Rules, 2016

Design Impacts

125. **Design of the Proposed Components.** The Central Public Health and Environmental Engineering Organization (CPHEEO) manual suggests a design period of 15/30 years in general while designing the systems for sewerage components. It is proposed to consider 2051 as the design year for all the components in order to maintain unanimity in the design period and design population. Accordingly, 2021 shall be the base year and 2036 the intermediate year to cross check the designs pertaining to intermediate demand. Technical design of all the elements of sewerage (STP, reuse arrangements, sewer mains and network including manholes and house connections, etc., follows the relevant national planning and design guidelines, include the Sewerage and Wastewater Policy of Rajasthan 2016.

126. Following environmental considerations are already included in the project to avoid and/or minimize adverse impacts and enhance positive benefits:

(i) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically);
(ii) Recovering wash water from treatment process to optimize the water use;
(iii) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs;
(iv) Designing the entire system to maintain optimal flow and terminal pressure and optimizing the overall energy usage;
(v) Avoiding usage of asbestos containing materials;
(vi) Reducing the incidence of water borne diseases by providing 100% population including urban poor with improved sanitation facility;

(vii) Reuse of treated wastewater from STP for non-potable uses thereby reducing the load in freshwater resources;
(viii) Adopting a combined approach of sewerage system and faecal sludge and septage management to cover 100% population of the town with safe collection, conveyance and treatment of sewage generated in the town; and
(ix) Provision of appropriate personal protection equipment to the workers and staff

127. **Use of Hazardous/Harmful Substances in Water and Wastewater Treatment.** Wastewater treatment may involve application hazardous/harmful chemicals., As the treatment process will be designed by DBO contractor, the use of chemicals in treatment is not available at this stage. Measures are required to reduce the usage as well the handle if any hazardous substances safely following prevailing rules and regulations. For disinfection, the bid specifies, however, the use of Chlorine as disinfectant. Disinfection with chlorine is proposed at STP. There is invariably a safety risk when chlorine is handled. Safety precautions are necessary to ensure the safety of workers and citizens. Following measures are suggested:

(i) Reduce the use of chemicals in the treatment process to the extent possible provide non-chemical alternatives or easily recoverable and/or reusable chemicals or biocompatible alternatives;
(ii) Establish proper handling/storage/application system according to the relevant standards, safety precautions and prevent accidental release/spill/
(iii) Provide leak/spill detection, collection/capture and safe disposal facilities such as chlorine absorption and neutralization facility/
(iv) Provide ventilation, lighting, entry and exit facilities; visible and audible alarm facilities to alert chemical/chlorine leak;
(v) Facility for isolation in the event of major leakages;
(vi) Eye wash and shower facility;
(vii) Personal protection and safety equipment for the operators (masks, oxygen cylinders, gloves, etc.,);
(viii) Provide training to the staff in safe handling and application of chemicals, material safety, and standard operating procedures and emergency responses; and
(ix) Develop emergency response procedures.

128. **Design of Sewage Treatment Plant.** Two STPs of capacities 3,80MLD and 6.10MLD are proposed to be constructed at the identified sites to treat the sewage generated from Ratangarh Town. It is proposed to establish STP based on SBR (sequential batch reactor) process, followed by disinfection by chlorine. As the bid is DBO type, detailed design of the STP will be carried out by the contractor to the following specific discharge standards. Currently for STPs in India, the standards notified by Ministry of Environment, Forests and Climate Change (MOEFCC) in 2017 (see column (4) in table below) are applicable. However, under RSTDSP, PMU has decided to base the STP design on discharge standards for STPs suggested by CPCB in 2015, which are more stringent. The strident standards also facilitate maximum utilization of treated wastewater for reuse in various purposes following the Sewerage and Wastewater Policy, 2016, of Rajasthan[17]. It is also to be noted that, in April 2019, the National Green Tribunal (NGT) in one of its orders directed MOEFCC to reconsider stringent standards for STPs.

[17]"The use of treated wastewater in irrigation and industrial application shall be given the highest priority and shall be pursued with care. Effluent quality standards shall be defined based on the

Table 8: Proposed Raw and Treated Wastewater Characteristics for STP Design

S. No	Parameter	Proposed Discharge Standards for Ratangarh STPs	MOEF andCC STP Discharge Standards, 2017	CPCB discharge standards, 2015#	IFC Guideline value for sewage discharge	WHO Guideline Value for safe use in agriculture
1	pH	6.5 – 9.0	6 – 9	6.5-9.0	6 – 9	6 – 9
2	Biochemical Oxygen Demand (BOD) (mg/l)	≤10	<30 <20 (metro cities)	<10	30	-
3	Chemical Oxygen Demand (COD) (mg/l)	≤50	-	50	125	-
4	Total Suspended Solids (TSS) (mg/l)	≤20	<100 and <50 (metro cities)	<20	50	-
5	Total Nitrogen (mg/l)	<10	-	<10	10	-
6	Ammonical Nitrogen (mg/l)	<5	-	<5	-	-
7	Total Phosphorus (mg/l)	-	-	-	2	-
8	Fecal Coliform MPN/100 ml	<100	<1000	<100	-	<1000
9	Oil and grease, mg/l	-	-	-	10	-
10	Nematodes, number of eggs per litre	-	-	-	-	1

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

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

129. **Treated wastewater Reuse/Ddisposal.** Rajasthan is a water scarce region and receives low rainfall. Recognizing the importance of treated wastewater in reducing the demand on water, Sewerage and Wastewater Policy, 2016, of Rajasthan promotes the reuse of treated sewage for non-potable applications, and also to make sewerage projects environmentally sustainable. Government of Rajasthan adopted this policy to ensure "improved health status of urban population, specially the poor and under privileged, through the provision of sustainable sanitation services and protection of environment". To further promote the reuse and provide guidance, Policy prioritized reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry and non-potable domestic reuse. Policy requires monitoring of treated

best attainable treatment technologies, and calibrated to support or improve ambient receiving conditions, and to meet public health standards for end users".

wastewater quality, soil quality etc., Policy prohibits artificial recharge of aquifers using treated wastewater, and promotes construction of storage tanks to store treated wastewater to facilitate reuse. Policy prescribes that the detailed project report (DPR) should clearly define the best reuse option specific to the town and prepare a Reuse Action Plan part of the DPR following water quality norms and legal implications. LSGD is currently in the process of publishing Guidelines for Reuse of Treated Wastewater in Rajasthan 2019 to promote the reuse and provide guidance to the stakeholders. Guidelines promotes the use the treated wastewater and envisages to maximize the collection and treatment of sewage generated and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources.

130. Policy provided priority to reuse in agricultural for unrestricted irrigation. It suggests blending of treated wastewater with fresh water to improve quality where possible, and crops to be irrigated shall be selected to suit the irrigation water, soil type and chemistry. Policy requires monitoring of accumulation of heavy metals and salinity. It encourages farmers to use modern and efficient irrigation technologies, and to ensure protection of on-farm workers and crops. As a contingency measure, policy requires regular monitoring of treated water quality, and emergency alerts to users in any event of deterioration of quality. Policy prohibits use of treated wastewater for artificial recharge (Excerpts from Policy on Reuse is provided in Appendix 11).

131. **Reuse Options.** Following the Sewerage and Wastewater Policy, 2016, the draft Guidelines on Reuse provides the following reuse applications:

(i) Agriculture, horticulture, irrigation;
(ii) Gardening in park;
(iii) Road washing and water sprinkling to reduce fugitive dust;
(iv) Industries including mining;
(v) Recreational ponds and lakes;
(vi) Social forestry;
(vii) Construction Activities;
(viii) Firefighting and other municipal uses;
(ix) Railway;
(x) Thermal power plants ;
(xi) Cantonments; and
(xii) Individual Users

132. **Allocation of treated wastewater for reuse.** City Level Committee (CLC) headed by the District Collector will allocate the water for most appropriate uses. According to the proposed procedure, agencies / individuals that require treated wastewater shall apply to the District Collector. CLC will allocate water to users. In case of supply is more than the demand of the town, the treated wastewater can be allocated to users with 25 km of STP by the CLC. It may also be made mandatory to industries to use treated wastewater under certain conditions

133. **Reuse Plan.** The State Policy require the Sewerage Detailed Project Report provide reuse options and strategy to implement reuse, and detailed Reuse Action Plan. As the Ratangarh subproject is proposed under DBO, the Reuse plan will be prepared by the DBO contractor during the detailed design phase in consultation with the stakeholders in Ratangarh, and reuse modalities will be firmed up. Subproject includes following components as part of the STP to facilitate reuse: disinfection of treated wastewater, Treated effluent storage reservoir (TESR), effluent pumping station and a treated effluent elevated reservoir (TEER). At STP 1 (3.80 MLD), the capacities of TESR and TEER respectively are 470 KL (12.5% of STP capacity) and 270 KL

(7%), and at STP 2 (6.10 MLD), the capacities are 270 KL (4.5%) and 140 KL (2.5%). Thus, total storage capacity that will be available at each STP for treated wastewater will be 20% of STP 1 and 7% of STP 2 capacity, which will mainly facilitate supply to reuse applications from the TESR. Treated effluent will be chlorinated prior to its entry into TESR/TEER. Following needs to be considered in the preparation of reuse plan:

(i) As part of the plan, identify potential reuse application in Ratangarh and establish quality criteria for each of the use;
(ii) For applications that use treated wastewater directly (e.g., agriculture), the quality required for such application in safe manner considering health, environment, and crop yield concerns shall be ensured;
(iii) Prepare a reuse plan for agriculture, if that is the priority use or one of the applications as per the CLC in Ratangarh, clearly indicating the limits (geographical/crops/type of application/type of soils etc.,); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations;
(iv) Plan should include awareness and training provisions and responsibilities; these can be conducted by concerned department (e.g., Agricultural Department, District Collectorate);
(v) Carryout regular/online monitoring of critical quality parameters of treated wastewater to ensure that they meet the preset standards established for reuse.

134. **Use of treated wastewater for irrigation.** Treated wastewater from STP 2 in Gaushala will be used for agricultural purposes, while STP 1 treated wastewater reuse plan will be prepared during the detailed design, and irrigation will be one of uses. Use of wastewater for irrigation is associated with some health risks – from germs in wastewater, which may contaminate food and spread disease, health risk to farm workers from worms (helminths) and nematodes and chemical risk is associated if industrial wastewater enter the sewers. If the wastewater with bacteriological contaminants are used for food crops like lettuce, tomato, which are eaten without peeling or cooking, it will present a greater health risk if precaution such as such washing with chlorinated water or storing for adequate time in normal temperature before use (at least 10 days). According to the WHO, effluent which is used to irrigate trees, industrial/commercial (not food, like cotton) and fodder crops, fruit trees, and pasture should have less than one viable nematode egg per liter. Effluent used for the irrigation of food crops, sports fields, public parks, should have and less than one viable nematode egg per liter and less than 1000 fecal coliforms per 100 milliliters. These shall be considered in the Reuse Plan that will be prepared during the detailed design and complied accordingly.

135. **Disposal of treated wastewater.** Given the dry and water scarce project area, treated wastewater will be utilized for reuse purposes throughout the year by preparing and implementing a robust reuse plan in Ratangarh. Therefore, there is unlikely to be any need to discharge treated wastewater. As stated earlier, STP 2 in Guashala will not have any discharge as entire treated wastewater will be utilized for irrigation within the Gaushala land. From STP 1, if the need arises when there is excess/ surplus, it will be disposed in the nearby vacant/low – lying government lands. In the desert region of Ratangarh, there are no streams or channel or a defined natural drainage system. Therefore, surplus wastewater will be discharged onto vacant/low-lying government lands. Groundwater is very deep, and as the wastewater is treated to very fine discharge standards, there is unlikely to be any impacts on groundwater resources. Large expanse of government lands, high evaporation rates, and infiltration in sand soils, there is unlikely to be any issue of submergence or waterlogging in surrounding lands. Considering the existing status of land, and the degree of treatment, no significant impacts envisaged. Proper

systems should be put in place at the proposed STP to ensure that treated wastewater at all times meet the stipulated standards prior to its discharge. Operation and maintenance of STP and change in incoming sewage quality will have impact on the treatment efficiency. This therefore requires monitoring:

(i) Obtain of consent of RSPCB for discharge of treated wastewater into nearby drains;
(ii) Regularly monitor the treated wastewater quality at STP and ensure that it meets the discharge standards; and
(iii) Monitor water quality periodically during operation phase as per the Environmental Monitoring Plan

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

137. Subproject includes sludge management infrastructure in STP, including system for sludge collection, thickening, solar drying, and disposal at landfill/identified site. This includes a Sludge Sump to collect sludge from SBR basins; returning arrangement for supernatant from the sump to inlet/equalization tank for treatment; pumping sludge to sludge thickener and pumping thickened to mechanical sludge dewatering system (such as centrifuge). It also requires contractor to establish a shed where the dewatered sludge cake can be further air dried for 15 days. This is indicative sludge management system, and DBO contractor will design the system meeting these requirements. Bid indicates that “the sludge produced from the treatment process would be processed so it may be used as fertilizer and soil conditioner” and it requires DBO contractor “to conform to the regulations of public health and environment protection norms”. This follows the Sewerage and Wastewater Policy, 2016, which suggests “use of sludge produced from the treatment as fertilizer and soil conditioner after processing”.

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

139. Contractor will propose the sludge management plan with best methods for reuse of sludge as per guidelines of CPHEEO (guidelines are attached as Appendix 12) and best international practices in consultation with PMU and Nagar Palika. Properly dried sludge can be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests shall be conducted to confirm the concentrations below the following standards. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 have been adopted here. Rules stipulate that “In order to ensure safe application of compost, the following specifications for compost quality shall be met”.

Table 9 : Standards for Sludge Reuse as Manure

Standards for Composting. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 (Schedule II A, Standards for Composting) have been adopted here. According to the standards "In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:			
Parameters	**Units**	**Organic Compost (FCO 2009)**	**Phosphate Rich Organic Manure (FCO 2013)**
Arsenic	mg/kg	10	10
Cadmium	mg/	5	5
Chromium	mg/kg	50	50
Copper	mg/kg	300	300
Lead	mg/kg	100	100
Mercury	mg/kg	0.15	0.15
Nickel	mg/kg	50	50
Zinc	mg/kg	1000	1000
C/N ratio	-	<20	<20:1
pH	-	6.5 – 7.5	(1:5 solution) maximum 6.7
Moisture, percent by weight, maximum		15.0 – 25.0	25.0
Bulk density	g/cm3	<1	Less than 1.6
Total Organic Carbon, per cent by weight, minimum	percent by weight	12	7.9
Total Nitrogen (as N), per cent by weight, minimum	percent by weight	0.8	0.4
Total Phosphate (as P205) percent by weight, minimum	percent by weight	0.4	10.4
Total Potassium (as K20), percent by weight, minimum	percent by weight	0.4	-
Odour		Absence of foul Odor	
Particle size		minimum 90% material should pass through 4.0 mm is sieve	minimum 90% material should pass through 4.0 mm is sieve
Conductivity, not more than	dsm-1	4	8.2

* compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops.
FCO = Fertilizer Control Order, Department of Agriculture, Government of India

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

(i) Prepare a dried Sludge utilization plan for Ratangarh with the help of Agriculture Department/CLC; plan should also include if any additional processing is required for sludge to use as soil conditioner;

(ii) Plan should clearly various potential uses and demand in Ratangarh and surroundings;

(iii) Establish usage limits, where required, (geographical/crops/type of application/type of soils etc.,); adopt international good practice suggested by

agencies like World Health Organization (WHO) and Food and Agricultural Organization (FAO) of the United Nations;

(iv) Identify a landfill/suitable site for disposal of surplus dried sludge;

(v) Monitor sludge quality during operation phase as per the Environmental Monitoring Plan, ensure that it meets the quality parameters established by FCO; and

(vi) In case of sludge not meeting the quality parameters, it shall not be used as soil condition, and shall be disposed at appropriate disposal site (if it falls under hazardous category, it shall be disposed as per the Hazardous Waste Management Rules, 2016)

141. **Mixing of industrial effluent in wastewater.** One of the critical aspects in sewerage system operation is, change in raw sewage characteristics at inlet of sewage treatment plant may affect the process and output quality. STPs are designed for municipal wastewater, which does not include industrial effluent. Characteristics of industrial effluent widely vary depending on the type of industry, and therefore disposal of effluent into sewers may greatly vary the inlet quality at STP and will upset process and affect the efficiency. Various types of small to medium-scale industries, including small cement plant, wooden furniture and handicrafts, cement electric poles manufacturing, stone and steel furniture, plastic, detergent etc., Most of these industries generate wastewater from the process, which is generally treated at effluent treatment plants specifically established for the purposes and are not allowed into municipal sewers. While the project does not provide sewerage system in established industrial areas, there is a risk of industrial effluent joining municipal sewers from the small/household units established in town areas where sewers are being provided. Mixing of industrial effluent will severely deteriorate the quality of treated wastewater, and therefore the proposed reuse. Reuse of such water may have significant impact on public health, and on land and water. Following measures should be incorporated to safeguard the sewerage system and the intended reuse:

(i) No industrial wastewater shall be allowed to dispose into municipal sewers;

(ii) As there is a risk of potential mixing of industrial waste, no domestic wastewater from industrial units shall be allowed into municipal sewers;

(iii) Ensure that there is no illegal discharge through manholes or inspection chambers

(iv) Conduct public awareness programs in coordination with RPCB and CLC; and

(v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated wastewater quality complies with the effluent standards

142. **Design of Sewage Pumping Stations.** Two SPSs of capacities 3,80. MLD and 4.60 MLD are proposed to be constructed at the identified sites to move wastewater to higher elevations in order to allow transport by gravity flow until the sewage reach the treatment plants. As explained earlier, SPSs are proposed near to residential areas. Therefore, care should be taken while designing SPS to avoid impacts during operation phase. Design engineers should take following mitigation measures to reduce impacts due to proposed SPS:

(i) Provide low noise, efficient pumping systems;

(ii) Provide dedicated power supply to SPS, if possible, otherwise DG set to be used during power failure, should be soundproof and having acoustic enclosures with low/permitted air emission standards;

(iii) Design SPS with appropriate retention time, so as not to retain the sewage in the sump for long time to avoid generation of odourous gases;

(iv) Firm barricades should be provided all round during construction of SPS;

(v) Boundary wall of sufficient height should be provided during operation phase so that no children/residents can entre in the SPS premises;
(vi) Plantations should be provided if space available to reduce foul smell of sewer during operation;
(vii) No workers camps should be allowed during construction works at SPS site;
(viii) Entry should be restricted through provision of gate and guard during SPS operation; and
(ix) Highest Flood Level (HFL) should be used as a basis while deciding on the SPS dimensions. Also, all the prevention methods including buffer capacity secondary tank and alternative power arrangements should be implemented so that sewage does not either leak during power outages or percolate into ground and pollute water.

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

(i) Limit the sewer depth where possibl;
(ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);
(iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm);
(iv) In unavoidable, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided)
(v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes;
(vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry;
(vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope and gas vents in gravity mains to prevent buildup of solids and hydrogen sulfide generation; and
(viii) Take necessary precautionary measures to protect sewer network, and to avoid disposal of solid wastes, debris, wastewater into newly laid sewers from the time it is constructed to the start of operation phase.

144. **Fecal Sludge and Septage Management (FSSM).** The proposed FSSM will help the ULB to cover entire population with safe disposal of human excreta by serving areas which are not feasible to be provided with a sewerage system. About 18% of population will be served by this method. Under the FSSM, fecal sludge / septage will be collected from the household level septic tanks using truck mounted mobile desludging equipment and transported to Sewage Treatment

Plant (STP) for treatment. At this stage, the quantity of septage generated from this area is not available. This will be estimated during the detailed design phase, and number of mobile tankers required to collect the transport the septage to STP, frequency of collection depending on the size of septic tanks etc., will be worked out accordingly. IEE needs to be updated during the detailed design phase to reflect the final project design. Although handling, transportation and disposal into STP is completely mechanized, the system will however be operated by the workers, therefore proper precautions as workers will be dealing with highly harmful septage. Accessibility of septic tanks to mobile suction tankers to collect septage is critical for success of the septage management system. At STP, the septage will be mixed with the sewage and will be co-treated in the STP. Septage will be in concentrated and partially degraded form, and disposal of the same into STP inlet stream may upset the sewage treatment process, may generate bad odours, and may ultimately affect the quality of treated wastewater. Treatment process needs to be properly designed. Following measures are suggested for implementation:

(i) Conduct detailed survey of the households to be covered with FSSM to design the system to suit the local conditions, such as type of septic tanks and their location in the houses;
(ii) Create awareness program on the FSSM from collection to treatment system that will be adopted;
(iii) Design the sewage treatment process duly considering mixing of septage;
(iv) Ensure that the FSSM system is completely mechanized no human touch, even accidentally, from collection at household to discharge into STP, and in periodic cleaning of tankers;
(v) Demarcate a proper area for cleaning of mobile tankers in STP premises, and ensure that the wastewater shall be discharged into STP;
(vi) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary personal protection equipment, eliminate any risks to the workers and the communities by providing proper training and necessary PPEs to workers. Safeguards induction prior to start of works will include detailed instructions handling, managing and protection from diseases and other biological hazards;
(vii) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating, and resting places;
(viii) Conduct regular health checks; and
(ix) Prepare Health and Safety Plan for FSSM.

C. Pre-construction Impacts

145. 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 ULB will

(i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; and
(ii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

146. Site selection of construction work camps, stockpile areas, storage areas, and disposal areas. Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of

property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up construction camps to protect the human environment (i.e. to curb accident risks, health risks due to air and water pollution and dust and noise and to prevent social conflicts, shortages of amenities and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, swamps or in areas which will inconvenience the community. Construction sites will be selected by DBO contractor in compliance with these conditions and the same will be reflected in Site Environmental Management Plan (SEMP) which 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; and
(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.

147. 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 Mines and Geology Department. If new sites are necessary, these would 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 Mines and Geology and local revenue administration. If additional quarries will be required after construction is started, then the construction contractor shall use the mentioned criteria to select new quarry sites, with written approval of PIU.

D. Construction Impacts

148. The civil works for the subproject includes construction of STPs and SPSs. 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. 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 SPS and STP 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 pipework 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. 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.

149. Subproject also include linear works (laying of 159 km of sewers along the roads). This covers almost entire project area of Ratangarh town. Small sewers (tertiary sewers) will be laid in all streets and roads, the larger sewers will be laid mostly on wider main roads. Sewers will be laid by open cut method. The maximum depth for sewers depends on the design, and in Ratangarhi most of the sewers will be laid 1.2 to 2 m below the ground, and some sewers will be laid deeper (>2m) and maximum depth will be 8 m. As per the bid conditions, sewers of more than 3.5 m deep should not be laid by open cutting method. As per the bid conditions, “the maximum depth of sewer is 3.5 m for open excavation after 3.5 m sewer shall be laid by the trenchless method only. Trenchless method may also be used even where depth is less than 3.5 m for important roads in the city where traffic density is more, and in the streets where traffic diversion is not feasible etc. It is proposed that 10.18 km length of sewers will be laid by trenchless method; these will include railway line /main road crossings. Sufficient care will be taken while laying so that existing utilities and cables are not damaged and pipes are not thrown into the trenches or dragged, but carefully laid in the trenches. Trenches deeper than 1.5 m will be protected by shoring/bracings to avoid collapse of trenches, and also to avoid any risk to surrounding buildings. Once they are laid, pipes will be joined as per specification and then tested for any cracks of leakages. The minimum working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. Extraneous soil after backfilling of trenches shall be used for filling low lying area or stored/ dumped in approved debris disposal sites.

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

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

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

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

(i) Plan the work sites properly, and demarcate the sites for stockpiling of, soils, gravel, and other construction materials away from the traffic, vehicle, general worker movement to avoid disturbance of loose materials
(ii) Damp down exposed soil and any stockpiled material on site by water sprinkling;
(iii) Use tarpaulins to cover sand and other loose material when transported by trucks;
(iv) Clean wheels and undercarriage of haul trucks prior to leaving construction site;
(v) Don't allow access in the work area except workers to limit soil disturbance and prevent access by barricading and security personnel;
(vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly. Contractor's vehicles and equipment should compulsorily have PUC and submit PUC to PIU before deployment at site;
(vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers and DG Set etc. if specifically established for this project;
(viii) If contractor is purchasing ready mix concrete, asphalt/macadam and aggregates from third party, contractor will assure that all the partier/ suppliers are having CTE/CTO from RSPCB 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; and
(ix) Conduct ambient air quality monitoring periodically as per Environmental Management Plan (EMP).

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

(i) Prepare and implement a spoils management plan (Appendix 13);
(ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas;
(iv) Inspect all the drainage at construction site/construction camp/labor camp etc. and clear all the drainage lines so that no water stagnation/flooding may occur during heavy rainfall;
(v) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it;
(vi) If open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc.;
(vii) Inspect and verify all the emergency measures and emergency control system before start of monsoon, keep the emergency response committee on high alert during monsoon/heavy rain fall;
(viii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(ix) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
(x) Dispose any wastes generated by construction activities in designated sites; and
(xi) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

154. **Noise and Vibration Levels.** Construction works will be conducted along the roads in Ratangarh urban area, where there are houses, schools and hospitals, religious places and small-scale businesses. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads, operation of construction equipment like concrete mixers, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have impact on nearly buildings. This impact is negative but short-term, and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
(ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
(iii) As far as possible use new construction machineries and keep all the old machineries in good and maintained state;
(iv) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor;
(v) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s;
(vi) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
(vii) Consult the custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals; and
(viii) Conduct Noise monitoring according to the Environmental Management Plan (EMP).

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

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

(ix) Request PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

156. **Water Quality.** Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater collects in the voids. In Ratangarh groundwater is much deeper than the proposed trenching depth, and rains are limited during monsoon season. However, to ensure that water will not pond in pits and voids near project location, the construction contractor will be required to conduct excavation works in non-monsoon season to the maximum extent possible. These potential impacts are temporary and short-term duration only. However, to ensure that these are mitigated, construction contractor will be required to:

(i) Prepare and implement a spoils management plan (Appendix 13);
(ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas;
(iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
(vi) Dispose any wastes generated by construction activities in designated sites; and
(vii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

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

(i) Prepare and implement a Traffic Management Plan (Appendix 14);
(ii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(iii) Schedule transport and hauling activities during non-peak hours;
(iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
(v) Keep the site free from all unnecessary obstructions;
(vi) Drive vehicles in a considerate manner;
(vii) Coordinate with Traffic Police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
(viii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

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

(i) Inform the affected local population 1-week in advance about the work schedule;
(ii) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum; and

(iii) Provide pedestrian access in all the locations until normalcy is restored. Provide wooden/metal planks over the open trenches at each house to maintain the access.

159. **Traffic diversion and/or road closure**. Laying of water and sewer lines simultaneously may significantly impact the traffic movement. This should be avoided as far as possible by proper planning of construction works. If traffic diversion and/or road closure is required for the proposed works, prior consent from traffic department will be required and prior information to affected areas and public should be disseminated through consultations by CAPC. Proper road signage and traffic aids should be provided at site. Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. As the trenchless method adopted for sewers of more than 3.5 m deep avoiding open cut excavation, this will avoid large scale disturbances in the busy roads. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan water and sewer line works to minimize traffic disturbance / blockades; as the both water and sewer lines are to be laid in all the roads and streets in the town, work planning is crucial to minimize the inconvenience to public due to repeated excavations;
(ii) Prepare and implement a Traffic Management Plan (Appendix 14);
(iii) Duly consider and select sections for trenchless method of pipe laying based on traffic conditions;
(iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
(v) Keep the site free from all unnecessary obstructions;
(vi) Coordinate with Traffic Police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours;
(vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints; and
(viii) Maintain sufficient access to houses and shopkeepers (commercial establishments) during pipe/sewer laying work through metal sheets and temporary bridges.

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

(i) Prepare and implement spoils management plan (Appendix 13);
(ii) Leave spaces for access between mounds of soil;
(iii) Provide walkways and metal sheets where required to maintain access across for people and vehicles;
(iv) Increase workforce in the areas with predominantly institutions, place of worship, business establishment, hospitals, and schools;
(v) Consult businesses and institutions regarding operating hours and factoring this in work schedules;
(vi) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints;
(vii) Notify community/water users in advance about likely interruptions in water supply; and

(viii) Provide alternate sources of clean water until water supply is restored.

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

162. **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 7);
(ii) Following best practice health and safety guidelines: IFC's General EHS Guidelines18, WHO Interim Guidance (and its updates) on Water, Sanitation, Hygiene and Waste management for the COVID19 virus (Appendix 24), and Sector Specific (Water and Sanitation) Guidelines19;
(iii) Develop and implement site-specific occupational health and safety (OH andS) 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) OH and Training[20] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
(iv) Develop site specific OHS plan for sewage pumping stations works; SPS sites are located in low lying areas with accumulated waste and harmful working conditions;
(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 3.5 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; and
(ix) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following:

[18]https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES
[19]https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES

[20] 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.

a. Work schedule should be adjusted to avoid peak temperature hours (12 – 3 p.m.);
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 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;
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;
h. Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
i. Ensure moving equipment is outfitted with audible back-up alarms;
j. 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
k. 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.

(x) Conduct regular health check-ups for workers;
(xi) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites; and
(xii) During working in Dam area, workers should be made aware of risks of water depth and dangerous areas of water should be properly marked by fix or floating barricades and signage of danger. Workers should also be made aware for protection of biodiversity of the water and fishing should be strictly prohibited. A boat should be made available at site for transport of labour and materials and should be well maintained for any emergency condition. Workers should not be allowed to dip or bath in water of dam. Suitable working platform should be provided during construction works in water.

163. **Asbestos Containing Materials.** No Asbestos containing material (ACM) is proposed to be used in the subproject construction. There are ACM in the existing water supply infrastructure, these however will not be disturbed or come in contact during construction as the alignment of proposed sewer is different from the alignment of water lines.

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

(i) Plan routes to avoid times of peak-pedestrian activities;
(ii) Liaise with PIU in identifying risk areas on route cards/maps;

(iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure; and
(iv) Provide road signs and flag persons to warn of on-going trenching activities.

165. Old part of the town is 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 ULB shall be planned;
(ii) All trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3.5 m by adopting trenchless technology;
(iii) Survey the surrounding vulnerable buildings for likely issues in structural stability/differential settlement during the excavation works;
(iv) Provide prior information to the local people about the nature and duration of work
(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; and
(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.

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

(i) Consult PIU before locating project offices, sheds, and construction plants;
(ii) Minimize removal of vegetation and disallow cutting of trees;
(iii) Provide drinking water, water for other uses, and sanitation facilities for employees;
(iv) Provided temporary rest and eating area at all work sites;
(v) Ensure conditions of liveability 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[21] 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) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
(ix) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(x) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

167. **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; and
(iv) Inform local Archaeological Department if a find is suspected; take any action they require ensuring its removal or protection in site.

168. **Debris disposal.** Prior to the commencement of works, contractor shall identify a debris disposal site in consultation with the PIU and Consultant 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.22
(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; and
(v) The local governing body and community shall be consulted while selecting the site.

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

22 In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the Construction Manager.

169. **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:

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

(vii) As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site;
(viii) All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime;
(ix) Workers engaged in night works should have adequate rest/sleep in daytime before start of night works;
(x) Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night;
(xi) All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements;
(xii) Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests;
(xiii) Horns should not be permitted by equipment and vehicles;
(xiv) Workers should not shout and create noise;
(xv) First aid and emergency vehicles should be available at site;
(xvi) Emergency preparedness plan should be operative during night works;

(xvii) Old persons and pregnant women and women having small kids should not work in nighttime;
(xviii) All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise;
(xix) All the vehicles should be checked for working head lamps, tail lamps, inner 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; and
(xxvi) Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.

E. Operation and Maintenance Impacts

170. **Sewerage System.** Operation and Maintenance of the sewerage system will be carried out by DBO contractor for 10 years and then by Ratangarh Municipality directly or through an external operator. The sewerage system is intended to collect, convey, treat and dispose the sewage from the town areas safely. Operation will involve collection and conveyance of wastewater from houses to STP; treatment of sewage at STP to meet the disposal standards; and final disposal of treated wastewater, and treatment and disposal of sludge.

171. Treated wastewater is proposed to be utilized in reuse applications following the Sewerage and Wastewater Policy 2016 of Rajasthan, and accordingly Reuse Plan will be prepared by the DBO contractor during the detailed design phase. As stated previously, subproject will be implemented under design-build-operate (DBO), and the successful bidder / DBO contactor will carry out detailed designs, therefore at present the subproject is designed in outline only. The treated wastewater if utilized for reuse purposes as per the Reuse Plan there will be no negative impacts, and in fact it will enhance environmental benefits in the form of water savings. Various measures to safeguard environment and health environment in utilizing the treated wastewater, including required quality for various process will be established in the reuse plan and will be implemented accordingly. All necessary safety, mitigation and monitoring measures as suggested in the reuse plan shall be implemented. The excess / surplus / unused wastewater, if any, will be discharged on to government vacant / low-lying lands. Groundwater is very deep, and as the wastewater is treated to very fine discharge standards, there is unlikely to be any impacts on groundwater resources. Large expanse of government lands, high evaporation rates, and infiltration in sand soils, there is unlikely to be any issue of submergence or waterlogging in surrounding lands. Considering the existing status of land, and the degree of treatment, no significant impacts envisaged. Proper systems should be put in place at the proposed STP to ensure that treated wastewater at all times meet the stipulated standards prior to its discharge. Operation and maintenance of STP and change in incoming sewage quality will have impact on the treatment efficiency.

172. STP operational procedures will be firmed up during the detailed design phase, including the amount of automated or manual operation. It must be ensured that the facility is operated with standard operating procedures and only by trained staff. Ensuring uninterrupted power supply with back-up facility is a must. Standard operating procedures and operation manual will be prepared by the DBO contractor. Besides routine operation, this should 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 worker safety.

173. Subproject includes sludge management infrastructure in STP, including system for sludge collection, thickening, solar drying, and disposal at landfill/identified site. This includes a Sludge Sump to collect sludge from SBR basins; returning arrangement for supernatant from the sump to inlet/equalization tank for treatment; pumping sludge to sludge thickener and pumping thickened to mechanical sludge dewatering system (such as centrifuge). It also requires contractor to establish a shed where the dewatered sludge cake can be further air dried for 15 days. This is indicative sludge management system, and DBO contractor will design the system meeting these requirements and prepare sludge management plan. Bid indicates that “the sludge produced from the treatment process would be processed so it may be used as fertilizer and soil conditioner” and it requires DBO contractor “to conform to the regulations of public health and environment protection norms”. The norms for safe use of processed sludge as fertilizer and soil conditioner are discussed in Para 158 of this IEE. This follows the Sewerage and Wastewater Policy, 2016, which suggests “use of sludge produced from the treatment as fertilizer and soil conditioner after processing”. A sludge disposal site will be identified during the detailed design phase to dispose unutilized dried sludge in reuse applications. The updated IEE will include the details of disposal site. If the sludge is managed accordingly, there will no impacts.

174. During the operation phase, it is necessary that the facility is operated by trained staff as per the standard operating procedures. Following measures are suggested for implementation / compliance during the operation phase:

(i) Ensure that treated wastewater meets the established discharge standards all times; Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards;
(ii) Ensure implementation of Reuse Plan, and ensure intended quality for each direct reuse;
(iii) Assess composition and characteristics of sludge from the first batch operation at the initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan;
(iv) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops;;
(v) Ensure valid consent to operate (CTO) from RSPCB for operation of STP
(vi) Ensure that all conditions/standards prescribed by RPCB are compiled duly;
(vii) Ensure that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case of any accident and/or maintenance activity, ensure that the staff follows documented procedures only;

(viii) Implement Emergency Response System (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 16;
(ix) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility;
(x) Operate and maintain the facility following standard operating procedures of operational manual;
(xi) Undertake preventive and periodic maintenance activities as required;
(xii) Conduct periodic training to workers; ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations; and
(xiii) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers; monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with RSPCB.

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

(i) Establish regular maintenance program, including:
   a. Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas;
   b. Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and
   c. Monitoring of sewer flow to identify potential inflows and outflows;
(ii) Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);
(iii) Review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;
(iv) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system;
(v) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers;

(vi) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.;
(vii) Provide necessary health and safety training to the staff;
(viii) Provide all necessary personnel protection equipment;
(ix) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works;
(x) As far as possible use remote / CCTV mechanism to identify/detect the problems in sewers and do not engage persons for this purpose;
(xi) As far as possible use mechanized cleaning of manholes and sewers by using modern techniques and machines and do not engage persons for this purpose;
(xii) Ensure that maintenance staff and supervisors understand the risks; provide proper instructions, training, and supervision;
(xiii) Use gas detector to detect any hazardous or inflammable gas in confined areas like sewers /manholes prior to maintenance process;
(xiv) Provide suitable personal protective equipment that may include waterproof/abrasion-resistant gloves, footwear, eye and respiratory protection. Face visors are particularly effective against splashes. Equipment selection and a proper system for inspection and maintenance are important;
(xv) Provide adequate welfare facilities, including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers.
(xvi) For remote locations portable welfare facilities should be provided;
(xvii) Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities;
(xviii) Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive dressings;
(xix) Make effective arrangements for monitoring the health of staff;
(xx) Keep emergency preparedness plan ready before starting the work of sewage system cleaning.

176. Biological hazards are among the environmental risks that may adversely impact the health and wellness of the workers and the community. Breakouts of diseases such as diarrhea, flu or pandemics such as the COVID19 shall be avoided. Designs and implementation of treatment systems shall ensure that disease-causing pathogens or viruses are disinfected and will not cause any health issues. The World Health Organization has released an interim guidance on Water, Sanitation, Hygiene and Waste Management for the COVID19 virus (see Appendix 24). Measures on managing wastewater and fecal waste and keeping water supplies safe is critical to avoid the start or spread of any disease.

177. **Operation of FSSM.** About 18 % of total households (2021-design year) of Ratangarh town will be covered with FSSM system wherein which septage from individual septic tanks at houses will be collected via mobile / vehicle mount tankers with suction equipment, transport and discharged into STP for safe treatment and disposal. Although system will be completely mechanized, given the very harmful nature of septage, following precautionary measures shall be implemented:

(i) Create awareness program on the FSSM in general public;
(ii) Implement Health and Safety Plan for FSSM;
(iii) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary personal protection equipment and ensure their usage;

(iv) Ensure that the system is operated completely mechanically, with least involvement of workers; there shall be no direct contact of septage to any worker or staff;
(v) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating, and resting places;
(vi) Conduct regular health checks; and
(vii) Ensure that tankers cleaning is done mechanically, and in the demarcate area at STP, and the wastewater generated in the process shall be discharged into STP

178. In Ratangarh, at present, people depend on septic tanks for discharge of sewage. Once the sewerage system is operational, these septic tanks will be decommissioned, and the wastewater outlets from the houses will be connected to sewers. Contractor should prepare a decommissioning plan for all septic tanks.

F. Cumulative Impacts

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

180. Sewerage works are proposed in Ratangarh Town, a small town, with central part congested with people, traffic and activities. There are sensitive places like hospitals, schools, and religious places. Works will be spread over entire town, covering all the roads and streets. Although no other notable public works are anticipated during the project implementation on public roads, there will be usual construction activities, such as building construction, as Ratangarhis a developing town. Given dry and windy weather conditions, dust generation from cumulative construction activities may be significant, and this may increase the particulate matter concentration in ambient air. Dust control measures suggested in the EMP aim to minimize the dust generation from the subproject construction activities. Suggested trenchless method, by avoiding excavation, will also help in reducing the overall dust generation from the subproject activities. If there are any road improvement works proposed to be implemented in Ratangarh, scheduling of works needs to be coordinated with the respective road agency (ULB or Public Works Department) so that improved roads are not subjected for excavation. The increase in road traffic, disturbance to traffic, public safety and worker safety issues, damage to existing utilities, influx of outstation workers, etc., due to various simultaneous construction works will be notable. However, the measures suggested in the EMP will minimize these impacts greatly, and therefore effective implementation of EMP must be ensured. Thus, the net impacts are unlikely to be significant.

181. **Project Benefits.** The citizens of the Ratangarh will be the major beneficiaries of the improved sewerage systems. The subproject is primarily designed to improve environmental quality and living conditions of Ratangarh Town through provision of sewerage. The benefits arising from this subproject include: (i) better public health particularly reduction in waterborne and infectious diseases; (ii) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and (vi) improvement in quality of water due to avoidance of discharge of untreated wastewater.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

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

183. A three-tier consultation process has been adopted for RUDSICO-EAP: focus group discussions, primary household sample surveys and a town-level public consultation workshop. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are residents, shopkeepers and businesspeople who live and work alongside the roads in which network improvements will be provided, and government and utility agencies responsible for provision of services, Ratangarh Nagar Parishad, Public Health Engineering Department, and Rajasthan Pollution Control Board. Secondary stakeholder are NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, the executing and implementing agencies (LSGD and RUDSICO-EAP), Government of India and the ADB.

B. Public Consultation

184. The public consultation and disclosure program are a continuous process throughout the project implementation, including project planning, design and construction. During project/IEE preparation stage, public consultations were conducted near two proposed STP and SPS locations and other locations of proposed sewerage network to access the awareness of general public, present sanitation situations, environmental and health conditions in town, their opinion about the proposed project and suggestions. Local residents, businesspersons (vendors, hawkers, shopkeepers etc.), Government officials, women and residents were consulted during public consultations in June 2017, July 2017, July 2018 and again in September 2019.. The proposed STP facilities will cover the entire Ratangarh town and the people consulted were all residents of Ratangarhi and are direct beneficiaries. Public consultations were also done at nearest habitations of SPS and STP locations. Details of public consultations are given in Appendix 17.

Consultation during Project Preparation

185. Institutional consultations were conducted with the Governmental Departments such as Local Self Government Department, Public Works Department, Pollution Control Board, Public Health Engineering Department, RatangarhNagar Parishad, etc. The project proposals are formulated in consultation with PHED and RatangarhNagar Parishad and the proposals will be finalized only after certification of Commissioner Ratangarh Nagar Parishad that the proposals suit the requirements of the ULB.

186. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. Public consultation had been conducted to assess the impact

of proposed civil work on the livelihood of the people, local environmental set up and also to prepare Initial Environmental Examination (IEE). The site verification reveals that, all the components of the sewerage works are either located on vacant government land or along the existing right-of-way of the roads. The subproject details have been explained in detail to the people who are involved in public consultation and also asked their suggestions and willingness to complete the proposed civil work. It is observed that people shown their willingness in favour of the sewerage project at Ratangarh. They are agreed to take up house service connections. Details of public consultations are attached in Appendix 17. Points / issues raises / feedback received are listed below:

(i) Awareness and extent of the project and development components
(ii) Benefits of Project for the economic and social 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) Sewerage system
(x) Forest and sensitive area nearby the project site
(xi) Movement of wild animal etc.
(xii) Pollution level during construction period specially dust and noise pollution
(xiii) Health and Hygiene
(xiv) Safety of residents during construction phase
(xv) Solid waste disposal system
(xvi) Reuse of treated effluent
(xvii) Disposal of treated effluent in natural water body
(xviii) Requirement of enhancement of other facilities.

187. It was observed that people are willing to extend their cooperation as the proposed activities are supposed to enhance the infrastructure service levels and the living standard of the public. The proposed project is a need of the town. Locals are very much in favor of the project and they want that this should be completed as early as possible. People are ready to extend all types of support to during execution of the project. Few people expressed their concern regarding the nuisance and disturbance (dust, road closure and traffic management activities) during the construction stage which can have impact on their day to day activities. Public demanded for advance notice before construction and proper warning signs along the construction area to avoid accidents and inconvenience. Public opined that an appropriate operation and maintenance system should be in place, especially for sewerage system, for its best functioning and to have the maximum health and aesthetic benefits.

188. City level Stakeholder Committee (CLC) meeting was organized in in Churu on July 20, 2018 to discuss the matter of proposed sewerage works in Ratangarh under the chairmanship of District Collector,Churu in presence of consultants, RUDSICO-EAP officials, PHED officials and other invitee members. Proposed scope of works and technology was discussed in the meeting and it was decided that treated effluent shall be reused by Nagar Parishad in beneficial uses. Executive Engineer PIU, RUDSICO-EAP(Churu) has prepared/issued the Minutes of the Meeting and circulated among all concerned officials. And Government departments. Minutes of CLC meeting and photographs are attached in Appendix 18

Consultation during construction

189. Prior to start of construction, Nagar Parishad Ratangarh and PIU with the assistance of PMCBC and CSMC/CAPC will conduct information dissemination sessions at major intersections and solicit the help of the local community leaders/prominent citizens to encourage the participation of the people to discuss various environmental issues. At each ward/neighborhood level, focus group meetings will be conducted to discuss and plan construction work with local communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in project monitoring and evaluation.

190. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction and operational phases and also regarding the grievance redress mechanism. Nagar Parishad Ratangarh / PIU with the help of Community Awareness and Participation Consultant (CAPC) 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

191. Executive summary of the IEE will be translated in the local language and made available at the offices of RUDSICO-EAP, PMU and PIU. Copies of summary will be provided to participants of city level workshop to be organized in Ratangarh. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Hindi will be placed in the official website of the ULB/RUDSICO-EAP/PMU after approval of the IEE by Government and ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

192. Public information campaigns via newspaper/radio/TV, 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 plans. Prior to start of construction, the 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.

193. 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.

194. 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.

195. 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); and
(vi) Semi-annual Environmental Monitoring Reports (English).

196. 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 following documents will be submitted to ADB for disclosure on ADB website. PMU will send written endorsement to ADB for disclosing these documents:

(i) final IEE;
(ii) a new or updated IEE and corrective action plan prepared during project implementation, if any; and
(iii) environmental monitoring reports.

VIII. GRIEVANCE REDRESS MECHANISM

A. Project Specific Grievance Redress Mechanism

197. A project-specific, three-tier grievance redress mechanism (GRM) covers both environment and social issues. The GRM will be established to receive, evaluate, and facilitate the resolution of affected persons' concerns, complaints, and grievances about the social and environmental performance at project level. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns related to the project. Assessment of the GRM designed and implemented for Rajasthan Urban Sector Development Program (RUSDP)[30] the system was effective in timely resolution of grievances in a transparent manner.[31] The multichannel, project-specific, three-tier GRM is functional at RUSDP, hence the design of GRM for RSTDSP takes into account the proposed institutional structure for RSTDSP and the positive features and learnings from the previous GRM.[32]

220. **Common GRM.** A common GRM will be in place for social, environmental, or any other grievances related to the project. Implementation of the resettlement plans/RIPPs/DDRs/IEEs will follow the GRM described below. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the project.

221. Public awareness campaigns within entire ULB/Municipal area will ensure that awareness on grievance redress procedures is generated. The nodal officer- social/environment at field level through community awareness and public participation consultant (CAPPC) will conduct ULB/Municipal area-based awareness campaigns to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements. Contractors will provide pamphlets to communities prior to start of works and billboards during construction. The pamphlets and billboards will include relevant environmental and social safeguards, GRM information, and contact details of key personnel from PIU and contractors.

222. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaint/suggestion boxes that will be installed by project PIUs or by e-mail, by post, or by writing in a complaints register in ULB offices/complaints register at contractor's work site[33] or by sending a Whatsapp message to the PIU[34] or by dialling the phone number of town level PIU/CAPPC or by dialling a toll-free number.[35] Any aggrieved person can also avail the facilities of online grievance monitoring system 'Rajasthan Sampark' portal to register their grievances which is a parallel mechanism of grievance registration, in addition to the project GRM.[36] Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken and feedback provided to the complainant on action/decision taken. The Safeguard and Safety Officer of town/city level PIU will have the overall responsibility for timely grievance redressal on environmental and social safeguards issues and for registration of grievances, related disclosure, with the assistance of project consultants. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and officials of PIU with assistance from construction management and supervision consultants (CMSC) and CAPPC on-site will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact numbers and names of the concerned PIU safeguard and safety officer, contractors, CAPPC, and CMSC personal will be posted at all construction sites at visible locations.

(i) **1st level grievance**. The contractors, PIU Executive Engineer (EE)/Assistant Engineer (AE) designated as safeguard and safety officer (social and environment),

CMSC (safeguard staff) and CAPPC can immediately resolve issues on-site, in consultation with each other and will be required to do so within 7 days of receipt of a complaint/grievance. If required, city level monitoring committee (CLMC)[37] will be involved in resolution of grievances at the 1st level.

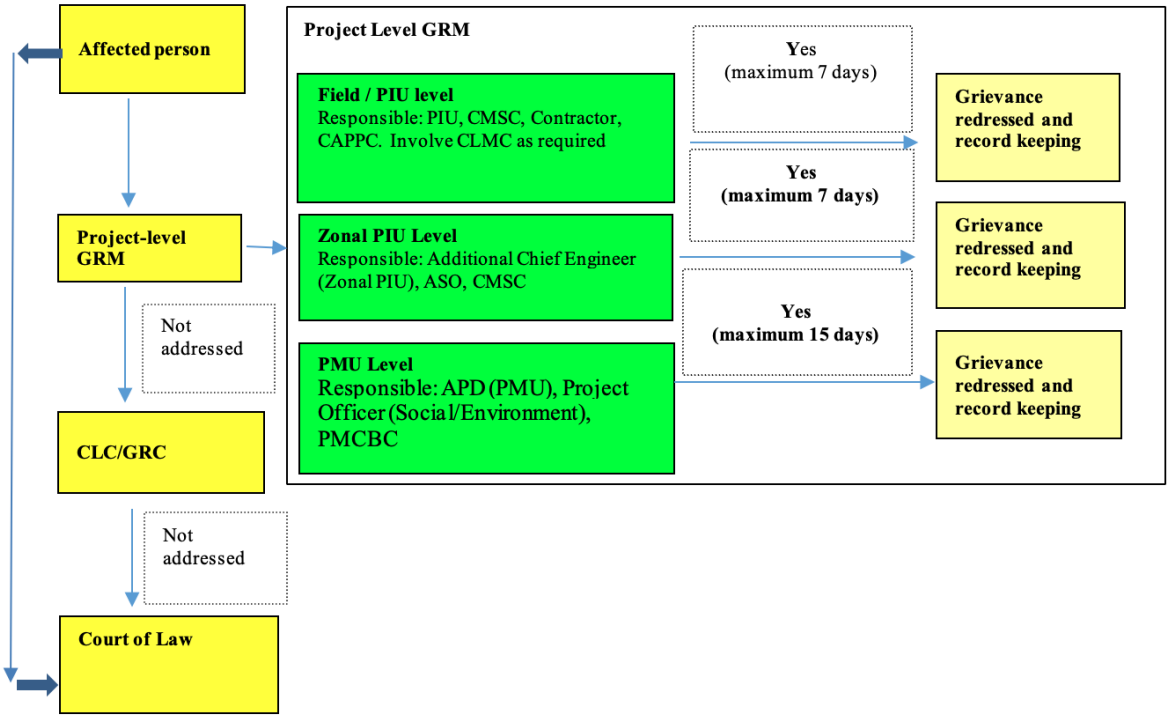
(ii) **2nd level grievance**. All grievances that cannot be redressed within 7 days at field/PIU level will be brought to the notice of Zonal PIU headed by Additional Chief Engineer (ACE).The ACE at zonal PIU will resolve the grievance within 7 days of receipt of compliant/grievance in discussion with the ASO, field level PIU, CMSC, CAPPC and the contractor.

(iii) **3rd level grievance**. All the grievances that are not addressed by Zonal PIU within 7 days of receipt will be brought to the notice of the PMU. Depending on the nature of grievance, the Project Officer (Social/Environment) at PMU will resolve the grievance within 15 days of receipt of grievance with necessary coordination of Zonal PIU and CMSC and guidance/instruction of Additional Project Director (APD-PMU).

(iv) Grievances not redressed through this process within/at the project level within stipulated time period will be referred to the CLC/GRC, which has been set up.[38] In its role as a GRC, the CLC will meet whenever there is an urgent, pending grievance. Other grievances can be discussed during its regular meetings. Zonal PIU will inform the CLC regarding any grievances required to be resolved urgently. The GRC will resolve the grievance within 15 days of receiving the complaint. In case of any indigenous peoples impacts in subprojects, the CLC/GRC must have representation of the affected indigenous people community, the chief of the tribe or a member of the tribal council as traditional arbitrator (to ensure that traditional grievance redress systems are integrated) and an NGO working with indigenous people groups.

(v) The multi-tier GRM for the project is outlined below (Figure 22), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration.

Figure 22: Grievance Redress Mechanism-RSTDSP



Note: APD = Additional Project Director, ASO = Assistant Safeguards Officer, CAPPC = community awareness and public participation consultant, CMSC = construction management and supervision consultants, CLC = city level committee, CLMC = city level monitoring committee, GRC = grievance redress committee, PIU = project implementation unit, PMU = program management unit, PMCBC = project management and capacity building consultant.

222. The project GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM. In case of grievance related to land acquisition, resettlement and rehabilitation, the affected persons will have to approach a legal body/court specially proposed under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARRA), 2013.[39]

223. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make an effort in good faith to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism[40].

224. **Record-keeping.** The PIU of each town/city will keep records of grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were affected and final outcome. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PMU

office, PIU offices, and on the web, as well as reported in monitoring reports submitted to ADB on a semi-annual basis. The sample grievance registration format is attached as **Appendix 19.**

225. **Periodic review and documentation of lessons learned.** The PMU Project Officers (Social and Environment) will periodically review the functioning of the GRM in each town and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances.

226. **Costs**. Contractors are required to allocated budget for pamphlets and billboards as part of the EMP. Costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the concerned PIU at town level while costs related to escalated grievances will be met by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

198. 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, which show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

199. 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.

200. 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.

201. 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.

202. The contractor will be required to submit to PIU, for review and approval, a site environmental plan (SEP) 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 SEP; and (iv) budget for SEP implementation. No works can commence prior to approval of SEP.

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

Table 1: Design Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Sewage Treatment Plant (STP)	Odour nuisance and aesthetics	(i) Provide a green buffer zone of 10-20 m wide all around the STP, and 5-10 m around SPSs, with trees in multi-rows. This will act as a visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation. (ii) Develop layout plan of STP such that odour generating units (such as sludge / solids handling facilities) are located away from the surrounding area with future development potential.	DBO Contractor / PIU	Project costs
All work sites	Tree cutting and site preparation	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of STP/SPS or any other site with trees (ii) Obtain prior permission for tree cutting at STP/SPS site or at any other site that may require tree cutting finalized during detailed design (iii) Plant and maintain 3 trees for each tree that is removed	DBO Contractor / PIU	Project costs
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 23 rovides the documentation for the Materials Recovery Facility and the Checklist for Solid Waste Management Transport	PIU	
Design sewerage system	Non-compliance or non-adherence with the environmental considerations proposed in preliminary designs during detailed design:	Ensure compliance with the following during the detailed design: (i) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically). (iii) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs (i) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage	DBO Contractor / PMU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(vi) Avoiding usage of asbestos containing materials (vii) Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies (viii) Reuse of treated wastewater from STP for non-potable uses thereby reducing the load in freshwater resources (ix) Adopting a combined approach of sewerage system and faecal sludge and septage management to cover 100% population of the town with safe collection, conveyance and treatment of sewage generated in the town (x) Provision of appropriate personal protection equipment to the workers and staff		
Seismic sensitivity	Damage to infrastructure and potential risks: project area in moderate earthquake risk zone (Zone II)	(i) Designs of project component structures shall comply with relevant codes of design such as Bureau of Indian Standard (BIS) specifications for earthquake resistant design (IS: 1893: Criteria for earthquake resistant design of structures).	DBO Contractor/PIU	Project costs
Sewage Treatment Plant (STP)	Hazardous / harmful chemicals	(ii) Reduce the use of chemicals in the treatment process to the extent possible; provide non-chemical alternatives or easily recoverable and/or reusable chemicals or biocompatible alternatives. (ii) Establish proper handling / storage / application system according to the relevant standards, safety precautions and prevent accidental release / spill (iii) Provide leak/spill detection, collection / capture and safe disposal facilities such as chlorine absorption and neutralization facility (iv) Provide ventilation, lighting, entry and exit facilities; visible and audible alarm facilities to alert chemical/chlorine leak (iv) Facility for isolation in the event of major leakages (vi) Eye wash and shower facility (vii) Personal protection and safety equipment for the operators (masks, oxygen cylinders, gloves, etc.,)	DBO Contractor/PIU	Project costs

<table>
<tr><th>Field</th><th>Anticipated Impact</th><th>Mitigation Measures</th><th>Responsible for Implementation/ Monitoring</th><th>Cost and Source of Funds</th></tr>
<tr><td></td><td></td><td>(viii) Provide training to the staff in safe handling and application of chemicals, material safety, and standard operating procedures and emergency responses
(ix) Develop emergency response procedures</td><td></td><td></td></tr>
<tr><td>Sewage Treatment Plant (STP)</td><td>Inefficient sewage treatment, treated effluent characteristics not satisfying the CPCB/RPCB standards</td><td>(v) Ensure that the selected process in appropriate for the town and meets discharge standards and facilitate reuse
(ii) Treated effluent should meet the criteria set by RSPCB/CPCB or the following bid specified parameters, whichever are stringent:
<table><tr><td>pH</td><td>6.5 – 9.0</td></tr><tr><td>BOD5, mg/l</td><td>≤10</td></tr><tr><td>COD, mg/l</td><td>≤50</td></tr><tr><td>TSS, mg/l</td><td>≤20</td></tr><tr><td>NH4-N, mg/l</td><td><25</td></tr><tr><td>Total nitrogen, mg/l</td><td><10</td></tr><tr><td>Fecal Coliform, MPN/100 ml</td><td><1000</td></tr></table></td><td>DBO Contractor / PIU</td><td>Project costs</td></tr>
<tr><td>Change in raw sewage quality</td><td>Mixing of industrial effluent with sewage</td><td>(vi) No industrial wastewater shall be allowed to dispose into municipal sewers
(ii) As there is a risk of potential mixing of industrial waste, no domestic wastewater from industrial units shall be allowed into municipal sewers
(vii) Ensure that there is no illegal discharge through manholes or inspection chambers
(viii) Conduct public awareness programs; in coordination with RSPCB and CLC.
, (v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated wastewater quality complies with the effluent standards</td><td>DBO Contractor and PIU / PMU</td><td>Project Costs</td></tr>
</table>

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Sewage Treatment Plant (STP)	Use of treated wastewater for reuse applications	Develop wastewater reuse plan for Ratangarh Town in consultation with CLC as per the Sewerage and Wastewater Policy, 2016. The Reuse Plan shall inter alia include the following: (ix) Identify potential reuse application in Ratangarh, and establish quality criteria for each of the use (ii) For applications that use treated wastewater directly (e.g., agriculture), the quality required for such application in safe manner considering health, environment and crop yield concerns shall be ensured; (x) Prepare a reuse plan for agriculture, if that is the priority use or one of the applications as per the CLC in Ratangarh, clearly indicating the limits (geographical / crops / type of application / type of soils etc.,); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations. (iv) Plan should include awareness and training provisions and responsibilities; these can be conducted by concerned department (e.g., Agricultural Department, District Collectorate) (v) Carryout regular / online monitoring of critical quality parameters of treated wastewater to ensure that they meet the preset standards established for reuse	DBO Contractor / PIU	Project costs
STP	Sludge management and reuse	(xi) Prepare a sludge management plan (ii) Prepare a dried Sludge utilization plan for Ratangarh within the help of Agriculture Department / CLC; plan should also include if any additional processing is required for sludge to use as soil conditioner (xii) Plan should clearly various potential uses and demand in Ratangarh and surroundings (iv) Establish usage limits, where required, (geographical / crops / type of application / type of soils etc.,); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations.	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(xiii) Identify a landfill / suitable site for disposal of surplus dried sludge (vi) Monitor sludge quality during operation phase as per the Environmental Monitoring Plan, ensure that it meets the quality parameters established by FCO (vii) In case of sludge not meeting the quality parameters, it shall not be used as soil condition, and shall be disposed at appropriate disposal site (if it falls under hazardous category, it shall be disposed as per the Hazardous Waste Management Rules, 2016)		
Sewage pumping stations	Handling and disposal of accumulated waste at identified SPS sites	(i) Prepare a waste handling and management plan for the work, considering handling, disposal and occupational and public health safety (ii) Assess the working conditions, develop appropriate working method, and work shall be only conducted under continuous supervision of EHS supervisor (iii) Waste shall not be handled manually; use appropriate equipment (iv) All workers shall be provided with necessary personal protection equipment, including gloves, boots, face / gas masks and oxygen cylinders in handy for emergency use etc.; if gas emission is suspected at any point of time, workers shall use gas masks with oxygen cylinders (v) Inform surrounding public about the work (vi) Fire control and safety equipment shall be provided at the work site (vii) Waste shall be properly covered during transport (viii) Manage the solid waste as per the Solid Waste Management Rules, 2016	DBO Contractor/PIU	Project costs
Sewage pumping stations	Noise and odour generation from sewage pumping operations, and public and occupational safety	(i) Provide low noise, efficient pumping systems (ii) Provide dedicated power supply to SPS, if possible, otherwise DG set to be used during power failure, should be soundproof and having acoustic enclosures with low/permitted air emission standards (iii) Design SPS with appropriate retention time, so as not to retain the sewage in the sump for long time to avoid generation of odourous gases	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(iv) Firm barricades should be provided all round during construction of SPS; (v) Boundary wall of sufficient height should be provided during operation phase so that no children/residents can entre in the SPS premises (vi) Plantations should be provided if space available to reduce foul smell of sewer during operation (vii) No workers camps should be allowed during construction works at SPS site (viii) Entry should be restricted through provision of gate and guard during SPS operation. (ix) Highest Flood Level (HFL) should be used as a basis while deciding on the SPS dimensions. Also, all the prevention methods including buffer capacity secondary tank and alternative power arrangements should be implemented so that sewage does not either leak during power outages or percolate into ground and pollute water.		
Sewer network – collection and conveyance	Poor design leading to overflows, blockages, and creating nuisance, pollution	(i) Limit the sewer depth where possible (ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible); (iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm) (iv) In unavoidable, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided) (v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes; (vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry (vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope and gas vents in gravity mains to prevent buildup of solids and hydrogen sulfide generation (viii) Take necessary precautionary measures to protect	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		sewer network, and to avoid disposal of solid wastes, debris, wastewater into newly laid sewers from the time it is constructed to the start of operation phase		
FSSM	Occupational health and safety issues, and impact on STP process	(i) Conduct detailed survey of the households to be covered with FSSM to design the system to suit the local conditions, such as type of septic tanks and their location in the houses (ii) Create awareness program on the FSSM from collection to treatment system that will be adopted (iii) Design the sewage treatment process duly considering mixing of septage (iv) Ensure that the FSSM system is completely mechanized no human touch, even accidentally, from collection at household to discharge into STP, and in periodic cleaning of tankers (v) Demarcate a proper area for cleaning of mobile tankers in STP premises, and ensure that the wastewater shall be discharged into STP (vi) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary personal protection equipment (vii) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating and resting places (viii) Conduct regular health checks (ix) Prepare Health and Safety Plan for FSSM	DBO Contractor/PIU	Project costs
Asbestos cement (AC) pipes in existing water supply system: clearing, transfer and disposal; work in narrow streets, and interventions in existing AC pipelines	Health impacts due to air borne asbestos if handled unsafely, cut, drilled or broken into pieces	(i)Develop ACM Management Plan (AMP) that includes identification of hazards, the use of proper safety gear and disposal methods. Sample AMP is provided in Appendix 20. Adhere to the workflow process suggested in Figure 19. (ii)Conduct awareness program on safety during the construction work	DBO Contractor/PMU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(iii)Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iv)Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches (v)Identify risk of intervention with existing AC pipes. If there is significant risk, implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods. (vii)Maintain records of AC pipes as per the AMP Refer to the instructions of the Asbestos Expert		
Preparation of plans and protocols	Various impacts	(i) Preparation of waste handling and management plan for SPS sites (ii) Prepare traffic management plan (iii) Prepare occupational health and safety plan (iv) Prepare spoils management plan	DBO Contractor and PMCBC (for ACM plan)	Approval of plans by PIU

Table 11: Pre Construction Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Compliance with environmental subproject selection criteria	Environmental impacts due to subproject	Compliance with environmental subproject selection criteria	DBO Contractor, PIU and Ratangarh Nagar Palika	PMU	No costs required
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
Legal compliance	Environmental legal noncompliance may attract legal actions	(i)Obtain all consents, clearances (CTE/CTO from RSPCB), permits	PIU/Consultants in coordination of Nagar Palika	PMU	Cost of obtaining all consents, permits,

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
	Failure to obtain necessary consents Permits, NOCs etc. can result to design revisions and /or stoppage of works	NOCs etc. before start of construction works Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (ii)Following consents are required- Tree cutting-local authority Storage, handling and transport of hazardous materials- RSPCB Sand mining, quarries, borrow areas- Department of mines and Geology Traffic diversion/road cutting- local authority, traffic police (iii)Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs etc. (iv)Include in detailed design drawings and documents all conditions and provisions; if necessary			clearance, NOCs etc. prior to start of civil works responsibility of PIU.
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of	DBO Contractor in collaboration with PIU and with approval of PMU	(i) List of affected utilities and operators; (ii) Bid document to include requirement for a contingency	No cost required. Mitigation measures are part of TOR of PMU, PIU and

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services. (iii) Require contractors to prepare spoils management plan (Appendix 13) and traffic management plan (Appendix 14)		plan for service interruptions (example provision of water if disruption is more than 24 hours), spoil management plan (Appendix 13), and traffic management plan (Appendix 14)	Consultant
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 ensure they are protected and conserved.	DBO Contractor and PIU	Chance Finds Protocol	No cost required. Mitigation measures are part of TOR of PIU and Consultant
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems;	Contractor to finalize locations in consultation and approval of PIU	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas. (ii) Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		(iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 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,	(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	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	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
	ponding and water logging, and water pollution.	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.		additional quarry sites if necessary.	
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 STP from RSPCB), 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- RPCB Sand mining, quarries, borrow areas- Department of mines and Geology Traffic diversion/road cutting- local authority, traffic police (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all	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 Consultant

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		obtained consents, permits, clearance, NOCs, etc. (iv) Include in detailed design drawings and documents all conditions and provisions if necessary			

Table 12: Construction Stage Environmental Management Plan

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 andS), core labor laws, applicable environmental laws, etc.	Construction Contractor	(i) Certificate of Completion (Safeguards Compliance Orientation) (ii) Posting of Certification of Completion at worksites (iii) Posting of EMP at worksites	Cost of EMP Implementation Orientation Training to contractor is responsibility of PMU. Other costs responsibility of contractor.
Air Quality	Emissions from construction vehicles, equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.	(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	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices; (iv) Certification that vehicles are compliant with Air Act (v) Reports of air quality monitoring	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
		operating correctly contractor's vehicles and equipment should compulsorily have PUC and submit to PIU before deployment at site (vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers and DG set etc. if specifically established for this project. (viii) If contractor procures any material (such as ready mix concrete, asphalt/macadam, aggregates etc.,) from third party agencies, contractor shall ensure that such agencies have all necessary clearances / permissions as required under the law; these include CTE/CTO from RSPCB, environmental clearance, etc.; contractor shall collect the copy of these certificates and submit to PIU; PIU will approve the source only after all the certificates are submitted (ix) Conduct air quality monitoring according to the Environmental Management Plan (EMP).			
Surface water quality	Works in rains/ Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during installation of	(i) Prepare and implement a spoils management plan (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (iii) Prioritize re-use of excess spoils and materials in the	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along trenches leading to water bodies; (iii) Records of	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
	pipelines can contaminate nearby surface water quality.	construction works. If spoils will be disposed, consult with PIU on designated disposal areas; (iv) Inspect all the drainage at construction site/construction camp/labor camp etc. and clear all the drainage lines so that no water stagnation/flooding may occur during heavy rainfall (v) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (vi) If open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. (vii) Inspect and verify all the emergency measures and emergency control system before start of monsoon, keep the emergency response committee on high alert during monsoon/heavy rain fall (ix) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (x) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (xi) Dispose any wastes generated by construction activities in designated sites; and		surface water quality inspection; (iv)Effectiveness of water management measures; (v) No visible degradation to nearby drainages, nallahs or water bodies due to civil works	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(xii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).			
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PIU/Consultant so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and (iv) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. (v) Periodical monitoring of noise quality as per EMP	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise-producing equipment and sound barriers; (iii) Equivalent day and nighttime noise levels (see Appendix 5 of this IEE)	Cost for implementation of mitigation measures responsibility of contractor.
Landscape and aesthetics	Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging	(i) Prepare and implement spoils management plan (Appendix 13); (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	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel (iii) Worksite clear of any excess excavated earth, excess construction	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
	materials, empty containers, spoils, oils, lubricants, and other similar items.	and reuse or remove from the sites; (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (vi) Remove all wreckage, rubbish, or temporary structures which are no longer required; and (vii) Request PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.		materials, and solid waste such as removed concrete, wood, packaging materials, empty containers	
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	Construction Contractor	Existing Utilities Contingency Plan	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 10 native trees for every one that is removed	Construction Contractor	PIU to report in writing the no of trees cut and planted.	Cost for implementation of mitigation measures responsibility of contractor.
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	Construction Contractor	(i) Traffic route during construction works including number of permanent signage, barricades and flagmen on worksite; (ii) Complaints from sensitive receptors;	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		Management Plan (Appendix 14) (ii) Duly consider and select sections for trenchless method of pipelaying based on traffic conditions (iii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (iv) Schedule transport and hauling activities during non-peak hours; (v) Locate entry and exit points in areas where there is low potential for traffic congestion; (vi) Keep the site free from all unnecessary obstructions; (vii) Drive vehicles in a considerate manner; (viii) Coordinate with Traffic Police for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; (ix) Notify affected sensitive receptors 1-week in advance by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints. (x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum. (xi) Provide pedestrian access in all the locations until normalcy is restored. Provide wooden/metal planks over the open trenches at each house to maintain the access.		(iii) Number of signage placed at project location.	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Socio-Economic – Income.	Impede the access of residents and customers to nearby shops	(i) Prepare and implement spoils management plan (Appendix 13). Contractor to Implement RP and to follow mitigation measures prescribed (ii) Leave spaces for access between mounds of soil; (ii) Provide walkways and metal sheets where required for people; (iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; (iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Spoils management plan (iii) Number of walkways, signage, and metal sheets placed at project location.	Cost for implementation of mitigation measures responsibility of contractor.
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	(i) Employ local labour force, or to the maximum extent possible (ii) Comply with labor laws	Construction Contractor	(i) Employment records; (ii) Records of sources of materials (iii) Compliance to labor laws (see Appendix 8 of this IEE)	Cost for implementation of mitigation measures responsibility of contractor.
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Comply with all national, state and local core labor laws (see Appendix 7 of this IEE); Following best practice health and safety guidelines: IFC's General EHS	Construction Contractor	(i) Site-specific OH and S Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage	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
		Guidelines23 and Sector Specific (Sanitation) Guidelines24 (ii) Develop and implement site-specific occupational health and safety (OH andS) 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 andS Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (iii) Conduct work in confine spaces, trenches, and at height with suitable precautions and using standards and safe construction methods; do not adopt adhoc methods; all trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3.5 m by adopting trenchless technology (iv) Develop site specific OHS plan for sewage pumping stations works; SPS sites are located in low lying areas with accumulated waste and harmful working conditions		for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H and S orientation trainings (viii) personal protective equipment; (ix) % of moving equipment outfitted with audible back-up alarms; (xi) permanent sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. (xii) Compliance to core labor laws (see Appendix 7 of this IEE)	

[23]https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES
24 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
		(iv) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (v) Provide medical insurance coverage for workers; (vi) Secure all installations from unauthorized intrusion and accident risks; (vii) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following: (a) work schedule should be adjusted to avoid peak temperature hours (12 – 3 PM); (b) provide appropriate shade near the workplace; allow periodic resting and provide adequate water, and (c) provide necessary medicine and facilities to take care of dehydration related health issues (viii) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (ix) Provide H andS 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			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		workers; (x) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (xii) Ensure moving equipment is outfitted with audible back-up alarms; (xiii) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; (xiv) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. (xv) Conduct regular health check-ups for workers (xvi) Provide periodical awareness camps and special trainings for workers for health			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		issues and risks in construction sites (xviii) Provide proper solid and liquid waste management system in workers' campsite, separate from spoils and debris disposal, as their presence can add to existing waste volume at the project sites.			
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	(i)Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned (ii) All trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3.5 m by adopting trenchless technology (iii) Survey the surrounding vulnerable buildings for likely issues in structural stability / differential settlement during the excavation works (iv) Provide prior information to the local people about the (v) Plan routes to avoid times of	Construction Contractor	(i)Traffic Management Plan; (ii) Complaints from sensitive receptors	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		peak-pedestrian activities. (vi) Liaise with PIU/ULB in identifying high-risk areas on route cards/maps. (vii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (viii) Provide road signs and flag persons to warn of on-going trenching activities.			
Safety of sensitive groups (children, elders etc.) and other pedestrians in narrow streets	Trench excavation in in narrow streets will pose high risk to children and elders in the locality	(i) Provide prior information to the local people about the nature and duration of work (ii) Conduct awareness program on safety during the construction work (iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iv) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches	Construction Contractor	Complaints from neighbourhood and monitoring of accidents	Cost for implementation of mitigation measures responsibility of contractor.
Night Works	Public inconvenience due to traffic diversion, disturbance due to excessive noise and access loss, occupational health and safety	Prepare a night work protocol and obtain prior approval from PIU, and strictly implement and report on implementation of protocol during the workers; Contractors should have handheld noise level meter for measurement of noise during night hours	Contractor	Night work plan/ protocol submitted by contractor and approved by PIU/Consultant	Contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	issues etc.	Contractors should have handheld lux meter for the measurement of illumination during night hours Preferably electrical connection is available for running equipment otherwise soundproof/super silent Diesel Generator set should be available Sound level should not increase as prescribe by CPCB Illumination should be as prescribed in protocol As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime Workers engaged in night works should have adequate rest/sleep in daytime before start of night works Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests Horns should not be permitted by equipment and vehicles Workers should not shout and create noise First aid and emergency vehicles should be available at site Emergency preparedness plan should be operative during night works Old persons and pregnant women and women having small kids should not work in night-time All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works PIU/DSC site engineers and contractor's safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and video graphic records as well as register the observations. Night works should be stopped early in the morning at least one			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		hour before start of pedestrian/traffic movement After completion of night works all the site should be cleaned and maintained obstruction free for daytime movement of vehicles and pedestrians Drivers and workers should be alert and responsive during night works All the wages to workers working in night hours should be as per the applicable labour acts Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.			
Work in narrow streets	will pose high risk to children and elders in the locality	(i) Conduct awareness program on safety during the construction work (ii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iii) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches (iv) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites			responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(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			
Construction camps and worker facilities	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(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 (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,	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Drinking water and sanitation facilities for employees	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
		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) (vi) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vii) Recover used oil and lubricants and reuse or remove from the site; (viii) Manage solid waste according to the preference hierarchy: reuse, recycling and disposal to designated areas; (ix) Ensure unauthorized persons specially children are not allowed in any worksite at any given time.			
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	Construction Contractor	Records of chance finds	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		during excavation work (iii) Stop work immediately to allow further investigation if any finds are suspected; (iv) Inform local Archeological Department if a find is suspected and take any action, they require to ensure its removal or protection in situ			
Monsoon preparedness	Disruption of utilities and water logging in trenches	(i) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (ii) if open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. (iii) keep emergency response system ready before monsoon/heavy rain fall	Construction Contractor	Monsoon preparedness plan	Cost for implementation of mitigation measures responsibility of contractor.
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of supervisor to ensure EMP implementation (ii) Timely submission of monitoring reports including pictures	Construction contractor	Availability and competency of appointed supervisor Monthly report	Cost for implementation of mitigation measures responsibility of contractor.
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored	Construction Contractor	PIU/Consultant report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions;	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
		(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.		(iii) all construction related structures not relevant to O andM are removed; and (iv) worksite clean-up is satisfactory.	

Table 13: Operation Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Sewerage system operation: treatment discharge of treated wastewater, sludge	Environmental and health issues due to operation	(i) Ensure that treated wastewater meets the established discharge standards all times; Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards; (ii) Ensure implementation of Reuse Plan, and ensure intended quality for each direct reuse (iv) Assess composition and characteristics of sludge from the first batch operation at the initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan (v) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops. (vi) Ensure valid consent to operate (CTO) from RSPCB for operation of STP (vii) Ensure that all conditions/standards prescribed by RPCB are compiled duly	O and M contractor for 10 years and then Nagar Palika	Nagar Palika, Ratangarh	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(viii) 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 (ix) Implement Emergency Response System (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 16 (x) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility; (xi) Operate and maintain the facility following standard operating procedures of operational manual; (xii) Undertake preventive and periodic maintenance activities as required; (xiii) Conduct periodic training to workers; ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations; (xiv) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers; monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with RPCB:			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(xv) Conventional and centralized water treatment that use filtration and disinfection that inactivates disease-causing vectors (xvi) Final disinfection step considered if treatment plant technologies are not able to destroy pathogens and remove viruses (xvii) Workers should wear appropriate PPE which includes protective outerwear, gloves, boots, goggles or a face shield and a mask (xviii) Perform hand hygiene frequently, avoid touching eyes, nose, mouth with unwashed hands			
Sewerage system operation: collection and conveyance	Environmental and health issues due to operation of sewer network	(i) Establish regular maintenance program, including: • Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas. • Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and • Monitoring of sewer flow to identify potential inflows and outflows • Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may	O and M contractor for 10 years and then Nagar Palika	Nagar Palika, Ratangarh	O and M cost of contractor

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

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

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive dressings. • Make effective arrangements for monitoring the health of staff. • Keep emergency preparedness plan ready before starting the work of sewage system cleaning			
Repair and maintenance activities of sewerage Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management, and safety measures. Site inspection checklist to review implementation is appended at Appendix 21.	O and M contractor for 10 years and then Nagar Palika, Ratangarh.	Nagar Palika, Ratangarh	O and M cost of contractor
Asset management	Reduction in NRW Increased efficiency of the system	Preparation and implementation of O andM Manual	O and M contractor for 10 years and then Nagar Palika	Nagar Palika, Ratangarh	O and M cost of contractor

Table 14: 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 find protocol, asbestos pipes management. and safety measures. Site inspection checklist to review implementation is appended at Appendix 21.	Weekly during construction	Supervising staff and safeguards specialist	No costs required
Tree cutting and plantation	STP, SPS and pipe laying sites	Obtain permission from concerned authority for any tree cutting and plant trees in the ratio of 1:3 as per RUDSICO-EAP Circular	Weekly during construction	Supervising staff and safeguards specialist	Contractors cost
Ambient air quality	6 locations (STP, SPS, pipe laying, construction	PM10, PM2.5, NO2, SO2, CO	Once before start of construction and	Contractor	Cost for implementation of monitoring

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
	camps and workers camp)		quarterly (yearly 4-times) during construction		measures responsibility of contractor
Ambient noise	06 locations (STP, SPS, pipe laying, construction camps and workers camp)	Day time and nighttime noise levels	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor
Soil quality	06 locations (STP, SPS, construction camps, workers camps)	pH, Elect. Conductivity (at 25^0C), Moisture (at 105^0C), Texture (silt, clay, sand), Calcium (as CaO), Magnesium (as Mg), Permeability, Nitrogen (as N), Sodium (as Na), Phosphate (as PO4), Potassium (as K), Organic Matter, oil and grease	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor

Table 15: Environmental Monitoring Plan for Operations Stage

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Monitoring of raw wastewater quality	Inlet of the STP	Suspended solids, pH, Temperature Oil and grease, Total residual chlorine, Ammonical nitrogen (as N), BOD, COD, Nitrate Nitrogen The values should be within the limit specified by STP design inlet values	Monthly once	O and M contractor for 10 years and then Nagar Palika	Contract O andM cost / Nagar Palika, Ratangarh
Sludge quality (STP) and suitability as manure	Dried sludge	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) Arsenic - 10.00 Cadmium - 5.00 Chromium - 50.00 Copper- 300.00 Lead - 100.00 Mercury- 0.15 Nickel - 50.00 Zinc- 1000.00 PH - 5.5-8.5	Yearly twice	O and M contractor for 10 years and then Nagar Palika	Contract O and M cost / Nagar Palika, Ratangarh
Consent to operate (CTO) from RSPCB	STP	CTO should be renewed before expired	As per RSPCB	Ratangarh Nagar Palika	Contract O andM cost / Nagar Palika, Ratangarh
Sewer network to sustain operational efficiency and avoid clogging and early occurrence of leakages	Sewer network	to be included in the O&M plan prepared under the project	as per O&M plan	Nagar Palika Ratangarh	Nagar Palika Ratangarh
Achieving targeted wastewater reuse and safe sludge disposal	STP	Volume of wastewater reuse and Quantity of safe sludge disposal	Monthly / Yearly	Nagar Palika Ratangarh	Nagar Palika Ratangarh
Achieving Septic Tank Closure	Town	Numbers of septic tanks closed; IEC Campaign Details	Yearly	Nagar Palika Ratangarh	Nagar Palika Ratangarh

B. Institutional Requirements

223. The Local Self Government Department (LGSD) is the executing agency which will be responsible for the overall strategic guidance and ensure the compliance with ADB loan covenants. RUDSICO is the implementing agency responsible for the technical supervision and project implementation. The RUDSICO Board (under the chairmanship of the Honorable Minister), the LGSD and the City Level Monitoring Committees (CLMCs, under the chairmanship of their respective Commissioner / Executive Officer) is proposed to monitor the project implementation. The Project Management Unit (PMU) is at state-level and headed by a dedicated Project Director. The Project Implementing Units (PIUs) have two zonal offices (1 in Jaipur and 1 in Jodhpur). Each zonal office will be headed by an Additional Chief Engineer. Urban Local Bodies (ULBs) will be the final custodian and user of the created infrastructure. As primary stakeholders, the ULBs will be involved and engaged in the day-to-day monitoring and implementation.

224. At the PMU level, the Project Director shall be supported by Additional Project Director (Chief Engineer-level) and a Chief Engineer, who shall then be supported by Dy Project Director and a Financial Advisor. There shall be one Project Officer for Social and another Project Officer for Environmental aspects of the project.

225. The PMU shall be supported by the Project Management and Capacity Building Consultants (PMCBC). The PMCBC shall manage preparation/vetting design documents, tendering of contracts, implementation of resettlement, environmental management and gender action plans; setting and managing project performance monitoring systems, planning and managing implementation of training and capacity building as well as institutional strengthening activities besides preparing reports as per ADB requirements. PMCBC shall engage a social safeguard specialist and environmental safeguard specialist at the PMU level for managing all social and environmental safeguard related support services as envisaged in its scope of work. They will be assisted by concerned field level safeguard support staffs of Construction Management and Supervision Consultants (CMSCs) and PIU.

226. PMCBC shall be joined by the following specialists to address site-specific environmental requirements as below:

(i) Environment Specialist Consultant – responsibilities include the review and refinement of the IEEs and the EMPs and ensure inclusion in the bid documents and during construction, monitor the implementation of the EMPs and support in the reporting and documentation requirements;
(ii) Asbestos Management Specialist – provides training and awareness on the risks and safe handling and management of asbestos-containing materials (ACMs) and to coordinate with the Asbestos Management Service Provider in the implementation of the Asbestos Management;
(iii) Heritage Management Specialist – provides guidance on the ADB SPS requirement on Physical Cultural Resources in the RSTDSP towns including the conduct of Heritage Impact Assessment, provides support on the statutory clearances to be obtained and the documentation and reporting on the implementation of mitigation measures;
(iv) Biodiversity Expert – provides guidance on the ADB SPS requirement on Biodiversity Conservation and Critical Habitat Assessment including the conduct preliminary screening (e.g. IBAT assessment reports), on-site verifications and

consultations, recommend specific measures and provide supervisor support during the planning and construction periods; and

(v) Architect - assists the team leader and structural expert for review and approval of all drawings from architectural and heritage perspective; review and approve the detailed architectural drawings prepared by the Contractor and promptly address ant site-specific issues regarding architectural and heritage aspects.

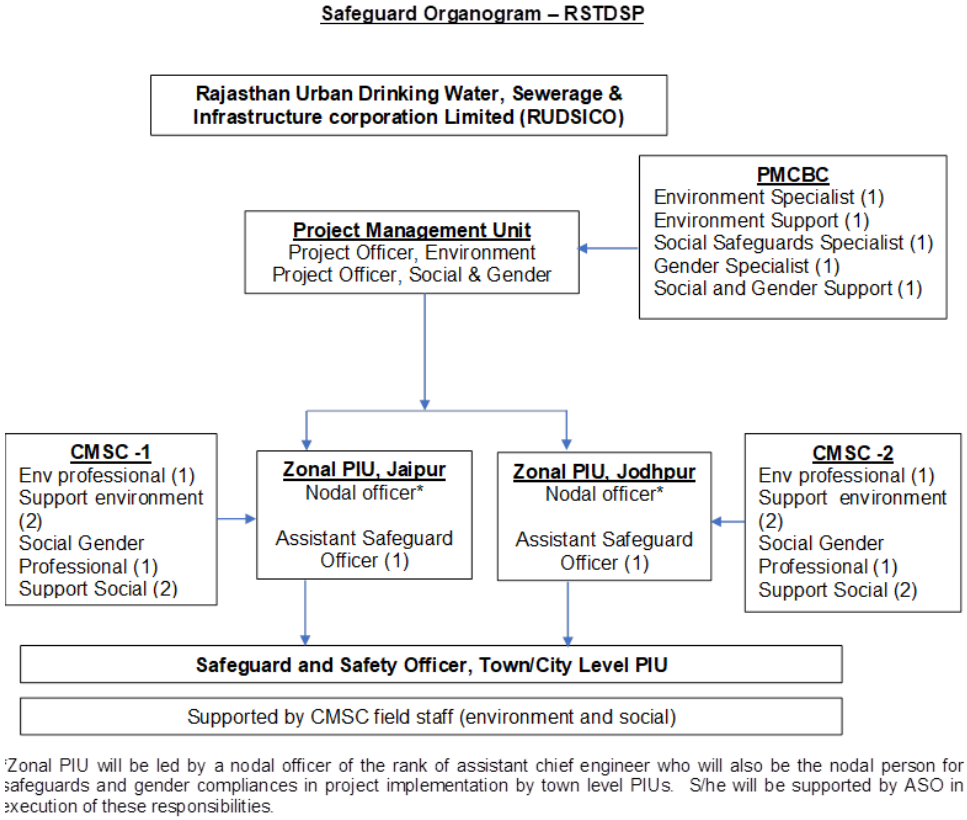
227. There will be two zonal PIUs and a PIU at every town. PIUs at the town-level shall be headed by a Superintending Engineer / Executive Engineer, who shall work as Project Manager and shall sign the contract documents, manage the contract and disburse payments as Drawing and Disbursing Officer.

228. Construction Management and Supervision Consultants (CMSC) - 2 nos catering to Jaipur and Jodhpur units. They shall directly support PIUs in day to day contract management, construction supervision including quality management of ongoing works etc. This shall include work measurement, quantities, verification of bills of contractors etc. In compliance with the EMP, the CMSC shall develop a strategy to overcome the difficulties of construction/traffic management in narrow streets and also prepare detailed plans for detour of traffic during excavation for pipe laying. The CMSC will propose and implement mechanism for coordination among all stakeholders such as traffic police, roads department, user committees, etc, for smooth construction execution. Adequate measures shall be taken for working near physical cultural resources involving close coordination with the Department of Archaeology. The CMSC will lead design of surveys and investigations required for the protection of archaeological sites / heritage areas and prepare Archaeological Impact Assessments, or other agreed upon document to be approved by the Department of Archaeology for the archaeologically sensitive locations;

229. Community Awareness and Public Participation Consultants (CAPPC) will closely work in the field (with PIUs) to facilitate creation of project awareness and ensuring public participation for all project works at the community level. This shall mainly involve house connections for water supply, sewerage and metering. CAPPC shall also undertake various IEC activities to promote and pursue health and hygiene among the communities.

Table 14 to Table 15 summarize the institutional responsibility of environmental safeguards implementation at all stages of the project.

Figure 23. Safeguards Implementation - RSTDSP



230. **Project Management Unit.** RUDSICO will establish a state-level PMU, headed by dedicated project director, and housed in EAP division of RUDSICO. For the purpose of project implementation, two Zonal Project Implementation Units (Zonal PIUs), at Jaipur and Jodhpur, headed by Additional Chief Engineers (ACE) will be established. At PMU, there will be two dedicated project officers (i) Project Officer (Environment) and (ii) Project Officer (Social and Gender), who will be responsible for compliance with the environmental, social safeguards and gender in program implementation. Key responsibilities of the Project Officer (Environment) are as follows:

(i) Review REA checklists and assign categorization based on ADB SPS 2009 and EARF;
(ii) Submit IEE to ADB for approval and disclosure in ADB website;
(iii) Ensure approved IEEs are disclosed in RSTDSP/PMU websites and summary posted in public areas accessible and understandable by local people.;
(iv) Ensure EMPs are included in the bid documents and contracts;
(v) Organize an orientation workshop for PMU, PIU, ULB and all staff involved in the project implementation on (a) ADB SPS, (b) Government of India national, state, and local environmental laws and regulations, (c) core labor standards, (d) OH&S, (e) EMP implementation especially spoil management, working in congested areas, public relations and ongoing consultations, grievance redress, etc.;
(vi) Assist in addressing any grievances brought about through the GRM;
(vii) Organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation

measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;

(viii) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements;

(ix) Assist PMU, PIUs, and project consultants to document and develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE and EMP;

(x) Assist in the review of the contractors' implementation plans to ensure compliance with the IEE;

(xi) Review monthly monitoring reports submitted by PIUs, and prepare and submit to ADB semi-annual monitoring reports;

(xii) If necessary, prepare Corrective Action Plan and ensure implementation of corrective actions to ensure no environmental impacts;

(xiii) Review and submit Corrective Action Plans to ADB;

(xiv) Coordinate with national and state level government agencies; and

(xv) Coordinate PIUs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are incorporated and implemented.

231. The PMU will be supported by three institutional consultants under the supervision and control of PD, PMU: (i) the Project Management and Capacity Building Consultants (PMCBC) will support the PMU; (ii) 2 Construction Management and Supervision Consultants (CMSC) will support the 2 zonal PIUs and town-level PIUs; and (iii) Community Awareness and Public Participation Consultants (CAPPC), will support the zonal PIUs and town-level PIUs.

232. **Zonal Project implementation units (Zonal PIUs).** There will be two zonal level PIUs at Jaipur and Jodhpur. Under each zonal PIU, there will be city/town level PIUs, for ease of day-to-day monitoring and management at local level. The Additional Chief Engineer at each Zonal PIU will serve as the Nodal Officer, Safeguards and Gender. Each Zonal PIU will be staffed with an assistant safeguards officer (ASO Environmental and Social Safeguards) who will assist PMU project officer (environment/social) in implementation of the environmental/social safeguards and GESI Action Plan in PIUs under its jurisdiction. Zonal PIUs will undertake internal monitoring and supervision and record observations throughout the project period to ensure that the safeguards and mitigation measures are provided as intended.

233. The zonal level Assistant Safeguards Officer will oversee safeguards implementation by the city/town level PIUs, coordinate public consultations, information disclosure, regulatory clearances and approvals, implementation of resettlement plans, EMP implementation, and grievance redressal. Key safeguard tasks and responsibilities of the zonal PIU Assistant Safeguards Officer (Environment) are as follows:

(i) Coordinate updating/revision of IEEs updated based on detailed design and technical studies (asbestos management, heritage impact assessment, and/or biodiversity assessment);

(ii) Review and submit approved updated/revised IEE to PMU;

(iii) Ensure relevant information in the IEE is disclosed to stakeholders;

(iv) Obtain all necessary clearances, permits, consents, NOCs, etc. Ensure compliance to the provisions and conditions;

(v) Ensure EMP requirements for pre-construction regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc. are complied and communicated by town-level PIUs to contractors in a timely manner;

(vi) Support town-level PIUs in supervising contractor EMP implementation. If necessary, organize an induction course upon mobilization of contractors, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation;
(vii) Coordinate actions required for obtaining rights of way in timely manner;
(viii) Take corrective actions when necessary to ensure no environmental impacts;
(ix) Consolidate monthly environmental monitoring reports by town-level PIUs and submit to PMU;
(x) Formulate timebound corrective actions for non-compliances
(xi) Conduct continuous public consultation and awareness;
(xii) Address any grievances in a timely manner as per the GRM; and
(xiii) Issue clearance for contractor's post-construction activities as specified in the EMP.

234. **Town/City Level Project Implementation Unit (PIU).** The town-level PIUs shall be responsible for the quality of works executed under the project and will be guided by the zonal PIUs. The city/town PIUs will be responsible for implementation of the IEE. The town-level PIUs will be headed by a Project Manager [Executive Engineer (EE) or Assistant Engineer (AE)] and supported by CMSC field staff. Environment Specialist of CMSC will assist PIU in implementation of environmental safeguard. At each PIU, the Assistant Project Manager will be given additional responsibilities of safeguard tasks and will be designated as Safeguard and Safety Officer (SSO). The SSO will be assisted by the Social and Gender Specialist and Environment Specialist of CMSC in reviewing updated/revised IEEs, etc. They will also be responsible for coordination of field level activities related to safeguards conducted by the DBO contractor and CMSC. Key responsibilities of the town-level Environment Specialist are as follows:

(i) Prepare REA Checklists, No Mitigation Checklists, baseline environmental surveys to support screening and categorization per EARF;
(ii) Submit proposed subproject categorization to Zonal PIU and coordinate with PMCBC the preparation of IEE and technical studies;
(iii) Coordinate the conduct of technical studies such as but not limited to inventory of asbestos materials in subproject sites, heritage impact assessment and/or biodiversity assessment;
(iv) Ensure IEEs are updated/revised based on detailed design and recommendations of technical studies;
(v) Oversee day-to-day implementation of EMPs by contractors, including compliance with all government rules and regulations;
(vi) Take necessary action for obtaining rights of way;
(vii) Take corrective actions when necessary to ensure no environmental impacts;
(viii) Submit monthly environmental monitoring reports to Zonal PIUs;
(ix) Conduct continuous public consultation and awareness;
(x) Address any grievances in a timely manner as per the GRM; and
(xi) Issue clearance for contractor's post-construction activities as specified in the EMP.

235. **Contractors.** The contractor will be required to update the IEE and will be responsible for providing final design (including pipe alignments) to the supervision consultant for finalization/updating of resettlement plan. The contractor shall appoint an Environment, Health and Safety (EHS) Engineer who will be responsible on a day-to-day basis for (i) ensuring

implementation of EMP, (ii) coordinating with the Town-level PIUs and environment specialists of project consultant teams; (iii) community liaison,[43] consultations with interested/affected people, (iv) field-level grievance redress; and (iv) reporting.

236. The Contractor will be required to submit to RUDSICO, for review and approval, a site-specific environmental management plan (SEMP) including (i) proposed sites or 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 per SEMP; (iv) budget for SEMP implementation. No works can commence prior to approval of SEMP.

237. A copy of the EMP 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 or SEMP constitutes a failure in compliance and will require corrective actions. The EARF and the IEEs specify responsibilities in EMP implementation during design, construction and O&M phases.

238. **RUDSICO** will ensure that bidding and contract documents include specific provision requiring Contractors to comply with: (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste and (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS, to employees and local communities surrounding the project sites.

Table 14: Safeguards Management Roles and Responsibilities

Implementation Arrangements	Roles and Responsibilities
Executing Agency: LSGD through RUDSICO	• Negotiate, sign, and execute the program. • Allocate and release government counterpart funds on time. • Facilitate obtaining timely Government-level approvals for smooth implementation of the program. • Monitor program implementation progress and ensure timely actions for completion of the project. • Plan, implement, and monitor public relations activities; gender mainstreaming initiatives and community participation activities, with the support of PIUs.
RUDSICO Board (like SLEC) **Chairman:** Minister of Urban Development Department, GoR Members: • Hon'ble Minister, LSGD • Secretary, LSGD – Vice Chairman • Principal Secretary, PHED -Director • Principal Secretary, PWD -Director	• Provide strategic guidance. • Provide policy decisions to support smooth program implementation. • Facilitate inter-departmental coordination and cooperation. • Support RUDSICO with government/ministerial level approvals. • Overall project review (physical, financial, safeguards) • Approvals/Decisions as per approved SOP (Standard Operating Procedures – laying delegation of powers, Administrative and Financial Approval of works and services)

• Secretary, Finance (Budget) Department - Director • Director, Department of Local Bodies • Executive Director, RUDSICO • Project Director, RUDSICO • Independent Director • Independent Director	
RUDSICO (with approval of RUDSICO board, as needed)	• Required support to review and monitor the physical and financial progress of the subprojects. • Provide additional technical support from RUDSICO Office (along with PMCBC) to PIUs for speedy resolution of implementation related issues such as variations, deviations, time and cost control, among others. • Provide backup technical support for review and finalization of DPRs, bid documents, bidding and award of contracts. • Review, appraise and put up matters to RUDSICO Board for approval, as described under "Delegation of Powers" • Overall Liaison, Monitoring and Reporting to DEA and ADB as per agreed requirements • Pursue GoR, through LSGD for approval of Policy, Rules, Guidelines, Government Orders for use in the state
Program Management Unit • Program Director: **Project Director, RUDSICO** • Additional Project Director, RUDSICO <u>PMU Staff</u> • 2 Zonal Additional Chief Engineers (Jaipur and Jodhpur). The Office of ACE to have Two EE, Two AE, Computer Operator, Support staff • Dy. PD(T) (Procurement, Tendering, Contracts, Consultancies) at RUDSICO HQ • Dy. PD(A) (Administration, Institutional) at RUDSICO HQ • SE's (Asset Management, NRW, Safeguards, Resettlement) at RUDSICO HQ • Financial Advisor at RUDSICO, Jaipur HQ • Senior Accounts Officer at RUDSICO, Jaipur HQ	**Program and Financial Management** • Overall responsibility of the investment program and financial management and administering program procedures and guidelines. • Oversee design of all projects (in individual tranches as needed). • Finalize the DPRs for ULBs/implementing agencies and obtain approval from ADB and government. • Establish project management and monitoring systems (Command and Control Center) • Undertake project appraisals based on technical, financial, economic and safeguards compliance as agreed by GoR/RUDSICO and ADB. • Provide overall technical and implementation guidance to the PIUs as required. • Facilitate approval of various implementation related requests from the Project Implementation management and Field Units • Sign key documents including withdrawal applications and audit reports. • Timely submission of any withdrawal applications. • Act as focal point for communication with the ADB. • Ensure compliance with loan covenants, ADB's guidelines, procedures and policies. • Facilitate ADB program review missions. • Represent the program at Tripartite Review Meetings.

PMU at HO supported by: • Project Officers (7 Nos. EE level with POs for Procurement and contracts; NRW Reduction; Contract Management and O&M, Social Safeguards, Environmental Safeguards, Capacity Building etc.) • Accounts officers • Assistant Project Officers – on each with PO – AE level, Assistant Account Officer • IT Cell (project Management and Monitoring, GIS, MIS etc.) with MIS Expert • Statistical Unit • Legal Unit • Administration and Establishment	**Safeguards compliance** • Review and monitor safeguards compliance by PIUs and support corrective actions as necessary. • Submit semi-annual safeguard monitoring reports to ADB • Guide PIUs as and when necessary on safeguards compliance, and arrange capacity building for PIUs **Capacity Building and Institutional** • Allocate funds for capacity building and arrange required disbursements • Approve and Monitor Capacity Building Plan • Pursue reforms with GoR • Supervise **a**nd Monitor PMCB Consultants and approve their invoices
Project Implementation Units • 2 zonal PIUs (1 in Jaipur, 1 in Jodhpur) A. <u>PIU Staff</u> • Project Manager (SE level) • Executive Engineer / Assistant Engineer (2 or 3) at each town for monitoring and supervision support • Assistant Accounts Officer • Computer Operator • Support Staff Supported by • Contract Management Officer (SE/EE of cluster shall invariably function as contract management officer) - **No new position** – • CMSC and CAPP Consultants (2 support engineers of CMSC at each town as per CMSc consultancy, 2 community mobilizers for each town – as per CAPP consultancy) besides required consultancy professionals reporting to EE)	**Project Management** • Responsible for implementation management of sub-projects. • Responsible for day-to-day implementation, monitoring and reporting. **Safeguards Compliance (with CAPPC)** • Ensure compliance with safeguard frameworks and plans • Facilitate consultation with stakeholders and disclose program information in consultation with PMU. • Address grievances (may be through Grievance Redressal Mechanism) Coordinate land acquisition actions, if required. • Submit quarterly safeguard monitoring reports to PMU. **Advance Project Preparation** • Prepare/supervise and monitor preparation of DPRs and bidding documents for future tranches.
ULBs	• Nodal Officers to be a part of PIU and discharge the assigned functions and part of project planning and implementation • Establish liaison with local communities, resolve local grievances for smooth implementation of the project

	• Support CAPPC in awareness creation, connection modalities to household consumers etc.
Asian Development Bank	• Approve and monitor safeguards documents and implementation compliance. • Field review missions. • Facilitate knowledge sharing. • Provide training in program management and ADB procurement procedures to PMU/PIU staff. • Support LSGD, RUDSICO, PIUs etc. through various capacity building activities.

Table 15: Institutional Roles and Responsibilities for Environmental Safeguards Implementation

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
PMU (Project Officer; Environment),	(i) Review REA checklists and assign categorization based on ADB SPS 2009 (ii) Review and approve EIA/IEE (iii) Submit EIA/IEE to ADB for approval and disclosure in ADB website (iv) Ensure approved IEEs are disclosed in RSTDSP/PMU websites and summary posted in public areas accessible and understandable by local people. (v) Ensure environmental management plans (EMPs) are included in the bid documents and contracts (vi) Organize an orientation workshop for PMU, PIU, ULB and all staff involved in the project implementation on (a) ADB SPS, (b) Government of India national, state, and local environmental laws and regulations, (c) core labor standards, (d) OH&S, (e) EMP implementation especially spoil management, working in congested areas, public relations and ongoing consultations, grievance redress, etc. (vii) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs (viii) Organize an induction course for the training of	(i) Over-all environmental safeguards compliance of the project (iii) Monitor and ensure compliance of EMPs as well as any other environmental provisions and conditions. (i) Review monthly monitoring report (ii) Prepare and submit to ADB semi-annual monitoring reports (iv) If necessary prepare Corrective Action Plan and ensure implementation of corrective actions to ensure no environmental impacts; (iii) Review and submit Corrective Action Plans to ADB (iv) Organize capacity building programs on environmental safeguards (iv) Coordinate with national and state level government agencies (vi) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs (ix) Coordinate PIUs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are	Compliance monitoring to review the environmental performance of project component, if required and as specified in EMP

	contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation. (ix) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (x) Assist PMU, PIUs, and project NGOs to document and develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE. (xi) Assist in the review of the contractors' implementation plans to ensure compliance with the IEE.	incorporated and implemented	
PIU, Assistant Safeguard Officer	(i) Ensure IEE is included in bid documents and contract agreements. Ensure cost of EMP implementation is provided. (iv) Disclose of approved EIAs/IEEs. (v) Obtain all necessary clearances, permits, consents, NOCs, etc. Ensure compliance to the provisions and conditions. (vi) EMP implementation regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc. (vii) Organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.	(i) oversee day-to-day implementation of EMPs by contractors, including compliance with all government rules and regulations. i.(ii) take necessary action for obtaining rights of way; ii.(iii) oversee implementation of EMPs, including environmental monitoring by contractors; (iv) take corrective actions when necessary to ensure no environmental impacts; (v) submit monthly environmental monitoring reports to PMU, (vi) conduct continuous public consultation and awareness; (vii) address any grievances brought about through the grievance redress mechanism in a timely manner as per the IEEs; and	(i) Conducting environmental monitoring, as specified in the EMP. (ii) Issuance of clearance for contractor's post-construction activities as specified in the EMP.

Consultant – 1.PMCBC-Environmental Safeguard Specialist – 1 no. Asbestos Expert – 1no. Heritage Expert – 1no. Biodiversity Expert – 1no.	(i) Review IEE/EMP submitted by CMSC and revise report to submit to PMU (ii) Assist PMU and PIU in obtaining all necessary clearances, permits, consents, NOCs, etc. Ensure provisions and conditions are incorporated in the IEE and detailed design documents. (iii) Assist in ensuring IEE is included in bid documents and contract agreements. (iv) Assist in determining adequacy of cost for EMP implementation. (v) Assist in addressing any concern related to IEE and EMP. (vi). Conduct specific assessment requirements	(i) Monitor EMP implementation (ii) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.	
Consultant- 2. CMSC- 2 nos. Environmental safeguards professional	(i) Update initial environmental assessment for proposed project using REA checklists and submit to PIU/PMCBC (ii) Assist in summarizing IEE and translating to language understood by local people.	i.Monitoring of Implementation of EMP at site by contractor ii.Recommend corrective action measures for non-compliance by contractors iii.Assist in the review of monitoring reports submitted by contractors iv.(iv) Assist in the preparation of monthly monitoring reports v.conduct continuous public consultation and awareness;	(i) Assist in the inspection and verification of contractor's post-construction activities.
Contractors (EHS Engineer)	(i) Review the IEE and provide information about changes needed as per revised design and scope of works to ESS of PMCBC for final revision of IEE (ii)Prepare EHS plan and take approval from CMSC/PIU and Ensure EMP implementation cost is included in the methodology. (iii) Undergo EMP implementation orientation by ESS of supervision consultant prior to start of works (iv) Provide EMP implementation orientation to all workers prior to deployment to worksites	(i) Implement EMP. (ii) Implement corrective actions if necessary. (iii) Prepare and submit monitoring reports including pictures to PIU (iv) Comply with all applicable legislation, is conversant with the requirements of the EMP; (v) Brief his staff, employees, and laborer about the requirements of the EMP and provide environmental awareness training to staff, employees, and laborers; (vi) Ensure any sub-contractors/ suppliers who	(i) Ensure EMP post-construction requirements are satisfactorily complied (ii) Request certification from PIU

	(v) Seek approval for camp sites and sources of materials. (vi) Ensure copy of IEE is available at worksites. Summary of IEE is translated to language understood by workers and posted at visible places at all times.	are utilized within the context of the contract comply with all requirements of the EMP. The Contractor will be held responsible for non-compliance on their behalf; (vii) Bear the costs of any damages/compensation resulting from non-adherence to the EMP or written site instructions; (viii) Ensure that PIU and ACM/SO are timely informed of any foreseeable activities related to EMP implementation.	

A. Capacity Building and Development

239. 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.

240. PMCBC's ESS shall assess the capabilities of the target participants, customize the training modules accordingly and provide the detailed cost.

241. Typical modules would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in water supply and wastewater projects; (iii) review of IEEs and integration into the project detailed design; (iv) improved coordination within nodal departments; and (v) monitoring and reporting system. 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 contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites. The proposed training project, along with the frequency of sessions, is presented in Table 16.

Table 16: Capacity Building Program on EMP Implementation

Sl. No.	Description	Target Participants and Venue	Cost and Source of Funds
1	Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement -EARF of RSTDSP -Government of India and Rajasthan applicable safeguard laws, regulations and policies including but not limited to core labor standards, OH&S, etc. -Incorporation of EMP into the project design and contracts -Monitoring, reporting and corrective action planning	All staff, ULBs and consultants involved in the project At PMU, Jaipur	PMU cost
2	Treated Effluent Reuse Concepts, Design and Management	All staff at PMU and ULBs	PMU cost
3	Sludge Reuse Concept, Design and Management	All staff at PMU and ULBs	PMU cost
4	EMP implementation (2 days) -Roles and responsibilities -OH&S planning and implementation -Wastes management (water, hazardous, solid, excess construction materials, spoils, etc.) -Working in congested areas, - Public relations - Consultations - Grievance redress -Monitoring and corrective action planning -Reporting and disclosure -Post-construction planning	All staff and consultants involved in the subproject All contractors before start of construction works At PIU	PMU cost
5	Plans and Protocols (1 day) -Construction site standard operating procedures (SOP) - Asbestos Management Plan -Heritage Impact Assessment -Biodiversity and Critical Habitat Assessment - Site-specific EMP	All staff and consultants involved in the project All contractors before start of construction worksor during mobilization stage.	PMU cost Contractors cost as compliance to contract provisions on EMP implementation

	-Traffic management plan -Spoils management plan -Waste management plan - Chance find protocol - O&M plans - Post-construction plan	At PIU	
6	Experiences and best practices sharing - Experiences on EMP implementation - Issues and challenges - Best practices followed	All staff and consultants involved in the project All contractors All NGOs At PMU Jaipur	PMU Cost
7	Contractors Orientation to Workers on EMP implementation (OH&S, core labor laws, spoils management, etc.)	All workers (including manual laborers) of the contractor prior to dispatch to worksite	Contractors cost as compliance to contract provisions on EMP implementation

C. Monitoring and Reporting

204. Prior to commencement of the work, the DBO contractor will submit a compliance report to PIU ensuring that all identified pre-construction environmental impact mitigation measures as detailed in the EMP will be undertaken. PIU with the assistance of the SO and ESS of PMCBC will review the report and thereafter PMU will allow commencement of works.

205. During construction, results from internal monitoring by the DBO contractor will be reflected in their monthly EMP implementation reports to the PIU and ACM, CMSC. PO (Environment) and ACM will review and advise contractors for corrective actions if necessary. Monthly report summarizing compliance and corrective measures taken will be prepared by SO with the assistance of ACM and submitted to PMU.

206. Quarterly report shall be prepared by CMSC and PIU and submitted to PMU for review and further actions.

207. Based on monthly and quarterly reports and measurements, PMCBC will draft semi-annual report and submit to PMU for their review and further submission to ADB (Appendix 22). Once concurrence from ADB is received, the report will be disclosed in the Project website. ADB's monitoring and supervision activities are carried out on an ongoing basis until a project completion report (PCR_ is issued. Thus, semi-annual monitoring report, which may cover O&M of completed packages, will be submitted to ADB until PCR is issued.

208. 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

D. EMP Implementation Cost

209. Most of the mitigation measures require the contractors to adopt good site practice, which are part of their normal procedures. Mitigation that is the responsibility of PIU/ULB 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 are given in Table 18.

Table 18: Cost Estimates to Implement the EMP

S. No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
A.	Mitigation Measures						
1	Compensatory plantation measures	Construction	Ha.	0.11	137200	150,92	Civil works contract
	Subtotal (A)					**15092**	
B.	Monitoring Measures**						
1	Air quality monitoring	Pre-construction and construction	Each	6	4920	29520	Civil works contract
2	Noise levels monitoring	Pre-Construction and construction	Each	6	1980	11880	Civil works contract
3	Ground Water Quality	Pre-Construction and construction	Each	6	6720	40320	Civil works contract
4	Soil Quality	Pre-construction and construction	Each	6	5880	35280	Civil works contract
	Subtotal (B)					**117000**	
C.	Capacity Building						
1.	Introduction and sensitization to environment issues	Pre-construction	lump sum			100,000	PMU
2..	EMP implementation	Construction	lump sum			50,000	PMU
3.	Plans and Protocols	Construction	lump sum			25,000	PMU
			lump sum			25,000	Civil works contract
4.	Experiences and best practices sharing	Construction/Post-Construction	lump sum			100,000	PMU
5.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	lump sum			25,000	Civil works contract

S. No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
	Subtotal (C)					**325,000**	
D	Civil Works						
1	Water Sprinkling for dust suppression	Construction	KL	2000	111	222000	Civil works contract
2	Rainwater Harvesting for water conservation	Construction	Nos.	2	400000	800000	Civil works contract
3	Barricading						
Sewerage							
	MS Pipe with PVC Tape	Construction	meter	408545	38.5	15728983	
	MS Pipe with nut and bolt	Construction	meter	55792	50	2789600	
	GI Corruglated sheet	Construction	Sq. metre	100425	101	10142925	
	Sub Total (D)					**29683508**	
E	**Grievance Redressal Mechanism Resolutions**				Lump sum	350,000	Civil works contract
	Sub Total (E)					**350,000**	
	Total (A+B+C+D)				**INR**	**30,490,600**	

* Tree cutting and utility shifting will be minimized through design alternatives for SPS. Contractor will revisit all sites including STP sites and ascertain the tree cutting/ utility shifting required.

X. CONCLUSION AND RECOMMENDATION

210. The process described in this document has assessed the environmental impacts of all elements of the Ratangarh sewerage subproject. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. During the construction phase, impacts mainly arise from the construction dust and noise, the need to dispose of large quantities of waste soil and import a similar amount of construction material to support the sewer in the trenches; and from the disturbance of residents, businesses, traffic and important buildings by the construction work.

211. Subproject sites are located in Ratangarh urban area and surroundings. There are no environmentally or archeologically sensitive areas within or near Ratangarh Town.

212. Two STPs of capacities 3.80 MLD and 6.10 MLD are proposed based on SBR (sequential batch reactor) process, followed by disinfection. As the bid is DBO type, detailed design of the STP will be carried out by the contractor to the following specific discharge standards. Currently for STPs in India, the standards notified by Ministry of Environment, Forests and Climate Change (MOEFCC) in 2017 and NGT order 2019 as amended are applicable. However, under RSTDSP, PMU has decided to base the STP design on discharge standards for STPs suggested by CPCB in 2015 and order of NGT, 30th April, 2019, which are more stringent. The stringent standards also facilitate maximum utilization of treated wastewater for reuse in various purposes following the Sewerage and Wastewater Policy, 2016, of Rajasthan. The treated wastewater will be reused, and a reuse plan will be prepared during the detailed design. Various measures are suggested for safe reuse of wastewater and sludge.

213. Proposed STP sites are away from habitations and surrounded by agricultural and barren vacant lands. Some trees are present at the proposed STP and SPS sites, which needs to be cut for construction of proposed facilities. During detail design all efforts should be done to reduce numbers of trees to be cut for construction works. Tree plantation will be carried out as per replacement ratio of 1:3. Treated wastewater will be mostly utilized in reuse purposes. STP 2 treated wastewater will be fully utilized for irrigation in Gaushala (cattle care centre) premises, where STP is located, and there will be no discharge of treated wastewater outside the premises. For STP, reuse application will be as per the Reuse Plan to be prepared during detailed design phase. Excess treated wastewater, if any, will be discharged into government vacant / low lying lands near the STP. Given the desert region, there is no defined natural drainage system, nor there any streams / channels. Owing to large expanse of vacant lands, deep groundwater table, sandy soil and high temperature, etc., there are unlikely to be any issues due to discharge of treated wastewater on the land.

214. Except sewer works, all other construction activities will be confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects. Sewer line works (159 km of sewers covering almost entire project area of Ratangarh town) will be conducted along public roads in an urban area congested with people, activities and traffic, subproject is likely to significant impacts during construction. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to deep trench excavations, especially in narrow roads, dust, access

impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation that are suggested in the EMP. Trenchless method (10.18 km) will be adopted for sewers deeper than 3.5 m and also at main road and railway crossings .

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

216. 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- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be longer-term surveys to monitor, treatment efficiency of STP (raw and treated sewage quality), sludge at STPs. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

217. Certain new initiatives have been taken in the project viz., promoting wastewater reuse, sludge reuse and contractor to work on private properties to provide sewerage connections. Hence, appropriate guidelines for these measures should be provided for these new initiatives. These could include viz., Guidelines for the ULBs for promoting wastewater reuse; Guidelines for the ULBs for sludge reuse; and Guidelines for the Contractors to work within the private properties. In the project, in a large portion of the project town areas, the septic tank system in individual households is replaced with direct connections to the new sewerage network. The impacts and mitigation measures from the existing septic tank that need to be closed should be identified in the Operation Phase

218. Stakeholders were involved in developing the IEE through face-to-face discussions, on site meetings, and a city level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stakeholders were incorporated into the IEE and the planning and development of the project. The 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.

219. The 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. 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.

220. The citizens of the Ratangarh will be the major beneficiaries of the sewerage systems. The subproject is primarily designed to improve environmental quality and living conditions of Ratangarh Town through provision of sewerage. The benefits arising from this subproject include: (i) better public health particularly reduction in waterborne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) improvement in quality of water quality due to avoidance of disposal of untreated effluent.

221. Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines STPs requires consent to establishment (CTE) and consent to operate (CTO) from Rajasthan State Pollution Control Board. CTE will be obtained prior to construction, as the detailed designs will be undertaken by contractor.

222. 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.

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

- Obtain all statutory clearances at the earliest time possible and ensure conditions/provisions are incorporated in the detailed design;
- Include this IEE in bid and contract documents;
- Ensure that the project sites are cleared of solid waste and other nuisance materials disposed in designated disposal sites per Solid Waste Management Rules 2000 and its amendment;
- Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2000 and its amendment) and solid waste disposal should have a designated site (dumping on vacant lot is not allowed);
- Update the asbestos management plan per site-specific conditions;
- Update/revise this IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location;
- Conduct safeguards induction to the contractor upon award of contract;
- Strictly supervise EMP implementation;
- Ensure contractor appointed qualified EHS officers prior to start of works;
- Documentation and reporting on a regular basis as indicated in the IEE;
- Continuous consultations with stakeholders;
- Timely disclosure of information and establishment of grievance redressal mechanism (GRM);
- Involvement of contractors, including subcontractors, in first-level GRM;
- Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation.

IEE: Ratangarh Sewerage Subproject Appendices

Appendix 1: REA Check list for sewerage treatment
Appendix 2: Compliance with environmental criteria for subproject selection
Appendix 3: Ambient air quality standards, emission limits and emission stack height requirements for diesel generators
Appendix 4: Effluent discharge standards for STPs
Appendix 5: Ambient noise level standards and noise limits for DG sets
Appendix 6: Extract from construction and demolition management rules, 2016
Appendix 7: Salient features of major labour laws applicable to civil works
Appendix 8: IBAT screening report of Ratangarh subproject
Appendix 9: GPS coordinates of subproject sites
Appendix 10: Sample chance find protocol
Appendix 11: Excerpts on reuse from Rajasthan state Sewerage and Wastewater Policy
Appendix 12: Reuse of Treated Effluent and Sludge as per guidelines of CPHEEO
Appendix 13:Outline spoil management plan
Appendix 14: Outline traffic management plan
Appendix 15: IFC benchmark standards for workers accommodation
Appendix 16: Guidelines and emergency plan for handling and storing chlorine
Appendix 17: Details of public consultations
Appendix 18: Minutes of CLC meeting
Appendix 19: Sample grievance registration form
Appendix 20: Officer order for establishing GRM
Appendix 21: Sample environmental site inspection checklist
Appendix 22: Format of Semi-annual Monitoring Reports

Appendix 1: Rapid Environmental Assessment (REA) Checklist

Sewerage Treatment

Instructions:
The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.
This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: India/ Sewerage Project in Ratangarh Town, Rajasthan

Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the project area…			
Densely populated?	✓		Subproject activities extend to the entire town including the densely populated areas. There are no major negative impacts envisaged, because pipeline will be located in unused government lands alongside the existing roads and can be constructed without causing disturbance to houses, and commercial establishments. STP sites are sufficient away from habitations.
Heavy with development activities?	✓		Ratangarh is a developing town; urban expansion is considerable
Adjacent to or within any environmentally sensitive areas?		✓	There are no environmentally sensitive areas within or near to any proposed site
Cultural heritage site		✓	
Protected Area		✓	
Wetland		✓	
Mangrove		✓	
Estuarine		✓	
Buffer zone of protected area		✓	
Special area for protecting biodiversity		✓	
Bay		✓	

SCREENING QUESTIONS	Yes	No	REMARKS
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			
Impairment of historical/ cultural monuments/areas and loss/damage to these sites?		✓	**Not applicable.**
interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	✓		**Anticipated during construction and operations but can be avoided and mitigated.** Sewage treatment plants' design include considerations to minimize, if not reduce, the nuisance to the nearby communities and comply with noise and odor standards. During construction, sewers will be laid underground and may interfere temporarily with access and other utilities. Coordination with the concerned agencies will be conducted in finalizing alignment and shifting of utilities, if necessary.
dislocation or involuntary resettlement of people?		✓	**Not anticipated.** Project does not involve any land acquisition. A Resettlement Plan will be prepared if there are any involuntary resettlement.
disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		✓	**Not anticipated.** Contractors shall prioritize hiring local labor force. Some of the skilled workers may be brought from outside but numbers should not be so large to have impacts on social services.
impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		✓	**Not anticipated.** Treated effluents from the STP will be utilized in agriculture or similar uses and comply with the State's Reuse policy.
overflows and flooding of neighboring properties with raw sewage?		✓	**Not anticipated.** Risks, climate change factors and forecasted demands are considered in the design and capacity of the sewerage systems.
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		✓	**Not anticipated.** Designs include sludge collection, handling, treatment and disposal. Standards are provided for the use of sludge as manure. Sewerage system design ensure no industrial effluent will be allowed into the network.
noise and vibration due to blasting and other civil works?		✓	**Anticipated but temporary, site-specific and can be mitigated.** Blasting for underground works is prohibited in RUDSICO. Nuisance or disturbance due to noise may be experienced but minimized with mitigation measures specified in the EMPs. Scheduling of works and prior information with the affected people will be conducted.

SCREENING QUESTIONS	Yes	No	REMARKS
risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?		✓	**Anticipated but temporary, site-specific and can be mitigated.** EMPs and contract provisions include requirements for an Occupational Health and Safety (OHS) plan. The contractor's OHS plan shall be reviewed and cleared by the PIUs prior to commencement of works.
discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		✓	**Not anticipated.** Sewerage system only caters to domestic waters, no industrial wastewater is allowed into the system.
inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?		✓	**Not anticipated.** STPs will be isolated through boundary walls and dense plantations to avoid/minimize nuisance.
road blocking and temporary flooding due to land excavation during the rainy season?	✓		**Anticipated during construction but temporary, site-specific and can be mitigated.** Road blocking for pipe laying works may be required and mitigation measures are required as per IEE/EMP. Underground construction works (sewer laying, foundations) should be carried out in non-monsoon period to avoid flooding.
noise and dust from construction activities?	✓		**Anticipated during construction but temporary, site-specific and can be mitigated.** No major noise-generating activities like rock blasting is anticipated. As the sewers will be laid on the road surface, cutting open of road surface using pneumatic drills will produce noise and dust. Temporary nuisance/disturbance due to noise and dust may be experienced by sensitive receptors. These impacts will be minimized with mitigation measures specified in the EMPs. During operations, noise may be experienced by sensitive receptors due to STP operations. This impact will be avoided by including noise barriers and enclosure of noise-producing components.
traffic disturbances due to construction material transport and wastes?	✓		**Anticipated during construction but temporary, site-specific and can be mitigated.** Linear activities like sewer laying along the roads is likely to disrupt traffic. Vehicle movement for construction purpose will increase the traffic. Identification of alternate routes, allowing limited - at least one-way traffic, prior information about the works and alternative arrangements, providing information/sign boards etc. will reduce the impact.

SCREENING QUESTIONS	Yes	No	REMARKS
temporary silt runoff due to construction?	✓		**Anticipated during construction but temporary, site-specific and can be mitigated.** EMPs and contract provisions include requirement for contractors to provide silt control measures.
hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?		✓	**Not anticipated.** Adequately trained staff and necessary equipment will be in place for regular operation and maintenance of the system. Proposed treatment system will be efficient and appropriate repair and maintenance procedure will be developed. Sufficient funds for operation will be ensured. Backup power supply system is part of project.
deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?		✓	**Not anticipated.** STP designs include sludge handling and treatment facilities to state policy standards.
contamination of surface and ground waters due to sludge disposal on land?		✓	**Not anticipated.** STP designs include sludge handling and treatment facilities to state policy standards. O&M manual includes testing procedures and acceptable parameters for disposal on land.
Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?	✓		**Anticipated during operation but temporary, site-specific and can be mitigated.** Workers may be exposed during cleaning of blockages in sewerage network. However, O&M Manuals will include standard operating procedures. All necessary health and safety training and personal protection equipment will be given to workers and staff during operation of sewerage system. Implementation of contractors' H&S will be strictly enforced by the PIUs.
Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		✓	**Not anticipated.** Most of the unskilled workers will be hired from local labor force. Some skilled workers may be brought from outside, but numbers will not be so large to have impacts on social infrastructure.
Social conflicts between construction workers from other areas and community workers?		✓	**Not anticipated.** Most of the unskilled workers will be hired from local labor force. Some skilled workers may be brought from outside, but numbers will not be so large to have impacts on social infrastructure. No conflicts envisaged.

SCREENING QUESTIONS	Yes	No	REMARKS
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	✓		**Anticipated but temporary, site-specific and can be mitigated.** Construction will not involve use of explosives and chemicals. During operations, chemicals such as pH adjusters, flocculants, or coagulants may be used. The complete list of chemicals, quantities, and requirements for safe use and storage will be included in the final IEE for the STPs (these are design-build-operate packages). The EMPs in the current IEEs already include measures and monitoring requirements conforming with IFC EHS Guidelines. O&M Manuals will include health and safety requirements for managing chemicals.
Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	✓		**Anticipated but temporary, site-specific and can be mitigated.** Work area will be clearly demarcated with security access for the workers and project-concerned members only. Community health and safety risks are present during construction such as risks from excavations for pipe laying, equipment and vehicle operations which should be identified and implemented in the site-specific EMPs.

Checklist for Preliminary Climate Risk Screening

Country/Project Title: India/Rajasthan Secondary Towns Development Sector Project (RSTDSP), Ratangarh Waste Water Project, District Churu, Rajasthan
Sector: Urban Development
Subsector: Waste Water
Division/Department: SARD/SAUW

Screening Questions		Score	Remarks[1]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	2	The subproject sites in Rajasthan are highly sensitive to fluctuations in rainfall and increases in temperatures. Some project locations may experience drought during dry season. Adequate measures such as installation of rainwater harvesting, minimization of non-revenue water and pressure control mechanisms (for improved asset management) will be included in the designs to safeguard facilities from extreme events.

[1] 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.

	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	No such issue may affect the project
Materials and Maintenance	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	No such issues may affect the project
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	No such issue may affect the project
Performance of project outputs	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 life time?	1	Extreme weather conditions may disrupt regular operations of water treatment and sewage treatment plants. Moreover, components require continuous power to operate that may be affected by low precipitation conditions. Back-up powers (such as solar panels) may be provided in cases of such extreme events

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): High

Other Comments: The proposed subproject activity involves construction of two new STPs and SPS and the anticipated environmental impacts are very marginal and the construction activity does not impose any threat to the existing climatic conditions.

Appendix 2: Compliance with Environmental Criteria for Subproject Selection

Components	Criteria	Design Considerations (if criterion is not met)	Compliance
All subprojects			
	Subproject will avoid potentially significant adverse impacts that are diverse, irreversible or unprecedented (ADB SPS Category A for environment).		Being complied, the proposed components of subproject are proposed in already developed area and all impacts are predictable and mitigation measures are part of project design
	Comply with all requirements of ADB SPS 2009 and follow procedures set in this environmental assessment and review framework (EARF)		Being complied
	Comply with relevant national, and local laws, rules and regulations regarding EIA, environmental protection, pollution prevention (water, air, noise, solid waste, etc.) wildlife protection, core labor standards, physical cultural resources, health and safety, and other laws in specific sectors as indicated below		Being complied
	Does not include and/or involve any activities listed in ADB's Prohibited Investment Activities List[2]		Being complied
	Reflect inputs from public consultations	Refer to ADB SPS requirements on meaning consultations[3]	Being complied

[2]ADB SPS Appendix 5

[3]Per ADB SPS, meaningful consultation is defined as "a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure ofrelevant 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

Location	Avoid involuntary resettlement by prioritizing rehabilitation over new construction using vacant government land where possible, and taking all possible measures in design and selection of site or alignment to avoid resettlement impacts	If cannot be avoided, prepare Resettlement Plan.	Being complied
	Avoid or minimize the cutting of trees	If tree is to be cut, consider 1:3 replacement	Being complied
Biodiversity	Avoid locating subprojects in critical habitats, such as, but not limited to, wildlife/bird sanctuaries, national parks, tiger reserves, elephant reserves, conservation reserves or core zone of biosphere reserves. Appendix 1 provides preliminary analysis using the International Biodiversity Assessment Tool (IBAT) key biodiversity areas, protected areas, IUCN red list species and likelihood of critical habitats per town. Should not directly affect environmentally protected areas, core zones of biosphere reserves and highly valued habitat	If criteria is not met, this is potential for Category A therefore alternate location should be considered. A Biodiversity Expert shall assess and confirm critical habitat qualification. Appendix 2 provides a Biodiversity Assessment Report prepared for a sample subproject (Abu Road water and sewerage subproject).	Being complied
	If work is proposed with the aim of improving the conservation or management of designated subproject sites (e.g. improved drainage), this must only be undertaken: (i) after a comprehensive study and development of management plans and criteria; and (ii) with the direct involvement and approval of national and local bodies responsible for the subproject site.		Being complied
Physical Cultural Resources	Should not result in the destruction/damage of or encroachment onto physical cultural resources (PCR)[4] such as archaeological monuments; heritage sites and movable or immovable objects, sites, structures, group of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance.	If location is within 300 m of notified protected monuments/ sites and there is no alternative, permissions from the ASI or State Department of Archaeology to be obtained prior to finalization of detailed engineering design. If	Being complied

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"

[4] Physical cultural resources as defined as "movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings and may be above or below ground or under water. Their cultural interest may be at the local, provincial, national, or international level."

		potential physical cultural resources are found within or adjacent to project sites, a Heritage Impact Assessment is required to be conducted by a competent expert.	
Existing Facilities to be rehabilitated or expanded	Conduct environmental audit of existing facilities[5]per ADB SPS	For non-compliances, provide corrective action for each area of concern including cost and schedule to be included in the subproject EMP.	Being complied
Associated Facilities[6]	Analyse environmental impacts and risks to be included in the IEE		Being complied
Asbestos-containing materials (ACM) including, but not limited to, pipes, roofing, ceilings, insulation materials, excess pipes stored in PHED campuses, walls, etc.	Avoid handling or removing any ACM. Ensure asbestos concrete (AC) pipes facilities containing asbestos will not be disturbed and left in-situ. Appendix 4 provides asbestos management plan.	If ACM is suspected, asbestos verification by a competent expert is required and an asbestos management plan (AMP) prepared. Appendix 4 provides a sample AMP prepared for a sample subproject (Sardarshahar water supply and sewerage subproject). RUDSICO-EAP shall include AMP in all contracts. Contractor should be certified to handle ACM.	Being complied
	When designing subproject infrastructure that involves excavation in urban areas the relevant authorities must be consulted to ascertain the location of any ACM prior to any subproject activity. Locations of new infrastructure must then be designed to avoid excavating or disturbing any ACM.		Being complied
Right-of-way	Locate water supply pipelines within the right of way (ROW) of other linear structures (roads, irrigation canals) as far as possible, to reduce new land acquisition.		Being complied
	Ensure that pipelines ROW do not require land acquisition from individual farmers that		Being complied

[5] ADB SPS Appendix 4 para 12 on Existing Facilities
[6] ADB SPS Appendix 1 para 6 defines associated facilities as "not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project"

	is a significant proportion of their total land holding (>10%).		
Sewage System			
Location	Locate new Sewage Treatment Plants (STP) at least 500m away as far as possible from any inhabited areas, in locations where no urban expansion is expected in the next 20 years, thus establishing a buffer to reduce effects of odor, visual appearance or other nuisance of the site (this may be reviewed depending on the technology adopted for the treatment of effluent).	In case of non-availability of suitable sites due to land and technical design constraints in already developed areas, where 500 m buffer is not available, following procedures shall be adopted and documented in order to finalize sites for implementation of project: (i) conduct alternate site analysis, justify the selected site; (ii) develop odor mitigation measures to prevent and control odor/air emissions – design measures, and operational practices that are feasible and practical in local conditions and include in DPR; (iii) develop layout plan with maximum buffer to nearby houses; (iv) provide a peripheral green buffer (at least three rows of trees within the pumping station compound); and (v) public information – consult local community, inform about the need, process adopted to select sites, its suitability, and measures adopted for odor prevention and control	Being complied
	Locate Sewage Pumping Stations (SPS) and wet wells as far as possible at least 100m away from any inhabited areas and from sites such as hospitals, schools, temples, etc. to minimize nuisance impacts from odor, rodents, etc.	In case of non-availability of suitable sites due to land and technical design constraints in already developed areas, where 100 m buffer is not available, following procedures shall be adopted and	Being complied

		documented in order to finalize sites for implementation of project: (i) conduct alternate site analysis, justify the selected site; (ii) develop odor mitigation measures to prevent and control odor/air emissions – design measures, and operational practices that are feasible and practical in local conditions and include inIEE; (iii) develop layout plan with maximum buffer to nearby houses; (iv) provide a peripheral green buffer (at least two to three rows of trees within the STP compound); and (v) public information – consult local community, inform about the need, process adopted to select sites, its suitability, and measures adopted for odor prevention and control	
	Locate STP at sites where there is no risk of flooding or other hazards that might impair function of the STP or present a risk of damage to the STP or the surrounding area		Being complied
Quality	Ensure that sewage is treated at all times to national wastewater discharge standards and confirm this by regular monitoring of effluent from the STP.		Being complied
Design	Ensure that no wastewater is discharged into a water course in which it could be a hazard to downstream users (e.g. a waterway that is used as a source of water for domestic or municipal supply)		Being complied
	Include measures to ensure the safe disposal of sewage sludge and if possible, to promote its safe and beneficial use as an agricultural fertilizer5		Being complied
Right-of-way	Locate sewage pipelines within the right of way (ROW) of other linear structures (e.g. roads) wherever feasible, to reduce new land acquisition.		Being complied
	Ensure that routes of sewage mains do not require land acquisition from individual		Being complied

	farmers that is a significant proportion of their total land holding (10%)		

Appendix 3: Drinking Water Standards, Ambient Air Quality, Vehicle, Diesel Generator Emissions Standards

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

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

[a] Bureau of India Standard 10500: 2012.
[b] Health-based guideline values.
[c] Per ADB SPS, the government shall achieve whichever of the standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.
[d] Figures in parenthesis are maximum limits allowed in the absence of alternate source.

Table 1: Ambient Air Quality Standards

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

Parameter	Location [a]	India Ambient Air Quality Standard ($\mu g/m^3$)[b]	WHO Air Quality Guidelines ($\mu g/m^3$)		Applicable Per ADB SPS[e] ($\mu g/m^3$)
			Global Update [c] 2005	Second Edition 2000	
PM_{25}	Industrial Residential, Rural and Other Areas	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)	-	10 (Annual) 25 (24-hr)
	Sensitive Area	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)		10 (Annual) 25 (24-hr)
SO_2	Industrial Residential, Rural and Other Areas	50 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	50 (Annual) 20 (24-hr) 500 (10-min)
	Sensitive Area	20 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	20 (Annual) 20 (24-hr) 500 (10-min)
NO_2	Industrial Residential, Rural and Other Areas	40 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	40 (Annual) 80 (24-hr) 200 (1-hr)
	Sensitive Area	30 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	30 (Annual) 80 (24-hr) 200 (1-hr)
CO	Industrial Residential, Rural and Other Areas	2,000 (8-hr) 4,000 (1-hr)	-	10,000 (8-hr) 100,000 (15-min)	2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min)
	Sensitive Area	2,000 (8-hr) 4,000 (1-hr)	-	10,000 (8-hr) 100,000 (15-min)	2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min)
Ozone (O_3)	Industrial Residential, Rural and Other Areas	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
	Sensitive Area	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
Lead (Pb)	Industrial, Residential, Rural and Other Areas	0.5 (Annual) 1.0 (24-hr)		0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
	Sensitive Area	0.5 (Annual) 1.0 (24-hr)		0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)

Parameter	Location [a]	India Ambient Air Quality Standard ($\mu g/m^3$)[b]	WHO Air Quality Guidelines ($\mu g/m^3$)		Applicable Per ADB SPS[e] ($\mu g/m^3$)
			Global Update [c] 2005	Second Edition 2000	
Ammonia (NH_3)	Industrial Residential, Rural and Other Areas	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
	Sensitive Area	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
Benzene (C_6H_6)	Industrial Residential, Rural and Other Areas	5 (Annual)			5 (Annual)
	Sensitive Area	5 (Annual)			5 (Annual)
Benzo(o) pyrene (BaP) particulate phase only	Industrial Residential, Rural and Other Areas	0.001 (Annual)			0.001 (Annual)
	Sensitive Area	0.001 (Annual)			0.001 (Annual)
Arsenic (As)	Industrial Residential, Rural and Other Areas	0.006 (Annual)			0.006 (Annual)
	Sensitive Area	0.006 (Annual)			0.006 (Annual)
Nickel (Ni)	Industrial Residential, Rural and Other Areas	0.02 (Annual)			0.02 (Annual)
	Sensitive Area	0.02 (Annual)			0.02 (Annual)

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

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

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

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

[e] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will

provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS

Table 2: Vehicle Exhaust Emission Norms

1. Passenger Cars

Norms	**CO (g/km)**	**HC+ NOx (g/km)**
1991Norms	14.3-27.1	2.0(Only HC)
1996 Norms	8.68-12.40	3.00-4.36
1998Norms	4.34-6.20	1.50-2.18
India stage 2000 norms	2.72	0.97
Bharat stage-II	2.2	0.5
Bharat Stage-III	2.3	0.35(combined)
Bharat Stage-IV	1.0	0.18(combined)
Bharat Stage-VI (Petrol)	1.0	0.16 (Combined)

2. Heavy Diesel Vehicles

Norms	**CO (g/kmhr)**	**HC (g/kmhr)**	**NOx (g/kmhr)**	**PM (g/kmhr)**
1991Norms	14	3.5	18	-
1996 Norms	11.2	2.4	14.4	-
India stage 2000 norms	4.5	1.1	8.0	0.36
Bharat stage-II	4.0	1.1	7.0	0.15
Bharat Stage-III	2.1	1.6	5.0	0.10
Bharat Stage-IV	1.5	0.96	3.5	0.02
Bharat Stage-VI (Diesel)	0.5	0.17 (HC+NOx)		0.0045

Source: Central Pollution Control Board

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

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

TABLE

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

Note:

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

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

DIESEL GENERATOR SETS : STACK HEIGHT

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

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

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

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

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

Appendix 4: Effluent Discharge Standards for STPs by NGT order, 30.04.2019

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

Appendix 5: Ambient Air Quality Standards in Respect of Noise

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

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

Noise Limits for Diesel Generator Sets

Noise Limit for Generator Sets run with Diesel

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

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

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

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

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

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

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

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

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

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

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

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

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

3.1 Applicability

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

02. These rules shall not apply to –

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

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

3.2 Requirement of Certification

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

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

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

Appendix 6: Extract from Construction and Demolition Management Rules, 2016

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

NOTIFICATION

New Delhi, the 29th March, 2016

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

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

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

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

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

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

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

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

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

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

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

building of infrastructure including alteration in these entities,;

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

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

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

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

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

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

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

(j) **"waste generator" means any person or association of persons** or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbour and Defence establishments who undertakes construction 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 device appropriate measures in consultation with expert institutions for management of construction and demolition waste generated including processing facility and for using the recycled products in the best possible manner;

(10) shall create a sustained system of information, education and communication for construction and demolition waste through collaboration with expert institutions and civil societies and also disseminate through their own website;

(11) shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads.

(7) Criteria for storage, processing or recycling facilities for construction and demolition waste and application of construction and demolition waste and its products-

(1) The site for storage and processing or recycling facilities for construction and demolition waste shall be selected as per the criteria given in **Schedule I**;

(2) The operator of the facility as specified in sub- rules (1) shall apply in **Form I** for authorization from State Pollution Control Board or Pollution Control Committee.

(3) The operator of the facility shall submit the annual report to the State Pollution Control Board in **Form II.**

(3) Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in **Schedule II.**

(8) Duties of State Pollution Control Board or Pollution Control Committee-

(1) State Pollution Control Board or Pollution Control Committee shall monitor the implementation of these rules by the concerned local bodies and the competent authorities and the annual report shall be sent to the Central Pollution Control Board and the State Government or Union Territory or any other State level nodal agency identified by the State Government or Union Territory administration for generating State level comprehensive data. Such reports shall also contain the comments and suggestions of the State Pollution Control Board or Pollution Control Committee with respect to any comments or changes required;

(2) State Pollution Control Board or Pollution Control Committee shall grant authorization to construction and demolition waste processing facility in **Form-III** as specified under these rules after examining the application received in **Form I**;

(3) State Pollution Control Board or Pollution Control Committee shall prepare annual report in **Form IV** with special emphasis on the implementation status of compliance of these rules and forward report to Central Pollution Control Board before the 31st July for each financial year.

(9) Duties of State Government or Union Territory Administration-

(1) The Secretary in-charge of development in the State Government or Union territory administration shall prepare their policy document with respect to management of construction and demolition of waste in accordance with the provisions of these rules within one year from date of final notification of these rules.

(2) The concerned department in the State Government dealing with land shall be responsible for providing suitable sites for setting up of the storage, processing and recycling facilities for construction and demolition waste.

(3) The Town and Country planning Department shall incorporate the site in the approved land use plan so that there is no disturbance to the processing facility on a long term basis.

(4) Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control.

(10) Duties of the Central Pollution Control Board - (1) The Central Pollution Control Board shall,-

(a) prepare operational guidelines related to environmental management of construction and demolition waste management;

(b) analyze and collate the data received from the State Pollution Control Boards or Pollution Control Committee to review these rules from time to time;

(c) coordinate with all the State Pollution Control Board and Pollution Control Committees for any matter related to development of environmental standards;

(d) forward annual compliance report to Central Government before the 30th August for each financial year based on reports given by State Pollution Control Boards of Pollution Control Committees.

(11) Duties of Bureau of Indian Standards and Indian Roads Congress -The Bureau of Indian Standards and Indian Roads Congress shall be responsible for preparation of code of practices and standards for use of recycled materials and products of construction and demolition waste in respect of construction activities and the role of Indian Road Congress shall be specific to the standards and practices pertaining to construction of roads.

Schedule III
Timeframe for Planning and Implementation
[See Rule 13]

Sl. No.	Compliance Criteria	Cities with population of 01 million and above	Cities with population of 0.5-01 million	Cities with population of less than 0.5 million
1	Formulation of policy by State Government	12 months	12 months	12 months
2	Identification of sites for collection and processing facility	18 months	18 months	18 months
3	Commissioning and implementation of the facility	18 months	24 months	36 months
4	Monitoring by SPCBs	3 times a year – once in 4 months	2 times a year – once in 6 months	2 times a year – once in 6 months

The time Schedule is effective from the date of notification of these rules.

FORM – I
See [Rule 7 (2)]
Application for obtaining authorisation

To,
The Member Secretary

_____Name of the local authority or Name of the agency appointed by the municipal authority :

Correspondence address Telephone No. Fax No.	
Nodal Officer and designation (Officer authorized by the competent authority or agency responsible for operation of processing or recycling or disposal facility)	
Authorisation applied for (Please tick mark)	Setting up of processing or recycling facility of construction and demolition waste
Detailed proposal of construction and demolition waste processing or recycling facility to include the following Location of site approved and allotted by the Competent Authority. Average quantity (in tons per day) and composition of construction and demolition waste to be handled	

Appendix 7: 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.

(ii) 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.

(iii) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(v) Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.

(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads and Runways are scheduled employment.

(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly

set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946-It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

(xv) Construction and Demolition Waste Management Rules 2016- This Rule stipulate that:

- Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities
- Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains.
- Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or 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 bio-degradable, non biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;
- store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; and
- No waste generator shall throw, burn or burry the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.

(xvii) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government. Salient features of this Act are given below:

Employer shall-

- Provide and maintain, at suitable point, sufficient quantity of wholesome drinking water, such point shall be at least 6 meters away from any washing areas, urinals or toilets
- Provide sufficient urinals and latrines at convenient place, easily accessible by workers
- Provide free of charge, temporary living accommodations near to work sites with separate cooking place, bathing and lavatory facilities and restore the site as pre conditions after completing the construction works
- Provide crèche with proper accommodation, ventilation, lighting, cleanliness and sanitation if more than fifty female workers are engaged
- Provide first aid facilities in all construction sites

For safety of workers employer shall provide-

- Safe access to site and work place
- Safety in demolition works
- Safety in use of explosives
- Safety in operation of transporting equipments and appoint competent person to drive or operate such vehicles and equipments
- 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 equipments
- Provide safety net, safety sheet, safety belts while working at height (more than1.6 mtrs as per OSHA)
- Providing scaffolding, ladders and stairs, lifting appliances, chains and accessories where required
- Safety in pile works, concrete works, hot asphalt, tar, insulation, demolition works, excavation, underground construction and handling materials
- Provide and maintain medical facilities for workers
- Any other matters for the safety and health of workers

Appendix 8: Integrated Biodiversity Assessment Tool - Ratangarh

A. Proximity Report

IBAT

Proximity Report

IND RSTDSP - RATANGARH STP1 NEAR NH11

Country: India

Location: [28.1, 74.6]

Date of analysis: 14 January 2020

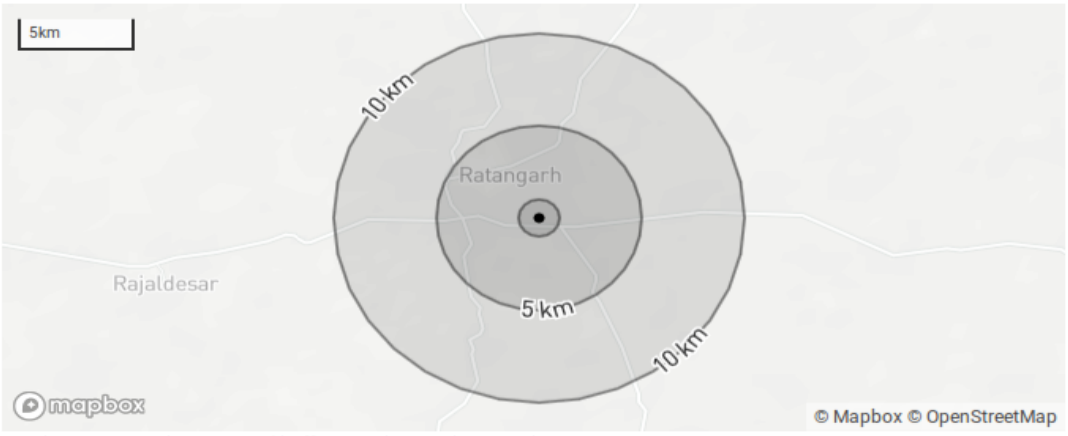
Buffers applied: 1.0 km | 5.0 km | 10.0 km

Generated by: Ninette Pajarillaga

Company/Subscriber: ADB

Overlaps with:

Protected Areas	0
Key Biodiversity Areas	0
IUCN Red List	29



Displaying project location and buffers: 1.0 km, 5.0 km, 10.0 km

IBAT

Proximity Report

IND RSTDSP - RATANGARH STP2 GAUSHALA NEAR CHURU RD

Country: India

Location: [28.1, 74.6]

Date of analysis: 14 January 2020

Buffers applied: 1.0 km | 5.0 km | 10.0 km

Generated by: Ninette Pajarillaga

Company/Subscriber: ADB

Overlaps with:

Protected Areas	0
Key Biodiversity Areas	0
IUCN Red List	29

Displaying project location and buffers: 1.0 km, 5.0 km, 10.0 km

IBAT

Proximity Report

IND RSTDSP - SPS1 NEAR BSNL OFFICE

Country: India

Location: [28.1, 74.6]

Date of analysis: 14 January 2020

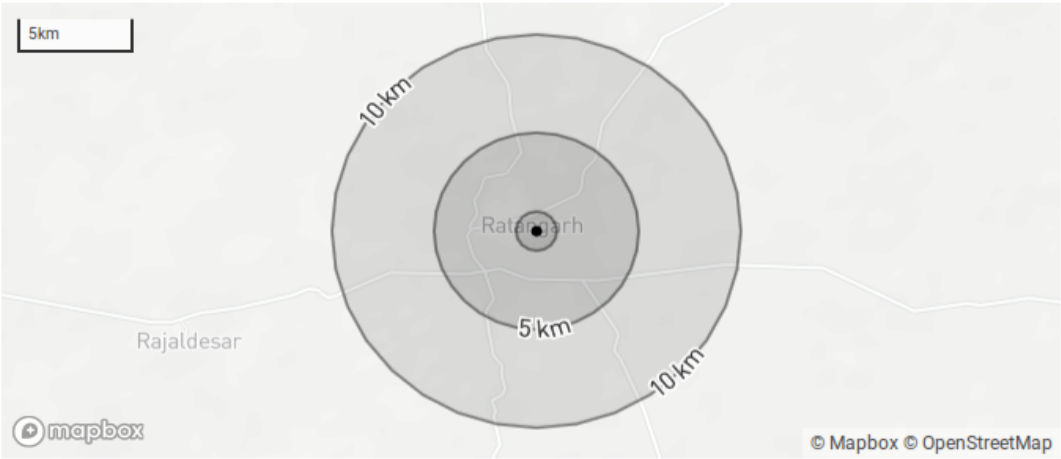
Buffers applied: 1.0 km | 5.0 km | 10.0 km

Generated by: Ninette Pajarillaga

Company/Subscriber: ADB

Overlaps with:

Protected Areas	0
Key Biodiversity Areas	0
IUCN Red List	29



Displaying project location and buffers: 1.0 km, 5.0 km, 10.0 km

IBAT

Proximity Report

IND RSTDSP - SPS2 WARD NO. 1 NEAR MAIN GINANI

Country: India

Location: [28.1, 74.6]

Date of analysis: 14 January 2020

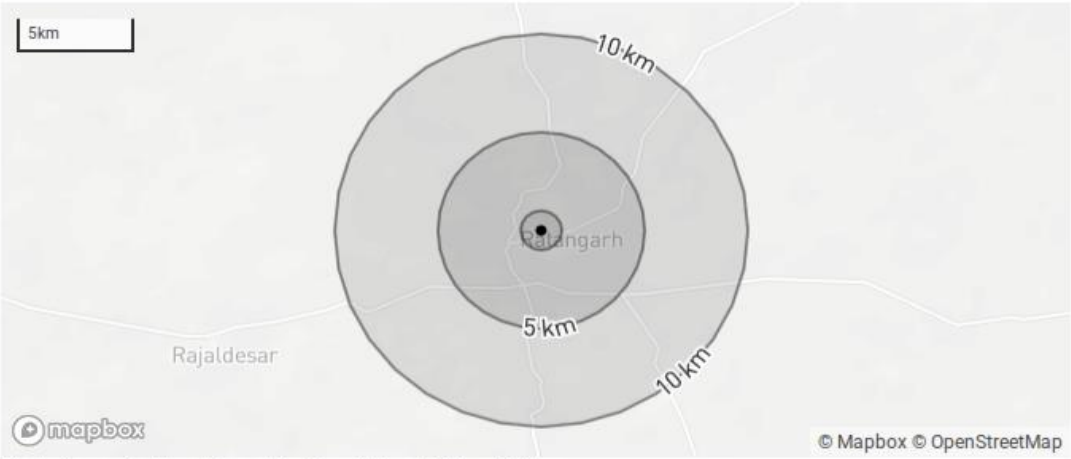
Buffers applied: 1.0 km | 5.0 km | 10.0 km

Generated by: Ninette Pajarillaga

Company/Subscriber: ADB

Overlaps with:

Protected Areas	0
Key Biodiversity Areas	0
IUCN Red List	29



Displaying project location and buffers: 1.0 km, 5.0 km, 10.0 km

IBAT

Protected Areas

The following protected areas are found within 1.0 km, 5.0 km, 10.0 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

No protected areas within buffer distance

Key Biodiversity Areas

The following key biodiversity areas are found within 1.0 km, 5.0 km, 10.0 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

No KBAs within buffer distance

IUCN Red List of Threatened Species

The following threatened species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.

Species name	Common name	IUCN Category	Taxonomic Class
Anacyclus pyrethrum	Atlas daisy	VU	Magnoliopsida
Antigone antigone	Sarus crane	VU	Aves
Aquila heliaca	Eastern imperial eagle	VU	Aves
Aquila nipalensis	Steppe eagle	EN	Aves
Aquila rapax	Tawny eagle	VU	Aves
Ardeotis nigriceps	Great indian bustard	CR	Aves
Aythya ferina	Common pochard	VU	Aves
Chlamydotis macqueenii	Asian houbara	VU	Aves

IBAT

Species name	Common name	IUCN Category	Taxonomic Class
Ciconia episcopus	Asian woollyneck	VU	Aves
Clanga clanga	Greater spotted eagle	VU	Aves
Columba eversmanni	Yellow-eyed pigeon	VU	Aves
Crocodylus palustris	Mugger	VU	Reptilia
Falco cherrug	Saker falcon	EN	Aves
Gyps bengalensis	White-rumped vulture	CR	Aves
Gyps indicus	Indian vulture	CR	Aves
Leptoptilos dubius	Greater adjutant	EN	Aves
Lutrogale perspicillata	Smooth-coated otter	VU	Mammalia
Manis crassicaudata	Indian pangolin	EN	Mammalia
Neophron percnopterus	Egyptian vulture	EN	Aves
Oryza malampuzhaensis		VU	Liliopsida
Oxyura leucocephala	White-headed duck	EN	Aves
Panthera pardus	Leopard	VU	Mammalia
Rusa unicolor	Sambar	VU	Mammalia
Rynchops albicollis	Indian skimmer	VU	Aves
Sarcogyps calvus	Red-headed vulture	CR	Aves
Saxicola macrorhynchus	White-browed bushchat	VU	Aves
Tetracerus quadricornis	Four-horned antelope	VU	Mammalia
Vanellus gregarius	Sociable lapwing	CR	Aves
Wallago attu		VU	Actinopterygii

B. BIODIVERSITY RISK SCREEN

IBAT

Integrated Biodiversity Assessment Tool

WORLD BANK GROUP BIODIVERSITY RISK SCREEN

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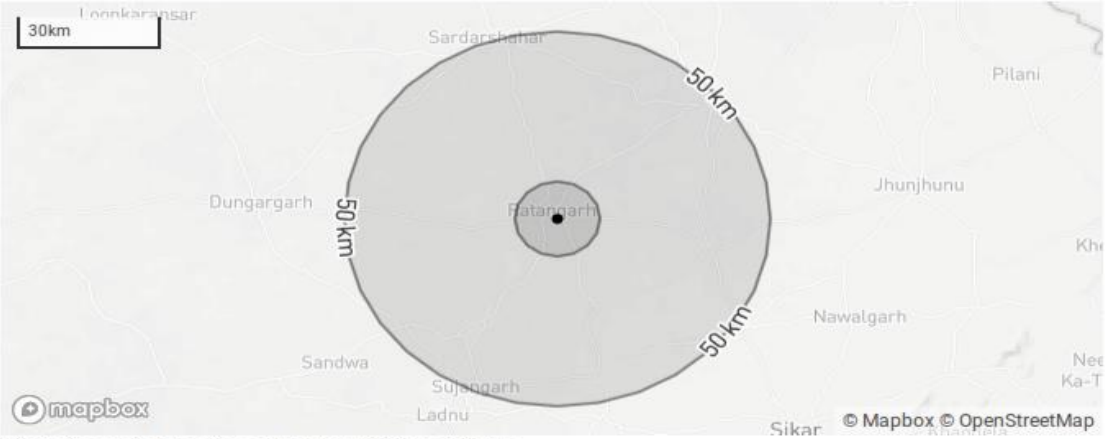
- **Project Name:** IND RSTDSP - Ratangarh STP1 near NH11
- **Country:** India
- **Location:** [28.1, 74.6]

Overlaps with:

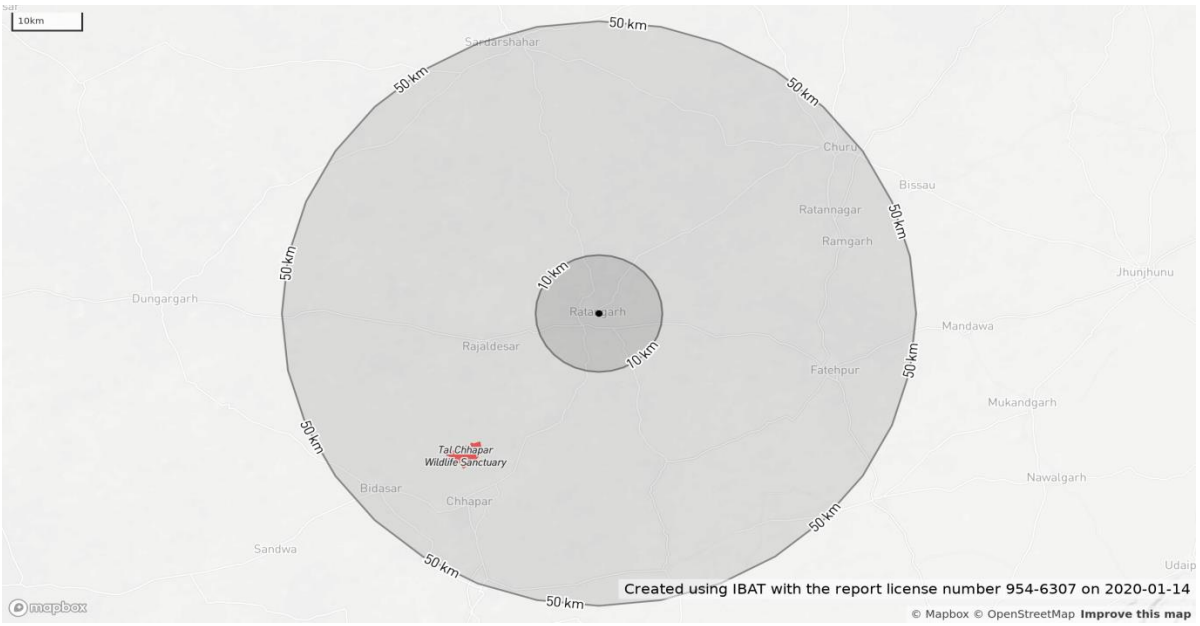
Protected Areas	1
Key Biodiversity Areas	1
IUCN Red List	11
Critical Habitat	Likely



Displaying project location and buffers: 10.0 km, 50.0 km

WORLD BANK GROUP

This report is based on IFC Performance Standard 6 (PS6) but applies to World Bank Environmental and Social Standard 6 (ESS6)



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	IUCN Category	Group
Ardeotis nigriceps	Great Indian Bustard	CR	AVES
Vanellus gregarius	Sociable Lapwing	CR	AVES
Gyps bengalensis	White-rumped Vulture	CR	AVES
Sarcogyps calvus	Red-headed Vulture	CR	AVES
Gyps indicus	Indian Vulture	CR	AVES
Manis crassicaudata	Indian Pangolin	EN	MAMMALIA
Oxyura leucocephala	White-headed Duck	EN	AVES
Neophron percnopterus	Egyptian Vulture	EN	AVES
Aquila nipalensis	Steppe Eagle	EN	AVES
Falco cherrug	Saker Falcon	EN	AVES
Leptoptilos dubius	Greater Adjutant	EN	AVES

IBAT

Biodiversity features which are likely to trigger Critical Habitat

Protected Areas

The following protected areas are found within 10.0 km and 50.0 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

Area name	Distance	Recommendation
Tal Chhapar	50.0 km	Assess for biodiversity risk

Key Biodiversity Areas

The following key biodiversity areas are found within 10.0 km and 50.0 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

Area name	Distance	Recommendation
Tal Chhapar Wildlife Sanctuary	50.0 km	Assess for critical habitat

Species with potential to occur

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
AVES	281	20	5	5	10	17	244	0
MAMMALIA	58	5	0	1	4	3	50	0
REPTILIA	11	1	0	0	1	0	9	1
ACTINOPTERYGII	28	1	0	0	1	2	25	0
MAGNOLIOPSIDA	39	1	0	0	1	0	37	1

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
LILIOPSIDA	52	1	0	0	1	0	49	2
AGARICOMYCETES	1	0	0	0	0	1	0	0
AMPHIBIA	10	0	0	0	0	0	10	0
INSECTA	31	0	0	0	0	0	31	0
GASTROPODA	18	0	0	0	0	0	18	0
POLYPODIOPSIDA	2	0	0	0	0	0	2	0
BIVALVIA	6	0	0	0	0	0	6	0
MALACOSTRACA	2	0	0	0	0	0	2	0
ARACHNIDA	1	0	0	0	0	0	1	0

Appendix 9: Geographical position coordinates of all project sites

Components	Latitude	Longitude
STP 1 (3.80 MLD) near NH-11	28°03'23.49"N	74°38'13.18"E
STP 2 (6.10 MLD) at Gaushala on Churu road	**28° 5'5.31"N**	**74°38'6.94"E**
SPS 1 (3.80 MLD) near BSNL Office	**28° 4'21.43"N**	**74°37'34.46"E**
SPS (4.6 MLD),Ward 1, near Main near Ginani	**28°04'43.13"N**	**74°36'40.28"E**

STP: Sewage Treatment Plant ; SPS: Sewage Pumping Station

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.

(i) **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.

(ii) **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.

(iii) **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)

(iv) **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.

(v) Reporting finds - When finds are made these should be reported to PIU/Consultants. Photographs and record drawings should be sent.

(vi) 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).

(vii) **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: Excerpts on reuse from Rajasthan state Sewerage and Wastewater Policy

viii. Design and performance specifications of wastewater treatment plants shall be as per guidelines given in the manual on sewerage treatment systems published by CPHEEO. Sufficient room in tendering for the construction of new plants shall be provided for competition to take place in both technologies and costs.

5.4. On Reuse of Treated Effluent and Sludge

1. Treated wastewater effluent is considered a water resource and is added to the water stock for reuse.
2. Priority shall be given to agricultural reuse of treated effluent for unrestricted irrigation. Blending of treated wastewater with fresh water shall be made to improve quality where possible. Crops to be irrigated by the treated effluent or blend thereof with freshwater resources shall be selected to suit the irrigation water, soil type and chemistry, and the economics of the reuse operations.
3. Crop nutrient requirements shall be determined taking into consideration the prevailing effluent quality. Overuse of nutrients shall be avoided.
4. Accumulation of heavy metals and salinity shall be monitored, managed and mitigated. Leaching of soils shall be advocated by the irrigation authorities.
5. Farmers shall be encouraged to determine the rate of water application needed for different crops, taking into consideration the value of nutrients in the treated water and other parameters.
6. Farmers shall be encouraged to use modern and efficient irrigation technologies. Protection of on-farm workers and of crops against pollution with wastewater shall be ensured.
7. Treated effluent quality should be monitored and users alerted to any emergency causing deterioration of the quality so that they will not use such water unless corrective measures are taken.
8. Studies should be conducted and projects designed and implemented to store the excess treated wastewater in surface reservoirs but artificial recharge is not permitted . Due attention shall be given to the quality of treated and groundwater and the characteristics of the strata.
9. Plans and studies for power generation from sludge, if proven technically, economically and financially feasible, shall be made with due attention to environment impacts.
10. Sludge produced from the treatment process would be processed so it may be used as fertilizer and soil conditioner. Care shall be taken to conform to the regulations of public health and environment protection norms.

11. **Industry:** Industrial reuse of reclaimed wastewater represents major reuse next only to irrigation in both developed and developing countries. Reclaimed wastewater is ideal for many industrial purposes,. Where effluent is to be used in the industrial processes, it should be the responsibility of the industry to treat it to the quality standards required. Pilot scale feasibility studies carried out in Australia have concluded that it is possible to economically treat the domestic wastewater to achieve adequate quality for reuse as cooling water. Based on the conclusions of the feasibility study, a full-scale treatment plant employing cross-flow membrane microfiltration system may be installed. The membrane filtration system can remove all suspended solids, fecal coliforms, and giardia cysts. It could also significantly reduce human enteric viruses such as *reovirus*and *enterovirus*. The water reclamation plant at Eraring Power Station demonstrates the potential for reuse of wastewater in power generation and other industrial manufacturing facilities.

    Industrial uses for reclaimed water include:

    (i) Evaporative cooling water:-

        (a) Once-through cooling system.

        (b) Re-circulating cooling system.

        (c) Cooling water quality requirements.

    (ii) Boiler –Feed water- The use of reclaimed water differs little from use of conventional public supplies for boiler-feed water,as both require extensive additional treatment quality requirement for boiler feed make up water are dependent upon pressure at which boiler is operated.

    (iii) Industrial process water-

    Suitability of reclaimed water for use in industrial process depends upon particular use like-

    (a) Pulp and paper.

    (b) Chemical industry.

    (c) Textile industry.

    (d) Petroleum and coal.

12. Whenever possible, other end uses of treated effluents; such as recycling, cooling, power generation, etc. shall be considered.

13. Re-use Options: The following options for re–use of effluent have been identified: In general, public health concern is the major issue in any type of reuse of wastewater, be it for irrigation or non-irrigation utilization, especially long term impact of reuse practices. It is difficult to delineate acceptable health risks and is a matter that is still hotly debated. Potential reuse of wastewater depends on the hydraulic and biochemical characteristics of wastewater, which determine the methods and degree of treatment required. While agricultural irrigation reuses, in general, require lower quality levels of treatment, domestic reuse options (direct or indirect potable and non-potable) reuses need the highest treatment level. Level of treatment for other

reuse options lie between these two extremes. The reuse options may be (artificial recharge of aquifers is not permitted):

i. Irrigation

(a) Agriculture and forestry

(b) Landscaping

ii. Fish – farming

iii. Industry

iv. Non-potable Domestic Reuse.

The detailed project report should clearly define the best reuse option particular to town and strategy to obtain it. Action plan with clarity should be the part of Detailed Project Report (DPR), while preparing sewerage projects. Before deciding the reuse of treated waste water, authorities must full fill the water quality norms and its legal implications.

14. Governing local body can sell the treated waste water and digested sludge to generate the revenue.

5.5. On Pricing, Financing and Investment

1. In view of increasing marginal cost of wastewater collection and treatment, wastewater charges, connection fees, sewerage taxes and treatment fees shall be set to cover at least the operation and maintenance costs. It is also highly desirable that part of the capital cost of the services shall be recovered. The ultimate aim is for a full cost recovery.

2. Appropriate criteria in order to apply the "polluter pays" principle shall be established.

3. Different charges for different areas may be applied. This shall be assessed for each geographical area as a function of end users and effluent quality and will be subject to economic and social considerations.

4. Because of the limited financial resources available to Government of Rajasthan, setting investment priorities in wastewater will be compatible with government investment plans.

5. Criteria for prioritizing investments in the wastewater sector shall take into account the current and future needs of the state, needs to expand wastewater systems in urban areas and to provide wastewater systems to smaller towns and villages.

6. Priorities of wastewater projects shall not be disconnected from water supply projects and urbanization in general. Decisions will be made concerning them to attain optimum solutions to the need for services, availability of finance and availability of trained manpower.

Appendix 12: Guidelines for Sewerage System Operations, Reuse of Treated Effluent and Sludge from STP for Beneficial Purposes

(Source: Manual on Sewerage and Sewage Treatment Systems, CPHEEO, Ministry of Urban Development, Govt. of India)

Health Hazards during Sewage Operations

Labourers working on the sewage treatment and operations may suffer from a number of aliments directly attributed to handling of sewage. In view of this it is desirable to disinfect sewage and where feasible mechanize sewage operations.

The staff of sewage operations must be well educated in the sanitary rules on the utilization of sewage for irrigation as well as with personal hygiene. All persons working in sewage farms must undergo preventive vaccination against enteric infections and annual medical examination for helminthiases and be provided treatment if necessary.

Sewage treatment plants should be provided with adequate space for canteens with proper sanitation,wash-stands and lockers for irrigation implements and protective clothing. Safe drinking water must be provided for the workers and for population residing within the effective range of the sewage treatment plants.

All workers should be provided with gum boots and rubber gloves, which must compulsorily be worn while at work. They should be forced to observe personal hygiene such as washing after work as well as washing before taking food. The use of antiseptics in the water used for washing should be emphasized. The farm worker should be examined medically at regular intervals and necessary curative measures enforced.

Mitigation Measures to Avoid Health Hazards

Personal Hygiene against Pathogen
The worker should take precautions because a large number of coliform groups, various kinds of micro-organisms, and egg parasites exist in sewage. The workers should strive to maintain good health by taking care of the following points:

(i) Wear clean uniform, work boots, etc;
(ii) After work and before having a meal, always wash hands and disinfect them;
(iii) After work, take a shower if possible;
(iv) Do not enter the offices and lounges wearing dirty clothes; and
(v) If necessary, take vaccinations against tetanus, leptospirosis fever and so on.

Maintaining Cleanliness. The worker should maintain each facility in a clean and neat condition.

(i) The floors of workrooms, stairs and corridors should be cleaned at the appropriate frequency to maintain them in a clean condition; and
(ii) Disinfection of relevant locations is to be carried out periodically.

Health Check Workers should receive health check once a year to maintain their health, and prevent illnesses or detect them at an early stage. The results of the health check should be maintained as records. Recommended items to be inspected during the health check are as given below.

(i) Examine medical history;
(ii) Examine subjective symptoms and other objective symptoms;

(iii) Check height, weight, vision and hearing ability;
(iv) Chest X-ray examination;
(v) Blood pressure measurement;
(vi) Check for anaemia
(vii) Check for liver functions;
(viii) Check for lipids in blood;
(ix) Check blood sugar level;
(x) Urine analysis; and
(xi) Electrocardiogram analysis

Welfare Measures The Sanitation Workers (Regulation of Employment and Conditions of Service) Act 2012 proposes constitution of a Sanitation Workers State Welfare Board to exercise powers conferred on it and to perform welfare functions such as the following for sanitation workers:

(i) Provide immediate assistance to a beneficiary in case of an accident;
(ii) Sanction of loan and advances
(iii) Medical expenses for treatment of major ailments;
(iv) Financial assistance for education of children;
(v) Payment of maternity benefits; and
(vi) Make provision and improvement of welfare measures and facilities as may be prescribed

Corrective Measures When a worker has symptoms of an illness listed above, the plant engineer should ensure that the worker is checked-up by a specialist doctor and receives proper treatment and care and should take the following actions considering the content of work done by the worker:

(i) Change the workplace if necessary;
(ii) Change the content of the work;
(iii) Shorten the working hours;
(iv) Perform relevant measurements of the working environment; and
(v) Maintain the facility or equipment.

Risks in use of treated effluent and sludge in agriculture practices

Cultivation of crops that are eaten raw should be banned. Cultivation of paddy in bunded fields is likely to give rise to sanitation problems and hence is undesirable. Growing of non-edible commercial crops like cotton, jute, fodder, milling varieties of sugarcane and tobacco would be suitable. Cultivation of grasses and fodder legumes, medicinal and essential oil yielding plants like menthol and citronella may be allowed. Cultivation of cereals, pulses, potatoes and other crops that are cooked before consumption may be permitted, if sewage is treated and care is taken in handling the harvests to ensure that they are not contaminated. Cultivation of crop exclusively under seed multiplication programmes would be advantageous as these are not consumed. As an additional safeguard, sewage irrigation should be discontinued at least two months in advance of harvesting of fruits and berries, one month for all kinds of vegetables and a fortnight for all other crops. Direct grazing on sewage irrigated farms should be prohibited.

Risks of Nutrient Loading in Agriculture

Crops receiving excessive dosage of nitrogen show superflous vegetative growth and decrease in grain or fruit yield. The phosphate deficit of sewage, therefore, should be made good by

supplementing with phosphate fertilizers, the extent of phosphate fortification depending upon the nature of crop and its phosphate requirements. As the availability of phosphate is low in the irrigation water it would be desirable to apply the required quantity of phosphatic fertilizer at the time or even (about a fortnight) before the sowing or planting of the crop. Even when sewage nutrients are balanced by fortification, irrigation with such sewage may supply excessive amount of nutrients resulting in waste or unbalanced growth of plants with adverse effects on yields. It may therefore be necessary to dilute the sewage. Dilution also helps in reducing the concentration of dissolved salts and decomposable organic matter in the sewage thus, decreasing hazards to the fertility of the soil. It is desirable to limit the BOD and total suspended solids of sewage to be disposed on land for irrigation, as per relevant standards. There is a need to take caution on describing nutrient supply capacity of sewage particularly in the case of availability of phosphorus because there is a possible conversion of available phosphorus in unavailable mode in the presence of heavy metals present in the sewerage. This happens commonly in high as well as low pH soils.

Alternative Arrangement during Non-irrigating Periods

During rainy and non-irrigating seasons, agricultural practices may not need any water for irrigation. Even during irrigating season, the water requirement fluctuates significantly. Hence, satisfactory alternative arrangements have to be made for the disposal of sewage on such occasions either by storing the excess sewage or discharging it elsewhere without creating environmental hazards. The following alternatives are generally considered: a) Provision of holding lagoons for off-season storage. They enable irrigation of a fied area of land to varying rates of crop demand. They may also serve as treatment units such as aerated or stabilization lagoons, provided the minimum volume required for treatment is provided beyond the flow-balancing requirement. b) Provision of additional land where treated sewage is not required on the main plot of land c) Discharge of surplus treated sewage to river or into sea with or without additional treatment. Combining surface discharge facilities with irrigation system is quite common and often quite compatible. d) Resorting to artificial recharge in combination with an irrigation system where feasible.

Treated Sewage into Perennial Rivers

When sewage is treated and discharged into perennial flowing rivers and the blended river water is drawn downstream of the point of such blending as raw water for treatment in public water supply schemes. This is indirect potable use after blending. This is historical and ongoing all around. However, of late, the organic load due to the discharged treated, partially treated and non-point sewage becomes in excess of the self-purifying capacity of the river. Thus, the river water is not actually fresh water. The water quality of Yamuna river for Agra water supply scheme requires to be fist treated in MBBR to purify the river water to a level as raw water for the downstream WTP. When it passes through flowing surface water it has the potential disadvantages of contamination by human and animal activities adding organic matter and waterborne pathogens unless the river stretch is protected from such activities. The guiding principle in such cases for the ULBs will be to at least intercept the sewage outfalls and provide adequate STPs and follow the recommended quality criteria for the treated sewage.

Treated Sewage into Non-Perennial / Dry River Courses

There are locations where the rivers are not perennial or almost dry throughout the year except some monsoon runoff. In this case the discharged treated sewage sinks into the aquifer zone and is extracted by infiltration wells or galleries. The advantage of direct dilution from surface water is

lost, but the additional purification in the soil and dilution from the aquifer water are happening. An example is the case of the Palar river course in Tamilnadu. The surface water flow in this occurs only for about a week if the monsoon is normal and if the water spills beyond the upstream impoundments. The aquifer however supports the public water supply of over 30 habitations along its dry tract of nearly 80 km before the sea. The partly treated sewage of the en-route habitations does reach this river course as intervals. So far, no epidemics have been met with. This may be due to the above said additional purification in the soil and dilution by aquifer water. However, if these are exceeded by the contamination load, there can be immediate health problems. The guiding principle in such cases for the ULBs will be (a) to keep a check on the raw water quality from the infiltration wells to detect sudden increase in contaminants and (b) at least intercept the sewage outfalls and provide adequate STPs.

Appendix 13: Sample Outline Spoil Management Plan

(i) The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan;
(ii) 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;
(iii) Further precautions need to be taken in case of the contaminated spoils;
(iv) The vehicle carrying the spoil should be covered properly; and
(V) 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.

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.

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

Documentation
The volume of spoil generated (site specific, date wise), site disposed, reuse / disposal details should be documented properly.

Appendix 14: 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.

6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

7. The PIU will also conduct an awareness campaign to educate the public about the following issues:

(i) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
(ii) Defensive driving behaviour along the work zones; and
(iii) Reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centres. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

(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 behaviour 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

10. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

(i) Signs;
(ii) Pavement Markings;
(iii) Channelizing Devices ;
(iv) Arrow Panels; and
(v) Warning Lights.

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, 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”).

12**.** **Figure A2 to Figure A12** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

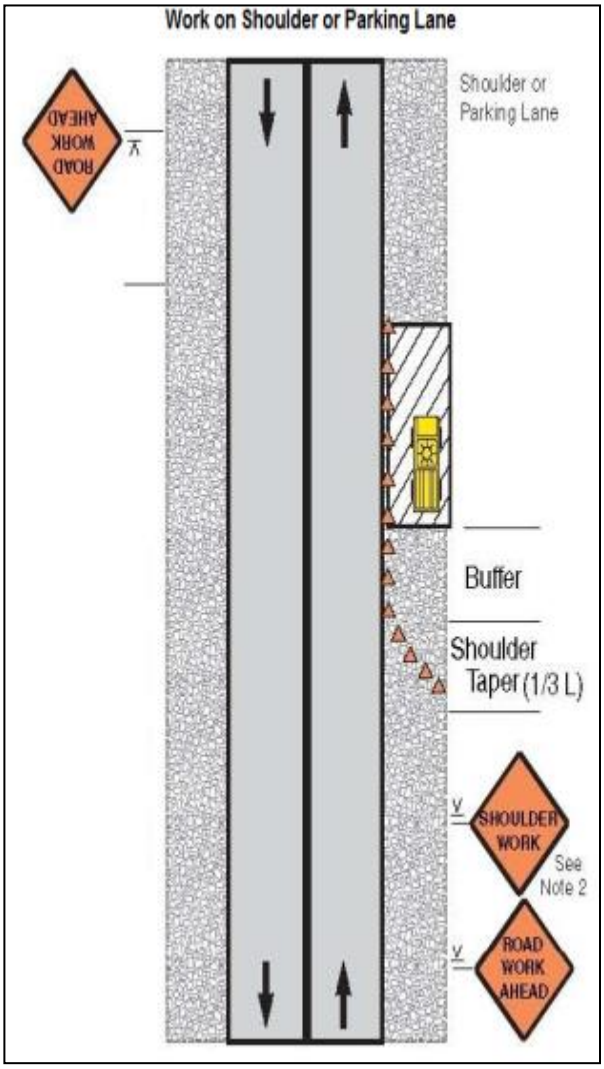
(i) Work on shoulder or parking lane;
(ii) Shoulder or parking lane closed on divided road;
(iii) Work in Travel lane;
(iv) Lane closure on road with low volume;
(v) Lane closure on a two-line road with low volume (with yield sign);
(vi) Lane closure on a two-line road with low volume (one flagger operation);
(vii) Lane closure on a two lane road (two flagger operation);
(viii) Lane closure on a four lane undivided Road;
(ix) Lane closure on divided roadway;
(x) Half road closure on multi-lane roadway; and
(xi) Street closure with detour.

13. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space 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.

14. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

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



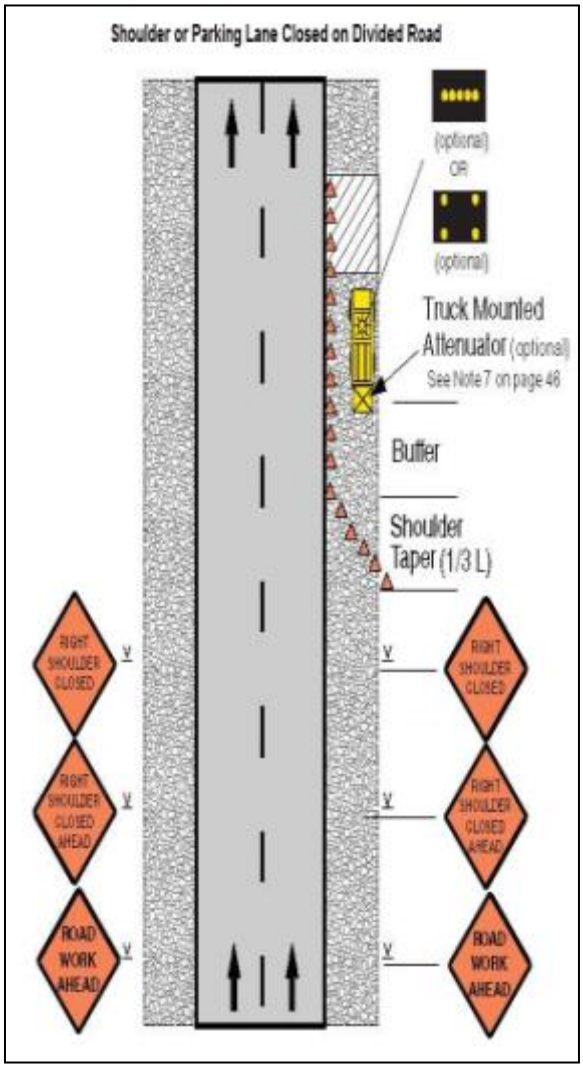


Figure A4 & A5: Work in Travel lane & Lane closure on road with low volume

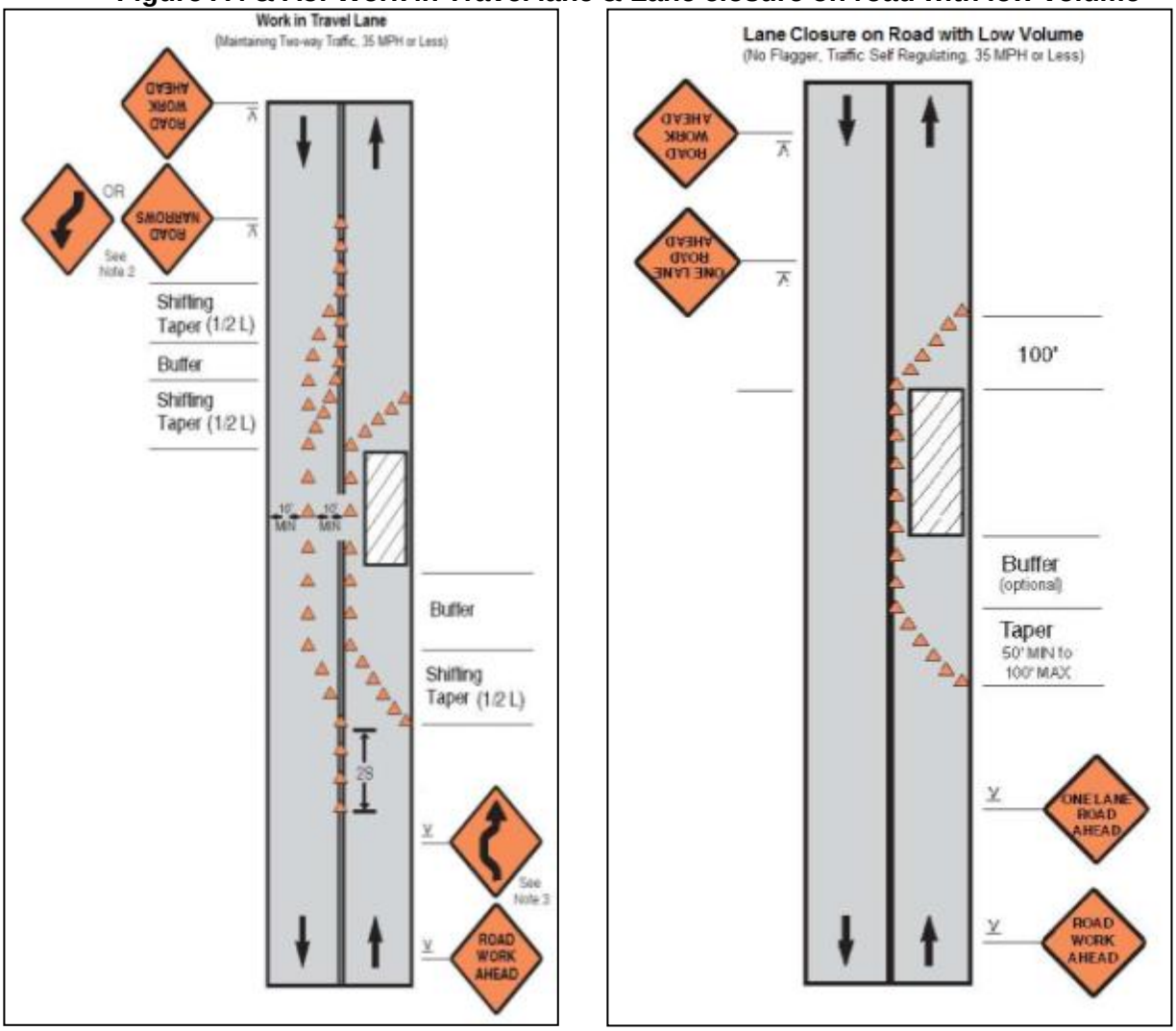
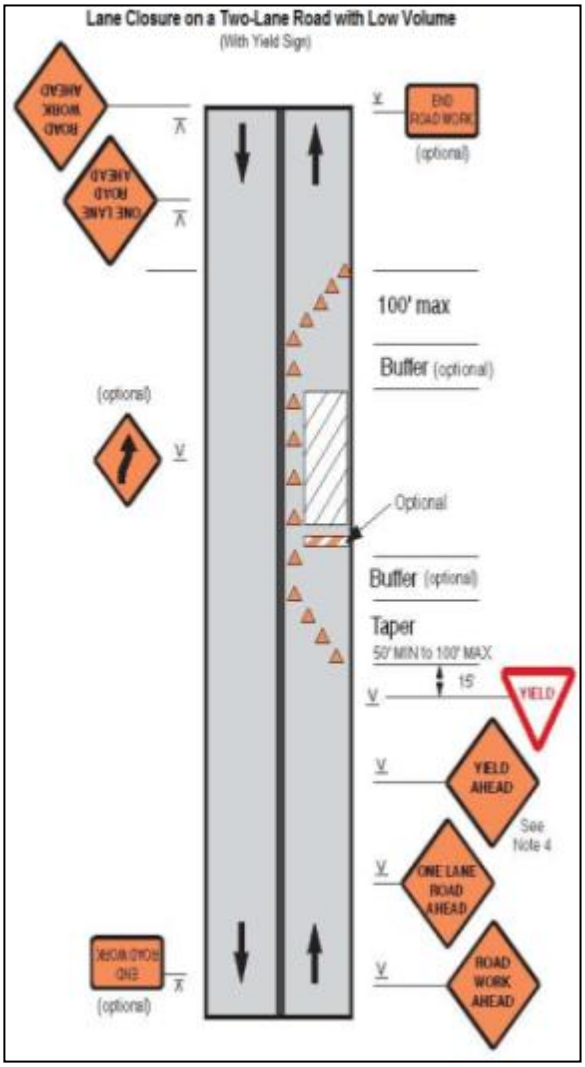


Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)



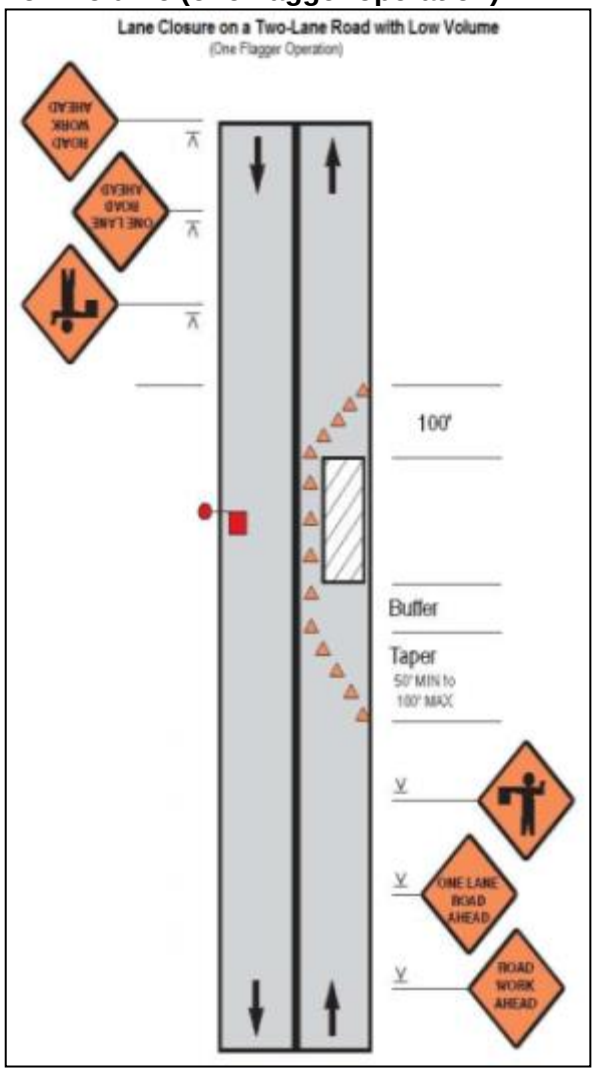


Figure A8 & A9: Lane Closure on a Two-Lane Road (Two Flagger Operation) & Lane Closure on a Four-Lane Undivided Road

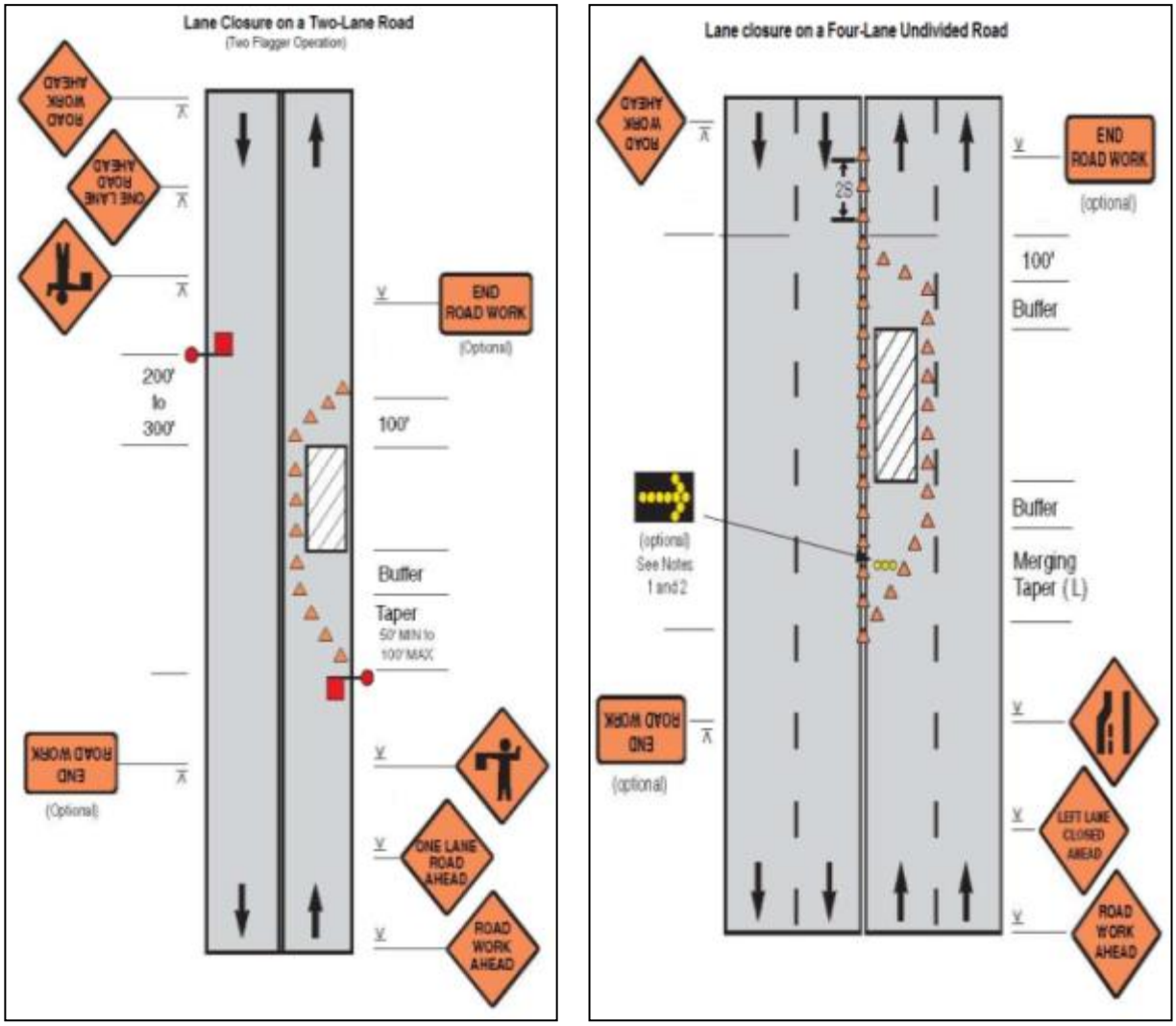
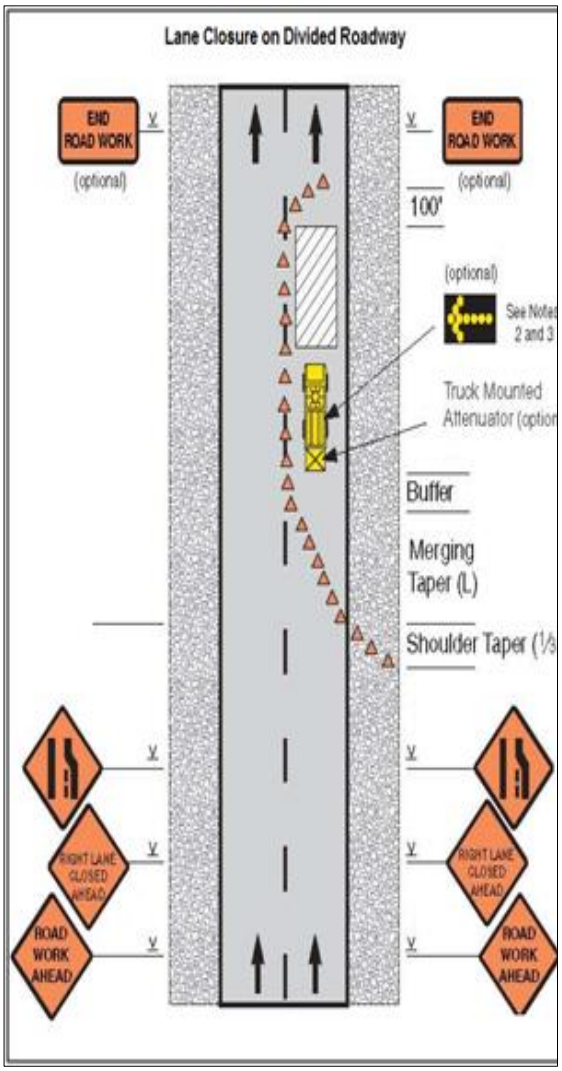


Figure A10 & A11: Lane Closure On Divided Roadway & Half Road Closure On Multi-Lane Roadway



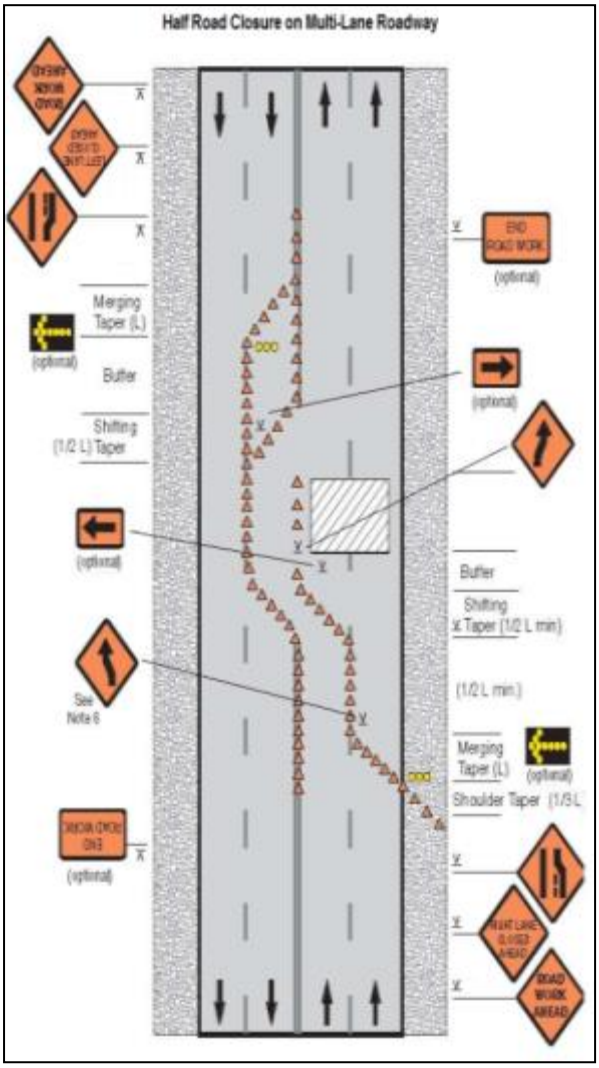
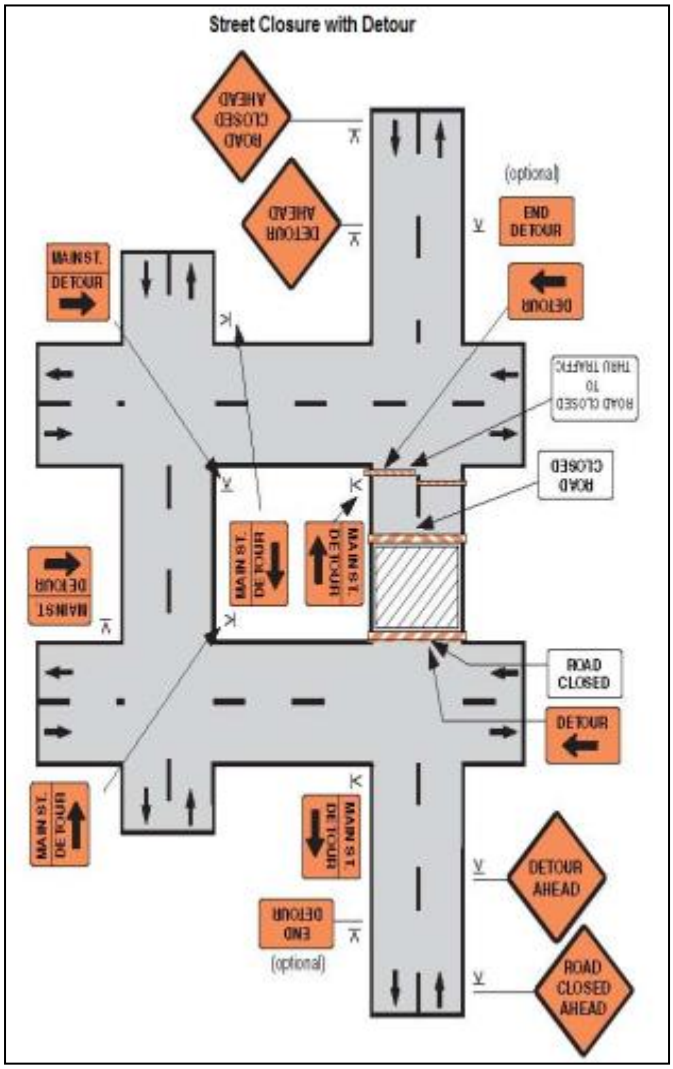


Figure A12: Street closure with detour



Appendix 15: IFC benchmark standards for workers accommodation

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[7] 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.[8]

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[9] 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/dwq/en/
8. ibid

9. As per the "Pollution Prevention and Abatement Handbook", World Bank Group, July 1998, available from 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 to 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 accomodation 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.[10]

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

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.[11] 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

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.

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 Cl2 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 vapour 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; and
(xiv) Ensure that all containers are properly fitted with safety caps or hooks.

2. **Cylinder & Drum Containers**

(i) Store chlorine cylinders upright and secure them so that they do not fall;
(ii) 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;
(iii) Keep enough space between containers so as to have accessibility in case of emergency;
(iv) 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;
(v) Do not store explosives, acids, turpentine, ether, anhydrous ammonia, finely divided metals or other flammable material in the vicinity of Chlorine;
(vi) Do not store containers in wet and muddy areas;
(vii) Store filled and empty containers separately;
(viii) Protective covers for valves are secured even when the containers are empty, except during use in the system;
(ix) Never use containers as a roller to move other equipment;
(x) Never tamper with fusible plugs of tonners;

(xi) Check leakages every day by means of ammonia torch. However, it should not be touched to brass components like valves of container for safety;
(xii) Never carry out any welding work on the chlorine system as combustion of steel takes place at 2510C in presence of chlorine; and
(xiii) 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**

(i) Use containers in the order of their receipt, as valve packing can get hardened during prolonged storage and cause gas leaks;
(ii) Do not use oil or lubricant on any valve of the containers;
(iii) Badly fitting connections should not be forced and correct tool should always be used for opening and closing valves. They should never be hammered;
(iv) The area should be well ventilated with frequent air changes.
(v) Transport the cylinders to the process area by using crane, hoist or railings etc;
(vi) 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;
(vii) 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;
(viii) Connect the containers to the system by using approved accessories;
(ix) 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;
(x) Never use rubber tubes, PVC tubes etc. for making connections;
(xi) Use the right spanner for operating the valve. Always keep the spanner on the valve spindle. Never use ill fitting spanner;
(xii) After making the flexible connection, check for the leakage by means of ammonia torch but it should not come in contact with a valve;
(xiii) Keep minimum distance between the container valve and header valve so that during change-over of the container, minimum amount of gas leaks;
(xiv) The material of construction of the adopter should be same as that of valve outlet threads.
(xv) 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;
(xvi) The tools and other equipment used for operating the container should be clean and free of grease, dust or grit;
(xvii) Wear breathing apparatus while making the change-over of the container from the process header;
(xviii) Do not heat the container to withdraw more gas at faster rate;
(xix) Use pressure gauge and flow measuring device to control the flow and to know the quantity of gas left in the container;
(xx) Use an inverted U type barometric leg or vacuum breaking arrangement for connecting the container to the process piping;
(xxi) Withdrawal of the gas should be stopped when the gas pressure inside the container is between 0.1 to 0.5 kg/cm2 approximately;

(xxii) 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;
(xxiii) Gas containers should be handled by trained persons only.

4. **Disconnecting Containers from Process System**

(i) Use breathing apparatus before disconnecting the container;
(ii) First close the container valve fully. After removal of chlorine the process valve should be closed;
(iii) 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;
(iv) Put the tag on the empty container & bring it to storage area marked for empties; and
(v) Check for the leakage.

5. Loading and Unloading of Containers

(i) The handling of containers should be done under the supervision of trained and competent person;
(ii) It should be done carefully with a crane, hoist or slanted ramp. Do not use magnet or sharp object for lifting the containers;
(iii) Small cylinders should not be lifted by means of valve caps as these are not designed to carry the weight;
(iv) The containers should not be allowed to strike against each other or against any hard object;
(v) Vehicles should be braked and isolated against any movement;
(vi) 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;
(vii) The containers should never be dropped directly to the ground or on the tyre from the vehicle;
(viii) There should be no sharp projection in the vehicle;
(ix) Containers must have valve caps and plugs fitted properly; and
(x) Check containers for leakage before loading/unloading.

6. **Transportation of Container**

(i) The name of the chemical along with diamond pictorial sign denoting the dangerous goods should be marked on the vehicle;
(ii) The name of the transporter, his address and telephone number should be clearly written on the vehicle;
(iii) The vehicle should not be used to transport any material other than what is written on it;
(iv) Only trained drivers and cleaners should transport hazardous chemical
(v) The driver should not transport any leaking cylinder;
(vi) The cylinder should not project outside the vehicle;
(vii) The transporter must ensure that every vehicle driver must carry “Trem Card” (Transport Emergency Card) and ‘Instructions in writing booklet’ and follow them;
(viii) Every driver must carry safety appliances with him, viz; Emergency kit, breathing apparatus etc.;

(ix) The vehicles must be driven carefully, specially in crowded localities and on bumpy roads. Do not apply sudden brakes;
(x) Check for the leakage from time to time; and
(xi) 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.

(i) Leakage may occur through the valve. There are basically four types of valve leaks:
  (a) Valve packing;
  (b) Valve seat;
  (c) Defective inlet thread; and
  (d) Broken valve thread;

(ii) 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 and

(iii) Leakage may occur through fusible plug.
  (a) If the leakage is through the threads of fusible plug, yoke, hood and cap nut arrangement is used to control the leak; and
  (b) If fusible metal itself in the plug is leaking, yoke and stud arrangement is used to control the leak.

8. First Aid to be Provided for a Person Affected by Chlorine

(i) **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;
(ii) **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;
(iii) **Eye Contact**. If eyes get affected with liquid chlorine or high concentration of chlorine gas, they must be flushed immediately with running water for atleast 15 minutes keeping the eyelids open by hand. Caution: No ointment should be used unless prescribed by an eye specialist; and
(iv) **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.

9. **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, and (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 centre 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. fire fighting, 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. Incase 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 labour, 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:

(i) Take a shallow breath and keep eyes opened to a minimum;
(ii) Evacuate the area;
(iii) Investigate the leak with proper gas mask and other appropriate Personal protection;
(iv) The investigator must be watched by a rescuer to rescue him in emergency;
(v) If liquid leak occurs, turn the containers so as to leak only gas;
(vi) In case of major leakage, all persons including neighbours should be warned;
(vii) 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;
(viii) Under no circumstances should water or other liquid be directed towards leaking containers, because water makes the leak worse due to corrosive effect;
(ix) 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 fluroprotein foam is available, use for preventing the evaporation of liquid chlorine;
(x) Use emergency kit for controlling the leak;
(xi) 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;
(xii) 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;
(xiii) Only specially trained and equipped workers should deal with emergency arising due to major leakage;
(xiv) If major leak takes place, alert the public nearby by sounding the siren;
(xv) Any minor leakage must be attended immediately or it will become worse; and
(xvi) 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:

(i) Breathing apparatus;
(ii) Emergency kit;

(iii) Leak detectors;
(iv) Neutralisation tank;
(v) Siren system;
(vi) Display of boards in local language for public cautioning, first aid and list of different authorities with phone numbers;
(vii) Communication system;
(viii) Tagging system for equipments;
(ix) First aid including tablets and cough mixtures;
(x) Exhaust fans;
(xi) Testing of pressure vessels, chlorine lines etc. every year as per factory act;
(xii) Training & mock drill;
(xiii) Safety showers;
(xiv) Eye fountain;
(xv) Personal protective equipment;
(xvi) Protecting hoods for ton-containers;
(xvii) Fire extinguishers; and
(xviii) Wind cock.

Appendix 17: Details of Public Consultations

Table 1: Public Consultation Conducted During Project Preparation in Ratangarh in July 2017

Sr. No	Name of Persons	Location/ Date	Topic Discussed	Outcome	Photographs
1	Female Groups	Near Kothi Ratangarh Date: 28.07.2018	Awareness of the project-including Project Coverage area, Present condition of Sewerage In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project Presence of historical/ cultural/ religious sites nearby. Drainage and sewerage problem facing Environmental Health & Hygiene Present solid waste collection and disposal problem Safety of residents during construction phase and applying of vehicle for construction activities Dust and noise pollution and disturbances during construction work	People are aware about the subproject proposed in the town. People are concerned about the poor sewerage conditions. They want to engage with the project as a job opportunity and want to become beneficiaries. There is no such environmental sensitive components nearby the project. No historical/ cultural religious sites nearby the subproject area. Drainage and Sewerage are major problems in this area. These should be sort out immediately. By the proposed project sewerage in the town, environmental health and hygiene condition will be improved. Solid waste collection facility is poor in this area. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase.	

Sr. No	Name of Persons	Location/ Date	Topic Discussed	Outcome	Photographs
			Foul smell and vector borne diseases Setting up worker camp site within the village/ project locality Willingness to pay for improved services	People should be made aware through CAPC and outreach team of contractor before start of work in particular area. By the proposed SPS, foul smell and vector borne disease will be mitigated/ removed. There is enough space available nearby the project area to establish labour camp. People suggested establishing the worker camp away from the habitation so there is no conflict and disturbances. People are interested to pay for improved services in the town.	
2	Female Groups	Near Surya Cinema Date: 29.07.2018	Awareness of the project-including Project Coverage area, Present condition of Sewerage in the town. Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project, Presence of historical/ cultural/ religious sites nearby. Unfavorable climatic condition Environmental Health and Hygiene	People are aware about the subproject proposed in the town. People are concerned about the poor sewerage conditions. Sewage flow in open drains and cause nuisance and vector borne diseases. There are no such environmental sensitive components nearby the project. No historical/ cultural religious sites nearby the subproject area. Climate is dry except during monsoon season. Environmental Health and Hygiene condition is poor in the town. By the proposed project of Water supply and sewerage, will improve the quality of environment, health & sanitation.	

Sr. No	Name of Persons	Location/ Date	Topic Discussed	Outcome	Photographs
			Present solid waste collection and disposal problem Availability of Labour during construction time Dust and noise pollution and disturbances during construction work Safety of residents during construction phase and applying of vehicle for construction activities Requirement of enhancement of other facilities Willingness to pay for improved services	Solid waste collection facility is poor in this area. Sufficient labour is available in nearby communities. People requested to engage the local people during construction phase. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the measures of environment and person protection will be strictly followed. PPE's will be adopted at site. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. The locals feel that Parks play grounds and Community halls are required in this town and in addition. Peoples are interested to pay for improved services.	

Sr. No	Name of Persons	Location/ Date	Topic Discussed	Outcome	Photographs
3	Local Public	Holidhora Date: 28.07.2018	Awareness of the project–including Project Coverage area, Present condition of Sewerage in the town Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project, Presence of historical/ cultural/ religious sites nearby. Unfavorable climatic condition Present solid waste collection and disposal problem Dust and noise pollution and disturbances during construction work Safety of residents during construction phase and applying of vehicle for construction activities Requirement of enhancement of other facilities	Some People are aware of the proposed Project. People are concerned about the poor sewerage conditions in the area/town. There are not any forest, wildlife or any sensitive /unique environmental, component nearby the project. There are not any historical/cultural and religious sites in nearby the subproject area. Climate is dry except during monsoon season. Solid waste collection facility is poor in this area. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. The locals feel that Parks, play grounds and Community halls are required in this town and in addition.	

Sr. No	Name of Persons	Location/ Date	Topic Discussed	Outcome	Photographs
			Treated water management released from STP Sludge Management Willingness to pay for improved services	Treated water will be reuse in agricultural activities in nearby area. During discussion with the local people near the STP, at present water is filled in vacant land presently use for Mela Maidan. People want to empty the water from there and retain the Mela Maidan as same earlier. ULB receives application from nearby farmers for reuse the treated water in agricultural purposes. Sludge will be reuse as manure in agricultural fields. People are interested to pay for improved services in the town.	
4	Local Public	Near SPS site at Ward no-1 Date: 26.07.2018	Work Proposed by RUDSICO-EAP, Status of Sewerage , hazards of absence of sewer system in town, possible impacts due to construction works, Willingness to pay for improved services	People are supportive of the project and indicated their willingness to participate in the project to make it successful. People understand direct benefits along with latent benefits of the project. People informed that there is nuisance due to absence of effective sewerage system in town and outflows of septic tanks creates foul smell and hazards for drainage system. People are aware of disturbance due to proposed works of pipe laying and ready to bear some disturbance due to proposed works. Proposed STP will effectively play a key role in good sanitation in town.	

Sr. No	Name of Persons	Location/ Date	Topic Discussed	Outcome	Photographs
5	Staffs, BSNL	Near BSNL Office (SPS site) Date: 26.07.2018	Work Proposed by RUDSICO-EAP, Status of Sewerage system, hazards of absence of sewer system in town, possible impacts due to construction works. Willingness to pay for improved services	People are supportive of the project and indicated their willingness to participate in the project to make it successful. People understand direct benefits of construction of STPs for effective treatment of sewage of town. People appreciated ongoing works of sewerage in town and hoped that after completion of proposed works, problem of disposal of sludge from septic tanks and foul smell from outflow of septic tanks will be eliminated and sanitation and health conditions will be improved. People also appreciated for location of STPs far from habitations. People shown their willingness to pay for improved services of water supply and sewerage facilities	

Attendance Sheet: July 2017 Consultations at Ratangarh

Consultation sheet

Place ---- सुवालका कोठी के पीछे, रतनगढ़ Date ---- 29.07.18

Topic Discussed ---- परियोजना कार्य की जानकारी दी गई पुर्व कहे की वस्तु स्थिति पर चर्चा कर स्वागत हुए।

S.No.	Name	Designation/Mobile No.	Signature
1	श्रीमति चन्द्रकला	-	चन्द्रकला
2	" मंजू	-	मंजू
3	" नन्दा	-	नन्दा
4	" गायत्री	-	
5	" रुक्मणी	-	
6	" संतोष	-	संतोष
7	" सरला	-	
8	" सरोज देवी	-	
9	" ममता	-	ममता
10	" सबीता	-	सबीता
11	" दीपिका	-	दीपिका
12			

Consultation sheet

Place ---- होलीधोरा, रतनगढ़ Date ---- 29.07.18

Topic Discussed ---- परियोजना कार्य की जानकारी दी गई तथा शहर की वर्तमान व्यवस्था से अवगत हुए।

S.No.	Name	Designation/Mobile No.	Signature
1	श्री सोमचंद	-	
2	श्री कमलकान्त	—	कमलकान्त
3	" प्रेमचन्द लोल	—	
4	" बनवारी लोल	—	बनवारी
5	" श्रवण कुमार	—	श्रवण कुमार
6	" अशोक सोनी	—	
7	" राजकुमार	—	राजकुमार
8	" बंशीधर	—	बंशीधर
9	" सुगन इदोरिया	—	सुगन
10			

Consultation sheet

Place ~~गणेश मंदिर के पास~~, रत्नगढ़ Date 29-07-18

Topic Discussed

परियोजना कार्य की जानकारी दी गई तथा
कार्य की वस्तुस्थिति से अवगत हुए।

S.No.	Name	Designation/Mobile No.	Signature
1	श्री महेन्द्र कुमार	—	महेन्द्र कुमार
2	" प्रदीप मांटोलिया	—	Pradeep
3	" मनोज रिणवा	—	मनोज
4	" मो० सलीम	—	मो० सलीम
5	" राजेन्द्र दाधीच	—	राजेन्द्र
6	" दीपचन्द	—	दीपचन्द
7	" राधेश्याम	—	राधेश्याम
8	" मुकेश शर्मा	—	मुकेश
9			

A.

Consultation sheet

Place ---- सूर्य सिनेमा के पास, रतनगढ़ Date ---- 29.07.18

Topic Discussed ----

परियोजना कार्य की जानकारी दी एवं कहते की वर्तमान व्यवस्था से अवगत हुए।

S.No.	Name	Designation/Mobile No.	Signature
1	श्रीमती प्रियंका	-	प्रियंका
2	" शालिनी	-	शालिनी
3	" प्रेमलता	-	प्रेमलता
4	" संगीता	-	संगीता
5	" सविता	-	सविता
6	" उर्मिला	-	उ (मिला)
7	" लाडू देवी	-	लाडू
8	" पूनम	-	Poonam
9	" नेहा	-	नेहा
10	" प्रमेश्वरी	-	आशिष प्रमेश्वरी
11			
12			

Table 2: Public Consultations at Ratangarh conducted on 18th September 2019

S.No.	Date and place of consultation	Proposed work site	Persons consulted	Topics discussed during consultation	Outcome of consultation
1.	18.09.2019 Ward No. 6 , 7 and 8	Water & Sewer pipe laying network	Mohammed Yusuf (ward member),Mrs. Khetiya, Smt zerena (Housewife), Mr. Mumtaj Ali, Mr. Javed, Mr. Kayum Gori, Mr.Rustam, Smt Ruksana, Mr. Akaram, Mohammed Sattar, Mohammed Rafik, (Labour),Mohammed hanif(Old age),Smt. Batul, Smt. Pilani ,Smt.Sabanam,Smt Jannat, Smt. Nazama (Housewife).Mr. Javed (Belder)Mr. Ajaram (Labour), Mr. Nanu Ram (Tailor)	Discussed about present water supply and sewerage system and its quality & proposed works and its advantages, their willingness to project work, temporary inconveniences during pipe laying works, contractor's cooperation, willingness to pay for sustainability of the project	Present water supply conditions is very poor and water quality is also not good. All the houses have a septic tank. They have given their assurance to provide full support to the deprt and contractor when the new project will be commence.
2	18.09.2019 Ward No. 29,30 & 33	Water & Sewer pipe laying network	Mr. Goverdhan, Mr. Bhagwati Prasad (Labour), Smt. Shankuntala, Smt. Suman, Smt. Pinnu Devi Mr. Madhusudan, Mr. Deepak Kumar Mr.Bablu, Mr. Shambu Ram (Nagar Palika worker), Mr. Vinod, Mr. Sanajy, Mr. Hasan Ali (Labour), Mr. Azam, Mr. Akaram (Barber),Mohammed Muslim(vegetable shop), Mohammed Muslim (Barber)Mr. Akthar Hussan(Retired)Mr. Charan Das, Mr. Ajay (labour),Mr. Kheneya Lal (Retired N.P.),Smt. Madina,Smt. Rabia,Smt. Sabia,Smt. Bano,Smt. Madina (Housewife)	Discussed about present water supply and sewerage system and its quality & proposed works and its advantages, their willingness to project work, temporary inconveniences during pipe laying works, contractor's cooperation, willingness to pay for sustainability of the project	Present water supply conditions is very poor and water quality is also not good. All the houses have a septic tank. They have given their assurance to provide full support to the deprt and contractor when the new project will be commence.
3	18.09.2019 Ward No.20	Water & Sewer pipe laying network	Mr. Bhawani Shanker (Bima Agent), Smt. Safiyana, Smt. Rabiya, Smt. Bimla , Smt. Nazama (Housewife), Mr. Sita Ram(Handicraft worker),Mr. Kheneiya Lal (Halwai),Mr. Nanad kishor (ward member)	Discussed about present water supply and sewerage system and its quality & proposed works and its advantages, their willingness to project work, temporary inconveniences during pipe laying	Present water supply conditions is very poor and water quality is also not good. All the houses have a septic tank. They have given their assurance to provide full support to the deprt and contractor when the

S.No.	Date and place of consultation	Proposed work site	Persons consulted	Topics discussed during consultation	Outcome of consultation
				works, contractor's cooperation, willingness to pay for sustainability of the project	new project will be commence.
4	18.09.2019 Ward No.05	Water & Sewer pipe laying network	Mr. Purshottum (Shopkeeper), Mr. Mumtaj Ali(Shop), Mr. Peer Mohhamed (Labour), Mr.Yunis Khan, Mr. Gauri Mohhamed (Dyes worker), Mr. Nathu Khan (Labour), Mr. Asif(Electrician), Mr. Asif (Belding work),Mr. Abhishek (godown)	Discussed about present water supply and sewerage system and its quality & proposed works and its advantages, their willingness to project work, temporary inconveniences during pipe laying works, contractor's cooperation, willingness to pay for sustainability of the project	Present water supply conditions are very poor and water quality is also not good. All the houses have a septic tank. They have given their assurance to provide full support to the deprt and contractor when the new project will be commence.

Photographs of consultations conducted on 18th September 2019

Consultations at Ward No. 6 dtd.18.09.2019

Consultations at Ward No. 29 dtd.18.09.2019

Consultations at Ward No. 7 dtd.18.09.2019

Consultations at Ward No. 29 dtd.18.09.2019

Consultations at Ward No. 8 dtd.18.09.2019

Consultations at Ward No.30 dtd.18.09.2019

Consultations at Ward No. 20 dtd. 18.09. 2019

Consultations at Ward No. 20 dtd. 18.09. 2019

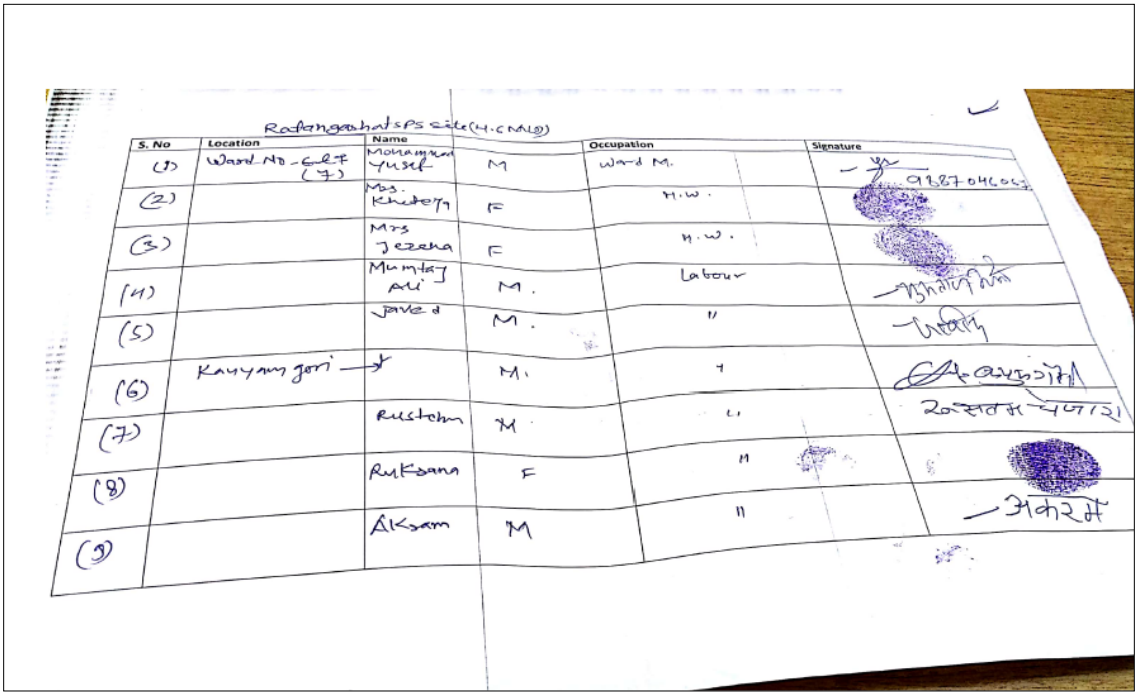
Consultations at Ward No. 20 dtd. 18.09. 2019

Consultations at Ward No. 05 dtd. 18.09. 2019

Consultations at Ward No. 05 dtd. 18.09. 2019

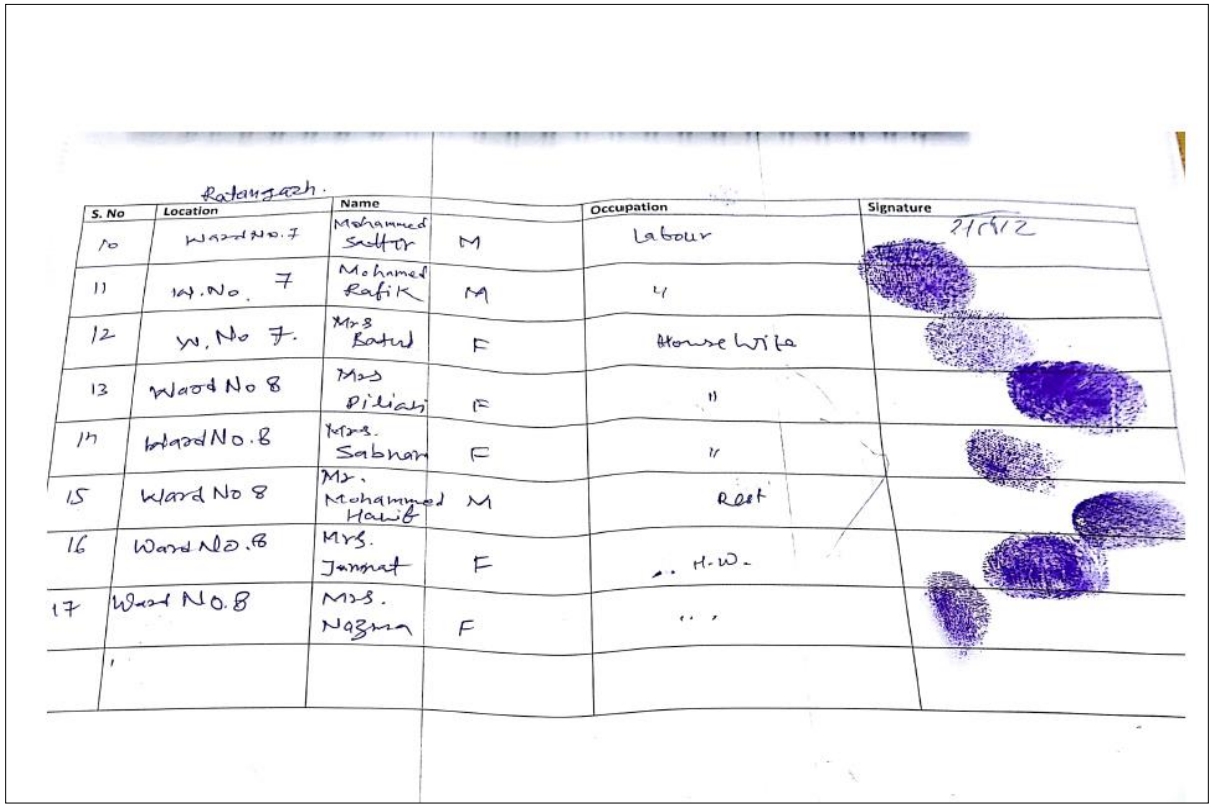
Consultations at Ward No. 05 dtd. 18.09. 2019

Attendance Sheet of Consultation conducted on 18th September 2019



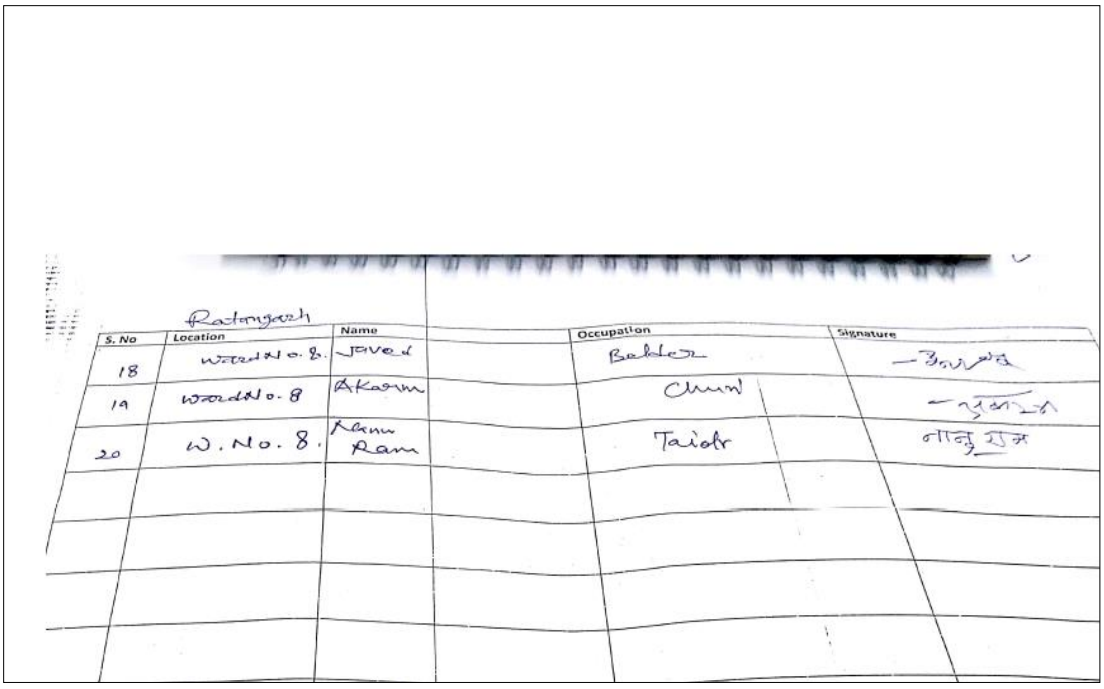
Ratangachat SPS site (H.C.M.L.P.)

S. No	Location	Name		Occupation	Signature
(1)	Ward No-6 & 7	Mohammad Yusuf	M	Ward M.	9287046065
(2)		Mrs. Khadeja	F	H.W.	
(3)		Mrs Jezeha	F	H.W.	
(4)		Mumtaj Ali	M.	Labour	
(5)		Javed	M.	"	
(6)	Kanyamgori		M.	"	
(7)		Rustom	M	"	
(8)		Ruksana	F	"	
(9)		Aksam	M	"	



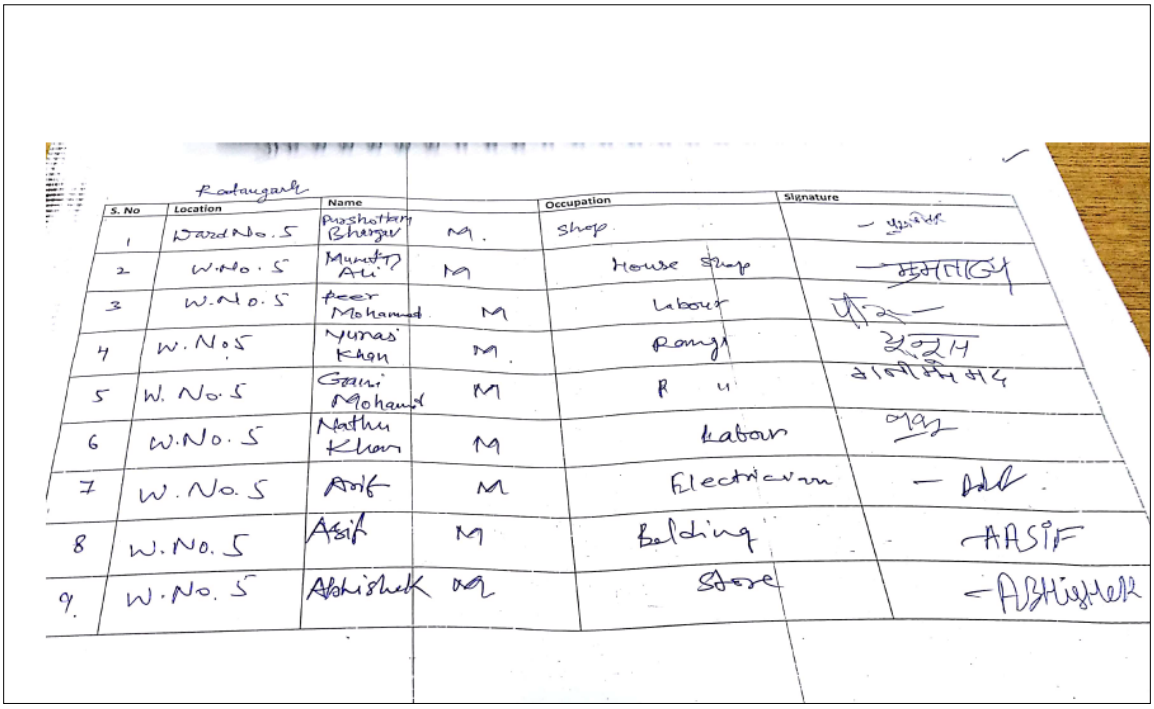
Ratangach.

S. No	Location	Name		Occupation	Signature
10	Ward No. 7	Mohammed Sultan	M	Labour	
11	W. No. 7	Mohamed Rafik	M	"	
12	W. No 7.	Mrs Batul	F	House Wife	
13	Ward No 8	Mrs Pillai	F	"	
14	Ward No. 8	Mrs. Sabnam	F	"	
15	Ward No 8	Mr. Mohammed Hanif	M	Rest	
16	Ward No. 8	Mrs. Jannat	F	" H.W.	
17	Ward No. 8	Mrs. Nazma	F	" "	



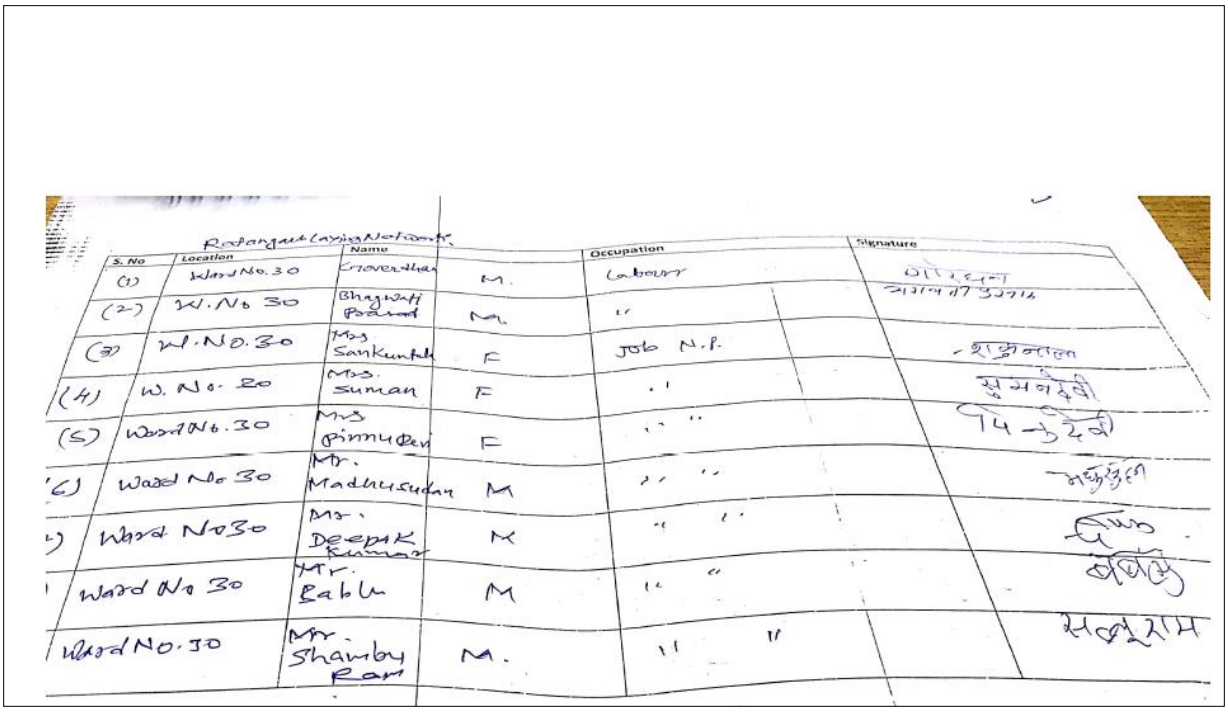
Ratangarh

S. No	Location	Name	Occupation	Signature
18	Ward No. 8.	Javed	Barber	
19	Ward No. 8	Akram	Cloth	
20	W. No. 8.	Ram Ram	Taiolr	



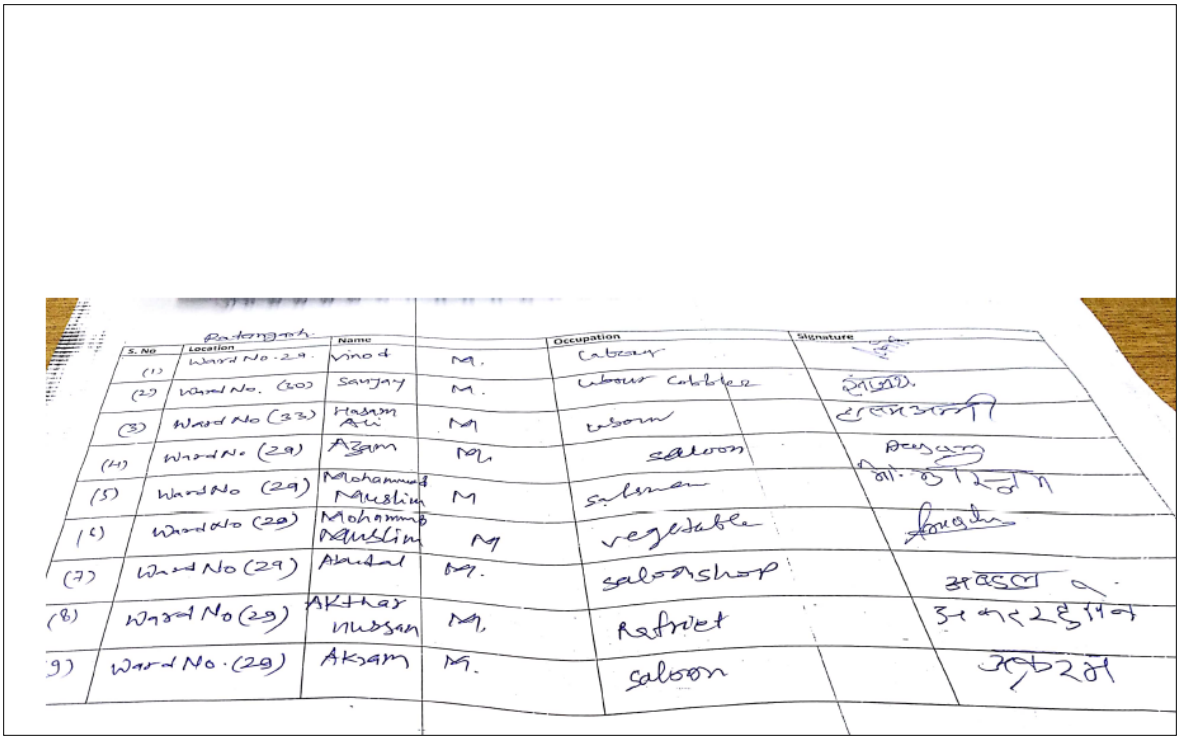
Ratangarh

S. No	Location	Name		Occupation	Signature
1	Ward No. 5	Purshottam Bhargav	M.	Shop	
2	W. No. 5	Mumtaj Ali	M	House Shop	
3	W. No. 5	Peer Mohamad	M	Labour	
4	W. No. 5	Yunas Khan	M.	Rangi	
5	W. No. 5	Gani Mohamad	M	R U	
6	W. No. 5	Nathu Khan	M	Labour	
7	W. No. 5	Arif	M	Electrician	
8	W. No. 5	Asif	M	Balding	AASIF
9	W. No. 5	Abhishek	M	Store	ABHishek



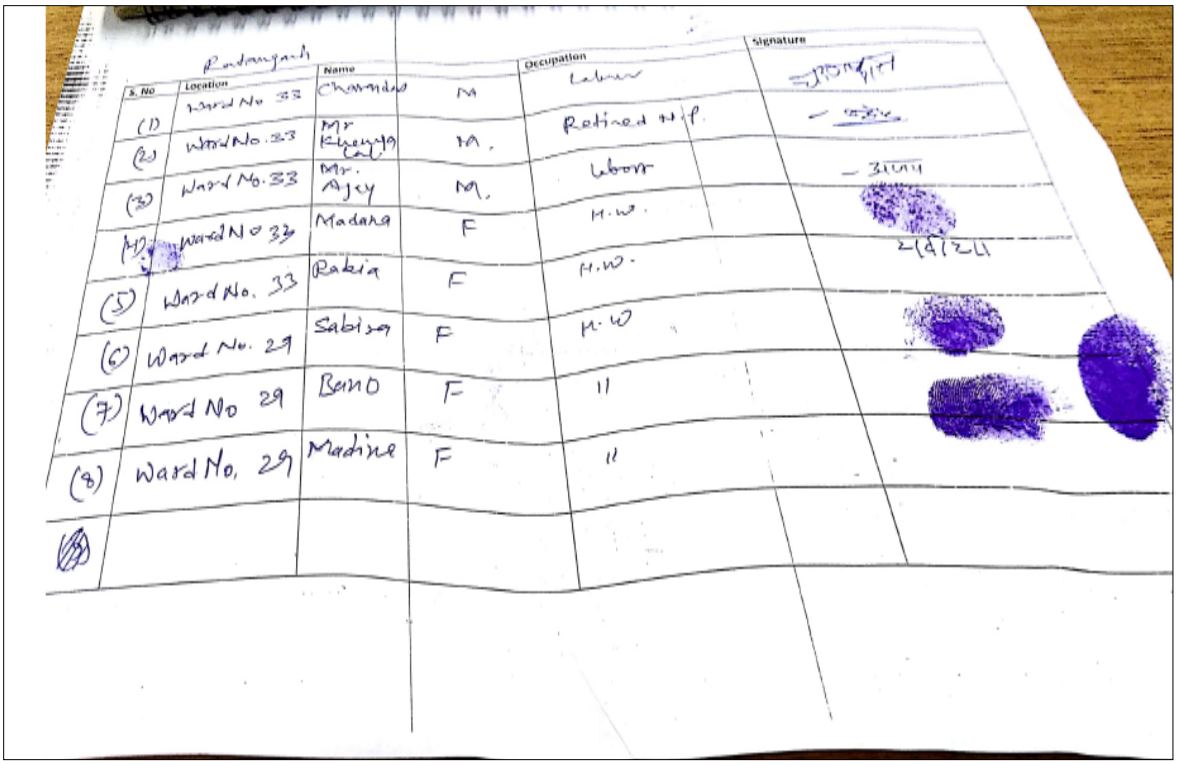
Ratangarh Canvassing Notice

S. No	Location	Name		Occupation	Signature
(1)	Ward No. 30	Shiveradhar	M.	Labourr	
(2)	W. No 30	Bhagwati Prasad	M.	"	
(3)	W. No. 30	Mrs. Sankuntla	F	Job N.P.	
(4)	W. No. 20	Mrs. suman	F	"	
(5)	Ward No. 30	Mrs pinnu Devi	F	" "	
(6)	Ward No 30	Mr. Madhusudan	M	" "	
(7)	Ward No 30	Mr. Deepak Kumar	M	" "	
(8)	Ward No 30	Mr. Babu	M	" "	
(9)	Ward No. 30	Mr. Shambu Ram	M.	" "	



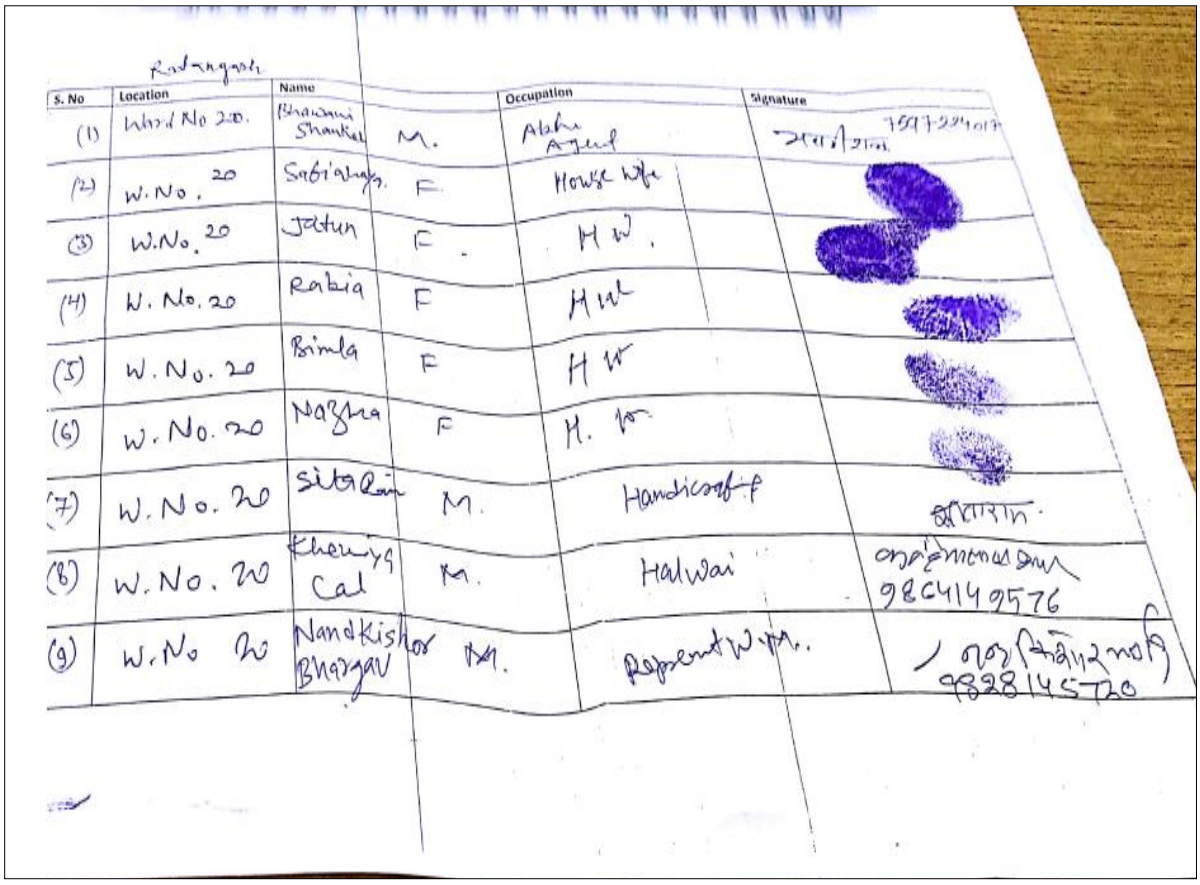
Ratangarh

S. No	Location	Name		Occupation	Signature
(1)	Ward No. 29	Vinod	M.	Cabour	
(2)	Ward No. (30)	Sanjay	M.	Labour Cobbler	
(3)	Ward No (33)	Hasam Ali	M	Labour	
(4)	Ward No. (29)	Azam	M.	saloon	
(5)	Ward No (29)	Mohammad Muslim	M	Salesman	
(6)	Ward No (29)	Mohammad Muslim	M	vegetable	
(7)	Ward No (29)	Akabal	M.	saloon shop	
(8)	Ward No (29)	Akthar Hussain	M.	Retired	
(9)	Ward No. (29)	Akram	M.	saloon	



Radhanagar

S. No	Location	Name		Occupation	Signature
(1)	Ward No 33	Chandan	M	Labour	
(2)	Ward No. 33	Mr Khemraj Cal	M.	Retired H/P	
(3)	Ward No. 33	Mr. Ajay	M.	Labour	
(4)	Ward No 33	Madana	F	H.W.	
(5)	Ward No. 33	Rabia	F	H.W.	
(6)	Ward No. 29	Sabina	F	H.W	
(7)	Ward No 29	Bano	F	11	
(8)	Ward No. 29	Madina	F	11	



Radhanagar

S. No	Location	Name		Occupation	Signature
(1)	Ward No 20.	Bhawani Shankar	M.	Akha Agent	
(2)	W.No. 20	Subiabegh.	F	House Wife	
(3)	W.No. 20	Jaitun	F	H W.	
(4)	W. No. 20	Rabia	F	H W	
(5)	W. No. 20	Bimla	F	H W	
(6)	W. No. 20	Nagma	F	H. W	
(7)	W. No. 20	Sita Ram	M.	Handicraft	
(8)	W. No. 20	Khemraj Cal	M.	Halwai	9864149576
(9)	W. No 20	Nandkishor Bhargav	M.	Repent W.M.	9828145720

Table 3: Stakeholders and Public Consultations conducted during preliminary design stage in June 2017

During design stage site visit was conducted to assess potential social and environmental impacts of proposed components. Discussions with public including vendors, shopkeepers and hawkers were held to understand their perception about the proposed works and their co-operation during implementation of project. During consultations it was found that most of the public is aware about the proposed works and shown their interest to co-operate during construction works. Details of public consultations are given below

Sr. no.	Name of Persons	Location	Topic Discussed	Outcome	Photographs of consultations
1	Executive Engineer, PHED, Ratangarh Date: 09.06.17	Office of The Executive Engineer PHED, Ratangarh	1. Present status of Water Supply in town 2. Presently Status of OHSR, CWR & Other Structure of Water Supply System. 3.Requirements of works for Develop Better Water Supply System 4.Status of land availability for WTP, OHSR, CWR etc. 5.Miscellaneous	1.Presently Water Supply system source are sufficient for proposed water supply. 2. Some Ext. Clear Water Rising mains to be utilized in project. 3.OHSR to be Constructed, with Sufficient Cap of CWR & Centralized Pump House. 4. Distribution network to be designed for over all town @ 24x7 Hours Supply.	
2	Junior Engineer, PHED, Ratangarh Date: 09.06.17				

Sr. no.	Name of Persons	Location	Topic Discussed	Outcome	Photographs of consultations
3	Mr. Ratan Singh Ji Junior Engineer, PHED Date: 09.06.17	Municipal Council, Ratangarh	1. Present status of Waste water / Drainage in town 2. Requirements of works for Waste Water System 3. Status of land availability for STP, SPS etc. 4.Any other	1.Drainage System use by depressions 3-4 Location 2.STP to Be Proposed Out Side of Town	
4	Mr. Parkash Ji Executive Officer, Municipal Council, Ratangarh Date: 24.06.17	Municipal Council, Ratangarh			
5	Member of Parliament of Rajgarh, Churu Date: 25.06.17	At MP's Home Office	1.Present Status of Waste water. 1. 2.Proposel of Waste Water Project	1. STP to be proposed Out Side of Town 2. New constructed road like Gaurav Path to be consider for Trenchless in WW network.	

Sr. no.	Name of Persons	Location	Topic Discussed	Outcome	Photographs of consultations
6.	Mr. Jagdish Chandra, Executive Officer, Nagar Palika, Ratangarh Mr. Rakesh Chandra Khichi, Chairman, Nagar Palika, Ratangarh Mr. Ratan Singh, AEN, Nagar Palika, Ratangarh Date: 10.07.17	Nagar Palika, Ratangarh	1.Present status of sewerage 2.Present status of solid waste management 3.present status of road and transportation 4. Any suggestions in proposed scope of works of sewerage in Ratangarh town	Presently sewerage is collected in 7 low laying locations in town and collected sewerage is pumped to outside areas of town. Solid waste is collected through NGO by door to door collection and dumped in outskirt areas/vacant govt. land, no waste processing facility is available in town. Mostly roads are in good conditions, some new CC roads are constructed. During proposed works excavation should be avoided in newly constructed roads	

Appendix 18: Minutes of City level Stakeholder Committee (CLC) Meeting

City stakeholder committee meeting was organized in, Churu on Dtd. 20.07.2018 to discuss the matter of proposed Sewerage works in Ratangarh under the chairmanship of District Collector, Churu in presence of consultants, RUIDP officials, PHED officials, Municipal Council officials and other invitee members. Proposed scope of works and technology was discussed in the meeting and it was decided that treated effluent shall be reused by Municipality in beneficial uses. Land availability for proposed STPs and SPS were also confirmed by Municipal Board.

Minutes of City Level Committee (CLC)

RUIDP

Government of Rajasthan
Office of the Executive Engineer, IPIU,
Rajasthan Urban Sector Development Investment Program (RUIDP – Phase – II)
PMC Campus, Bhaleri Road, Churu

Tel No.: 01562-252804
email : churu.ruidp@rajasthan.gov.in
Fax No.:01562-252804
web site : www.ruidp.org

No.EE/RUIDP/CHURU/CLC/18-19/ 241 Date: 20.07.2018

Minutes of CLC meeting held on dated 13.07.2018 for Sewerage works at Ratangarh and Water supply & Sewerage works at Sardarshahar town (CHURU) under RUIDP Phase-IV.

A City Level Committee (CLC) meeting was held under the chairmanship of District Collector, Churu on dated 13.07.2018 to discuss the Sewerage works proposed for Ratangarh and Water supply & Sewerage works proposed for Sardarshahar Town under RUIDP Phase-IV. List of members/officers attended the meeting is enclosed as **Annexure-A**.

RATANGARH TOWN

1. It was apprised that the Detailed Project Report (DPR) of Sewerage project is prepared by the Consultant **M/s Creative Technocrate Services Pvt. Ltd. Jaipur** engaged by the Municipal Board Ratangarh (Churu), which will be considered under RUIDP Phase-IV. RUIDP has scrutinized the Draft DPR and suggestions have already been conveyed to consultant for modifications & revised the estimate as per RUIDP SOR- 2017.
2. The basic scope of works & provision in DPR were briefed to the committee. The estimated cost of DPR is of about **Rs 279 Cr** for works proposed under waste water sector including 10 years O&M cost. The capital cost for execution of works will be borne by State Government financed by ADB under RUIDP Phase-IV. The O&M cost for Sewerage works (STP, SPS & sewer line) is to be borne by Municipal Board as per actual basis along with power charges. The brief scope of works are as follows:

   Sewerage Works: The scope under project to provide sewer network of about 219 Km length with 15872 nos. house sewer connections, three STPs (4.5 MLD, 3.5 MLD and 2.5 MLD capacity) & one Sewage Pumping Station (SPS) to pump sewage of low laying area to STP by 2180 mtr rising main. It was informed that STP is proposed on latest Sequential Batch Reactor (SBR) technology to meet out the latest effluent parameters. To reduce inconvenience to public deeper depth (3.5 mtr above) & crossing of NH & circles where traffic is more, trenchless technology for laying of sewer is proposed. CC/BT road restoration up to 4 mtr is proposed in full width. FSM generation for scattered areas at Ratangarh outskirts shall be taken.

Page 1 of 3

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A.

3. Municipal Board has informed that land is available for construction of STP and Sewage Pumping Station within town and permission and land papers also submitted as required from competent authority.
4. It was also deliberated that for public complaint redressal, provision of toll free number along with set up of a control room should be taken in the provision.
5. It was also suggested to enhance the roles and responsibilities of local bodies during the construction period. It was suggested to include the sewer jetting machine under the contract. After completion of project works, whole town will be benefited from sewerage facility.

SARDARSHAHAR TOWN

1. It was apprised that the Detailed Project Report (DPR) of Water supply & Sewerage project is prepared by the Consultant **M/s STUP Consultants Pvt. Ltd., New Delhi** engaged by RUIDP, which will be considered under RUIDP Phase-IV. RUIDP has scrutinized the Draft DPR and suggestions have already been conveyed to consultant for modifications & revised the estimate as per RUIDP SOR- 2017.
2. The basic scope of works & provision in DPR were briefed to the committee. The total tentative cost of DPR is **Rs 226 Cr** (for water supply sector Rs. 86 Cr and for waste water sector Rs. 140 Cr) including 10 Years O&M cost. The capital cost for execution of works will be borne by State Government financed by ADB under RUIDP phase-IV. The O&M cost for Water supply works is to be borne by the PHED and for Sewerage works (STP, SPS & sewer line) by Municipal Board as per actual along with power charges. The brief scope of works are as follows:

   Water Supply Works: - The scope under the project is to develop water supply system of Sardarshahar town. About 19.71 Km transmission mains (15.86 km existing & 3.85 Km new) are proposed to feed storage reservoirs and approx. 207 Km distribution network to supply water to consumer end including 22000 nos. house service connections with domestic water meters for continuous pressurized water supply. One new Clear Water Reservoir (CWR) of 2000 KL is proposed at existing CWR campus at Hanumangarh road.

   Sewerage Works:- The scope under project to provide sewer network of about 82 Km length including 11 Km trenchless pipe with 9966 nos. house sewer connections, three new STPs (2.5 MLD, 5 MLD & 2.5 MLD capacity) & two Sewage Pumping Station (SPS) to pump sewage of low laying area to main sewer are proposed under the sewerage system. Up-gradation of existing STPs are also proposed under the project. It was informed that STP is proposed on latest Sequential Batch Reactor (SBR) technology to meet out the latest effluent parameters. To reduce inconvenience to public deeper depth (3.5 mtr above) where

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traffic is more, trenchless technology for laying of sewer is proposed. CC/BT road restoration up to 4 mtr is proposed in full width. FSM generation for scattered areas at Sardarshahar outskirts shall be taken.

3. The Operation & Maintenance payment will be performance based under the contract.
4. It was informed that land is available for construction of CWR's and Pump House's at near existing CWR at Hanumanrgarh Road. It was instructed to Municipal board to provide the land for the construction of one STP (0.25 Hectare land in Ward 18) and two SPS (25m x 20m land near Navjeevan hospital Bikaner road and near railway station). Municipal officials assured for the same.
5. It was informed that sufficient space has been kept for laying sewer and water supply lines within the ROW of the town's Major roads. It was also deliberated that for public complaint redressal for customer relation centers will be taken under the contract. It was also deliberated that work shall be done in planned manner to avoid any inconvenience to public.
6. After completion of project works, whole town will be benefited from water supply and sewerage facility. It was suggested to include the sewer jetting machine under the contract.

Suggestions and directions of the City level committee will be incorporated in the detail project report. The project was agreed by the committee for further course of action at RUIDP level. Meeting ended with vote of thanks to the chair.

Executive Engineer
Member Secretary, CLC
RUIDP, Churu

No.EE/RUIDP/CHURU/CLC/18-19/ 241-253 **Date:** 20.07.2018

Copy to the following for information and necessary action:

1. PA to Hon'ble Minister, Devsthan Department, Govt of Rajasthan.
2. PA to Hon'ble MP, Churu
3. PA to Hon'ble MLA, Sardarshahar
4. Project Director, RUIDP, Jaipur.
5. District Collector & Chairman CLC, Churu
6. Chairman, Municipal Board, Ratangarh/ Sardarshahar.
7. Additional Project Director/Chief Engineer/ Addl Chief Engineer, RUIDP, Jaipur.
8. Superintending Engineer (WW/WS), RUIDP, Jaipur.
9. Superintending Engineer, PHED/ PWD/WRD, Churu.
10. Executive Engineer, PWD/PHED, Ratangarh/ Sardarshahar
11. Executive Officer, Municipal Board, Ratangarh/ Sardarshahar.
12. District Town Planner, Town Planning Department, Churu.

Executive Engineer
Member Secretary, CLC
RUIDP, Churu

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Attendance Sheet of CLC meeting

Annexure – A

उपस्थिति पंजीयन

सरदारशहर एवं रतनगढ़ शहर में आर.यू.आई.डी.पी. फेज चतुर्थ के कार्यों के संबन्ध में सिटी लेवल कमेटी की बैठक कलेक्ट्रेट सभागार, चूरू में आयोजित दिनांक 13 जुलाई 2018, दोपहर 1:00 बजे

क्र.सं.	नाम	पद नाम	मोबाईल सं.	हस्ताक्षर
01	श्रीमान् राजकुमार रिणवा	माननीय राज्य मंत्री (स्वतंत्र प्रभार) देवस्थान विभाग, राज0 सरकार (विधायक–रतनगढ़)	9414085140	
02	श्रीमान् राहुल कस्वां	माननीय सांसद, चूरू		
03	श्रीमान् भवँर लाल शर्मा	माननीय विधायक, सरदारशहर		
04	श्री मुक्तानन्द अग्रवाल	जिला कलक्टर, चूरू		
05	सुधमा पींचा	अध्यक्ष न.पा.सरदार शहर	9414465556	सुधमा पींचा
06	Pramod Jangir	E.O. न.पा. Sardarshahar	8432620849	
07	Noor Mohd Khan	E.O. U.I.P. Ratangarh	9829230911	
08	Sugreeb Singh	5th Town Planner Bikaner Zone	9414264788	
09	M. Afhar Jafri	D.T.P, CHURU	9602459477	
10	वैद्य बालकृष्ण गोस्वामी	अध्यक्ष- साहित्य कला संगम रतनगढ़	9414433535	
11	ओम प्रकाश मंडावरिया	सहायक. लोक सेवा संस्थान रतनगढ़	9414722733	
12	[illegible]	अध्यक्ष: नगरपालिका, रतनगढ़	9828524655	
13	रामावतार चौधरी	उपाध्यक्ष नगरपालिका रतनगढ़	9680038918	
14	Sarwan Rana	JEN UP Ratangarh	9672516549	
15	देवानन्द पीपलवा	P.A. मा. देवस्थान मन्त्री	9413360631	
16	महेश पुरोहित	दलाल रतनगढ़	9414395019	
17	लालचन्द गोदिका	रतनगढ़ दोनों	9214509822	
18	मोहन लालचंदानी	अधिशासी अभियन्ता यू.आई.डी.पी. रतनगढ़	9413075259	
19	B.M. Pilania	EE(Non) PHED Circle churu	9413073893	
20	R.D. Meena	SE (Project) PHED Sardarshahar	9413885207	

क्र.सं.	नाम	पद नाम	मोबाईल सं.	हस्ताक्षर
21	Mohan Jaiswal	Consultant CTS Jaipur	9461823211	
22	Ravendra Kumar	Consultant CTS Jaipur	7340061307	
23	Suresh C. Khanduri	ADB- PPTA Social Devt Gender	9711185155	
24	Ramesh ch Sahu	EE RVIDP SKDR/JJN	01413304430	
25	RAJAT KUMAR GARG	STUP CONSULTANT,	9811106835	
26	A. V. Rahul	STUP CONSULTANT	9414055625	
27	Sanchita Saha	STUP Consultant	9971104449	
28	Amit Soni	STUP Consultant	9811969871	
29	Jaideep Dowarah	Creative	9416042624	
30	K C Agarwal	PCHWO, PMU, Jaipur	9414782355	
31	Pradeep Garg	Addl CE, PMU	9414257244	
32	Dinesh Kumar	RVIDP J.E	9462254563	
33	Vikram Singh	—	9462262922	
34	Vishram Singh	P-M-CAL	9680734922	
35	Munni Lal	Site Supvr	9929429292	
36	Keshav Purohit		9828376547	
37	[illegible]	[illegible]	9414086398	
38	Dinesh Verma	Executive Engineer RVIDP, Churu	9828426880	
39				

Photographs of CLC Meeting

Newspaper coverage and Photographs of CLC meeting-Ratangarh (Churu)

रतनगढ़ में 280 करोड़ में होगा सीवरेज का काम, पानी की समस्या का होगा स्थाई समाधान

सरदारशहर में 219 किमी की पाइप लाइन व तीन एसटीपी का निर्माण

भास्कर संवाददाता | चूरू

आरयूआईडीपी की तरफ से रतनगढ़ में 280 करोड़ रुपए खर्च कर सीवरेज योजना का काम शुरू किया जाएगा। कलेक्ट्रेट सभागार में रतनगढ़ व सरदारशहर में सीवरेज व पानी आपूर्ति परियोजना की डीपीआर अनुमोदन को लेकर देवस्थान राज्य मंत्री की उपस्थिति में सिटी लेवल कमेटी की हुई बैठक में यह बताया गया। कलेक्टर मुक्तानंद अग्रवाल की अध्यक्षता में हुई बैठक में रतनगढ़ के तकनीकी सलाहकार फर्म की तरफ से रतनगढ के लिए 279.30 करोड़ रुपये की सीवरेज परियोजना प्रस्तुत की गई। बताया गया परियोजना के तहत 219 किमी की पाइप लाइन व तीन एसटीपी और एक एसपीएस का निर्माण करवाया जाएगा। इसी तरह सरदारशहर के लिए तकनीकी सलाहकार फर्म की तरफ से कुल 226.87 करोड रुपए की लागत से पानी सप्लाई व शेष रहे सीवरेज कार्य के लिए 140.23 करोड़ रुपए की परियोजना का काम करवाया जायेगा। इसमें पानी की परियोजना के लिए एक 2000 केएल का सीडब्लुआर व 207 किमी पाइप लाइन डाली जाएगी। सीवरेज परियोजना में एक नया एसटीपी तथा दो पुराने एसटीपी का प्रसार किए जाने के साथ 82 किमी सीवर लाइन डालना प्रस्तावित है। कलेक्टर अग्रवाल ने दोनों कस्बों में सीवरेज लाइन की सफाई के लिए इस योजना में सीवेज जेटींग मशीन खरीदने का सुझाव दिया। मंत्री रिणवा और रतनगढ़ नगरपालिका के अध्यक्ष इन्द्रकुमार ने सुझाव दिए। अतिरिक्त मुख्य अभियंता प्रदीप गर्ग ने पूरी योजना की जानकारी दी।

चूरू. कलेक्ट्रेट सभागार में बैठक में बोलते मंत्री राजकुमार रिणवा व कलेक्टर।

Appendix 19: Sample Grievance Registration Form

(To be available in Hindi and English)

The _____Project welcomes complaints, suggestions, queries and comments regarding project implementation.
Aggravated persons may provide grievance with their name and contact information to enable us to get in touch for clarification and feedback.
In case, someone chooses not to include personal details and wants that the information provided to remain confidential, please indicate by writing/typing *(CONFIDENTIAL)* above Grievance Format.
Thank you.

Date		**Place of registration**			
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 Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	

Appendix 20: Officer order for establishing GRM

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RUIDP

Government of Rajasthan
Office of Project Director
Rajasthan Urban Infrastructure Development Project
AVS Building, Jawahar Circle, JLN Marg, Jaipur - 302017
Tel No.: 0141-2721966, Fax No.: 0141-2721919, email : mail@ruidp.gov.in, web site : www.ruidp.gov.in

F3(301)(50)RUIDP/PMU/PH-IV/WS/GENERAL/ 1282 Dated: ~~04.2018~~ 04/05/18

Office - Order

Subject:- **Grievance Redress Mechanism for Rajasthan Secondary Town Development Investment Program (RSTDIP) - RUIDP Phase IV**

Reference: - Agreed Resettlement & Environmental framework -3183 IND (RUIDP Phase III) - https://www.adb.org/projects/42267-026/main#project-documents

It is directed that Grievance Mechanism of RUIDP Phase III will be replicated in RUIDP Phase IV and accordingly, PIU will maintain/ ensure proper records of safeguard related Grievances received in their town. PIU will also ensure that the safeguard related Grievances received are resolved as per Grievance Redress Mechanism (GRM) prescribed in RP which is summarized as under (for ready reference):-

Methodology of multi-tier GRM	Responsibility/Action to be taken	Time Frame	Record Keeping
1st level: Grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel from PIU will provide the most easily accessible or first level of contact for quick resolution of grievances	SE/EE PIU will resolve issues in consultation with supervision personnel, Contractor.	PIU will resolve issues within 3 days of receipt of a complaint/ grievance.	The grievance register will be endorsed by all field agencies involved in implementation of EMP and RP.
2nd level: All grievances that cannot be redressed within 3 days at field will be referred to PMU through PO Social/Environment by PIU.	Project Officers (Environment/Social) PMU in consultation with PMU, PIUand the Contractor will resolve the issued referred.	PMU will resolve issues within 7 days of receipt of a complaint/ grievance	PIU will keep records of the matter referred to PMU and will documents the outcome of each grievance resolved in the Grievance Register.
3rd level: All the grievances that are not addressed by PMU within 7 days, will be brought to the notice of Grievance Redress Committee (GRC). The City Level Committee (CLC), which will be established in every project town will act as GRC	SE/EE PIU will coordinate with PO Social/ PO Environment or other official of PMUand will prepare agenda for the GRC meeting accordingly and ensure keeping the same in GRC.	The GRC will resolve the grievance within 15 days of receiving the complaint	PIU will be responsible to see through the process of redress of each grievance and document the outcomes.
4th level: Very major issues that are beyond the jurisdictional authority of the CLC or those that have the potential to cause social conflicts or environmental damage or those that remain unresolved at PMU/CLC level, will be referred to the Empowered Committee (EC).	SE/EE PIU will assist PMU officials to prepare agenda for the Empowered committee meeting.		SE/EE PIU will keep records of Empowered committee meeting and will ensure documentation of outcome.
Please note that 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.			

PIUs will be responsible to ensure redressal of grievances as per GRM procedures summarized above and intimate to the complainant.

Contractor's will keep information board depicting Grievance registration numbers at each working site,Grievance registration form andwill maintain Grievance Registers(refer annexure 1 &2).

(G. S. Hada) 15/5/18
Addl. Project Director, RUIDP

F3(301)(50)RUIDP/PMU/PH-IV/WS/GENERAL/ 1283-84 Dated: ~~04.2018~~ 04/05/18

Copy to following for information and necessary action.

1) PA to PD /CE /FA/DyPD(A)/SE(WS)/SE(WW)/PO(Environment)/PO(Social)/, RUIDP, Jaipur
2) All EE, PIU, Phase-IV for ensureing maintenance of the Grievance register and helpline and for resolving of Grievances.

(K. M. Mandawaria)
PO(Co-ord.&Social)

Appendix 21: Sample Environmental Site Inspection Checklist

Project Name
Contract Number

NAME: _____ DATE: _____

TITLE: _____ DMA: _____

LOCATION: _____ GROUP: _____

WEATHER: _____

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Monitoring Items	Compliance
Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI)	
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 **Name**
Position **Position**

Appendix 22: Semi Annual Environmental Monitoring Report Format

I. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status

- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M)[a]	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
				%Physical Progress	Expected Completion Date

[a] If on-going construction, include %physical progress and expected date of completion.

II. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS[a]

Package No.	Subproject Name	Statutory Environmental Requirements[b]	Status of Compliance[c]	Validity if obtained	Action Required	Specific Conditions that will require

						environmental monitoring as per Environment Clearance, Consent/Permit to Establish[d]

[a] 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.

[b] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

[c] Specify if obtained, submitted and awaiting approval, application not yet submitted.

[d] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

III. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

No. (List schedule and paragraph number of Loan Agreement)	**Covenant**	**Status of Compliance**	**Action Required**

IV. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

Package Number	**Components**	**Design Status (Preliminary Design Stage/Detailed Design Completed)**	**Final IEE based on Detailed Design**				**Site-specific EMP (or Construction EMP) approved by Project Director? (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)**		

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.

- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:

(i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

(ii) **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).

- 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 (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
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)[a]

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

[a] Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

V. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

VI. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (ambient air, water quality and noise levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)			
			PM10 µg/m^3	PM2.5 µg/m^3	SO2 µg/m^3	NO2 µg/m^3

Surface Water Quality Results

S.No.	Parameters	Results		
		Location-1 (Name)	Location-2 (Name)	Location-3 (Name)
1.	pH			
2.	Turbidity			
3.	Total Hardness			
4.	DO			
5.	BOD			
6.	COD			
7.	Chloride			
8.	Iron			
9.	TSS			
10.	Arsenic			
11.	Cadmium			
12.	Fluoride			
13.	Potassium			
14.	Sodium			
15.	Calcium			

16.	Zn			
17.	Cr^{+6}			
18.	Magnesium			
19.	Copper			
20.	Manganese			
21.	Sulphate			
22.	Cyanide			
23.	Nitrate			
24.	Lead			
25.	Boron			
26.	Selenium			
27.	Aluminium			
28.	Total residual Chlorine			

Ground water Quality Results

S.No.	Parameters	Results		
		Location-1 (Name)	Location-2 (Name)	Location-3 (Name)
1.	pH			
2.	Total Alkalinity			
3.	Total Hardness			
4.	Chloride			
5.	Iron			
6.	TDS			
7.	Arsenic			
8.	Fluoride			
9.	Zn			
10.	Cr+6			
11.	Copper			
12.	Manganese			
13.	Sulphate			
14.	Phosphate			
15.	Nitrate			
16.	Lead			
17.	Phenolic Compound			

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

VII. ASBESTOS MANAGEMENT

Information on encountered or potential asbestos materials and capacity building activities on project sites should be included in this section.

FORM I – ASBETOS INVENTORY, INSPECTION AND ACTION FORM Format: RUIDP/IIA/ LOCATION/NAME OF DBO CONTRACTOR/HSE 002/YEAR	
Location:	
Site	

coordinates:		
Elevation:	**Team:**	
Date of visit:	**Sign:**	
Present Status		Indicate if installed, operational, in storage, etc.
Original age		Months or years since installation
Diameter		mm or inches
Length		meters
Volume		
Total packet		
Packing date		
Disposal date		
Existing Site (Photo or illustrations):		
Illustration/ Design of Activities On-site with respect to existing asbestos (include details such as size of new pipes, distance from existing AC pipes, other notable observations)		
DBO Contractor Handling Asbestos:		
Number of persons handling waste		
Medical Records		
Safety Gears		
Vocational Training Last Conducted: Number of attendees: Conducted by Schedule:		
Required Actions:		
Remarks		
Conclusion/Remark **HSE Signatory**		

MATRIX FOR TRAINING & RECORDS

Format: RUIDP/INSP.MATRIX/LOCATION/NAME OF DBO CONTRACTOR/HSE 001/YEAR			
S. No.	**Aspects of Asbestos Materials**	**Check points**	**Remarks**
Training Schedule:			
Trainer Details:			
Date/Location of Training:			
Number of attendees:			
Training Schedule, Training Materials & Attendance Sheet, Feedback of Trainees.			
Understanding of:			
A. DOCUMENTS AND RECORDS			
1.	Site Inventory		
2.	List of Asbestos materials storage and installation points		
3.	Structure of Asbestos materials management committee		

B. INVENTORY				
1.	Inventory of Asbestos materials			
	Number of Asbestos materials/ pipes			
	Dimensions of Asbestos materials/ pipes			
	Total volume of Asbestos materials/ pipes			
2.	Storage facility/ installation location:			
A.	In-use	Location		
		Condition	Intact/ damaged	
		Purpose		
		Accessibility by the workers		
		Evidence of physical damage and approximate size (length, width, volume) without coming into contact with The damaged Asbestos materials		
		Impacts on the environment (Based on Asbestos fiber Monitoring)		
3.	**LABELING AND SIGNAGE**			
	Notification to workplace safety and health			
	Working instruction			
	The risks associated with exposure to asbestos fibers			
	Cautionary statement to not disturb materials containing asbestos			
4.	**PERSONAL PROTECTIVE EQUIPMENT (PPE)**			
	Record of PPE			
	Mask			
	Eye glasses			
	Gloves			
	Ear muffs			
	Others			
	Training			
	On occupational risks of asbestos to the workers		Date: Time: In-house/ external: Faculty: No of workers attended:	
	Training for maintenance, repair and renovation		Date: Time: In-house/ external: Faculty: No of workers attended:	
	Training for workers working with asbestos		Date: Time: In-house/ external: Faculty: No of workers attended:	
	Periodic air quality monitoring records		• Within the permissible limits • Not within the permissible limits (specify the reason)	

	Workers medical check-up records	Date: In-house/ external: Performed by: Remarks: No of workers attended:
Conclusion/Remark: **EHS Officer Signatory:**		

ASBESTOS MANAGEMENT
In-situ Storage of Asbestos materials

S.No	Activity	Number of Stacks	Area occupied	Details of Asbestos materials Pipes	Day/month/year Of storage
Site History					
For existing Stacks, details of re-handling of pipes in number or volume to be mentioned under supervision of Authorized Experts.					
Details of Location of re-handled Asbestos materials storage, new area should be • Minimum 10-15 ft away from campus habituation. • 250m away from the water sources • 500-800m away from Children play area • The area should be isolated and covered from all the sides with restricted Access for Authorised Experts Only. • Register to be maintained for Entry& Exit of personals. • Register to be maintained for Entry & Exit of Asbestos materials • Labels to be displayed in legible format • Specific training of Asbestos materials to be inducted in the Asbestos materials storage area for residing population in the campus.					
Details of transit storage of Asbestos materials to be maintained as per norms in an isolated storage room full covered					

VIII. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

IX. APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

Appendix 23: Site Preparation Information and Checklist for Solid Waste Transport

नगरपालिका मण्डल, रतनगढ़ (राजस्थान)

दिनांक 20/02/2020

क्रमांक:–नपार/2020/ 4170

बनाम्

मैसर्स स्वामी कन्स्ट्रा०
रतनगढ़

विषय :– का र्या दे श

विषयान्तर्गत पालिका द्वारा निम्नांकित कार्य की सामने अंकित निविदा दर को स्वीकार कर लेने पर राजकीय नियमों व उपबन्धों के अनुसार निम्नांकित विवरण के अनुसार कार्यादेश दिया जाता है :–

क्र.सं.	कार्य का नाम	अनुमानित लागत	स्वीकृत दर	कुल लागत
1	Construcation of M.R.F. Station and composting Platform Ratangarh	25.00 लाख	13.37%Below	2165750/–

ले–आऊट प्राप्ति का दिनांक – 24/02/2020
कार्य प्रारम्भ का दिनांक – 02/03/2020
कार्य पूर्ण करने का दिनांक – 01/06/2020

संवेदक दिनांक 27/02/20 तक कार्यालय में उपस्थित होकर अनुबंध पत्र सम्पादित करवावें एवं कुल लागत का 0.25 प्रतिशत का नॉन ज्युडिशियल स्टाम्प पेपर साथ लेकर आवे।

कनिष्ठ अभियन्ता कार्य शुरू कराने से पूर्व सक्षम अधिकारी से तकनीकी स्वीकृति प्राप्त कर ली गई है, के बाबत आश्वस्त हो जावे।

कुल लागत की सीमा (निविदा दर सहित) में ही कार्य पूर्ण करावें व कार्य करते समय जो भी नुकशान हुआ उसके हर्जे व खर्चे की समस्त जिम्मेदारी संवेदक की होगी।

संवेदक पालिका कनिष्ठ अभियन्ता से निर्धारित तिथि तक ले– आऊट प्राप्त कर लेवें। संवेदक द्वारा उपस्थित नहीं आने या ले–आऊट नहीं लिये जाने पर अवधि व्यतीत होते ही कनिष्ठ अभियन्ता रिपोर्ट करें।

निर्माण कार्य की सूचना संबंधित बोर्ड जिसमें निर्माण कार्य का नाम कार्यादेश की राशि, कार्य की स्वीकृति दिनांक, कार्य शुरू करने की दिनांक, कार्य सम्पादन करने की दिनांक, संवेदक का नाम एवं दुरभाष नम्बर, डिफेक्ट लाईबिल्टी अवधि एवं संबंधित अभियन्ता का नाम एवं दुरभाष नम्बर की समस्त जिम्मेदारी संवेदक की होगी।

संवेदक कार्य स्थल के कार्य शुरू करने से पूर्व व कार्य पूर्ण होने के बाद के पोस्टकार्ड साईज 2 फोटोग्राफ अपने स्वयं के व्यय से तैयार करवाकर अंतिम बिल से पूर्व पेश करनी होगी।

उपरोक्त कार्यादेश व निविदा शर्तों की पालना पश्चात ही फाईनल बिल का भुगतान किया जायेगा।

कार्यादेश पर राज्य सरकार द्वारा जारी आदेश व निर्देश लागू होंगे एवम् पालना की जावेगी।

अधिशाषी अधिकारी
नगरपालिका रतनगढ़

क्रमांक:–नपार/2020/ 4170 – 74 दिनांक 20/02/2020

प्रतिलिपि सूचनार्थ एवं आवश्यक कार्यवाही हेतु:–

01. सहायक अभियन्ता/कनिष्ठ अभियन्ता, नगरपालिका मण्डल, रतनगढ़
02. लेखा शाखा, नगरपालिका मण्डल, रतनगढ़
03. रिर्जव पत्रावली

अधिशाषी अधिकारी
नगरपालिका रतनगढ़

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Checklists for Transportation and Disposal of Solid Waste

Checklist-1: Generation Information

1. Date of filling Checklist-
2. Name of Town- Ratangarh
3. Place from where Solid Waste to be removed (A)-
4. Approximate quantity of solid waste present at site-
5. Place where Solid Waste to be transferred (B)-
6. Approximate area of B-
7. Approximate quantity of Solid Waste, which can be stored at B after transfer from A-
8. Mode of transportation (truck/tractor/dumper/other)-
9. How may numbers of vehicles are being used for transportation-
10. Vehicle and operator details- Provide following details-

S.No.	**Name and type of vehicles**	**Vehicle registration number**	**Name of operator and valid driving licence number**	**Capacity of vehicle/trip**	**PUC number**
1					
2					
3					
4					

Checklist 2: Information about transportation of Solid Waste

1. Date-
2. Vehicle no-
3. Name of operator-
4. Trip number of this vehicle today-

Loading Information		**Unloading information**	
Mode of loading (Manual/mechanical)		Mode of unloading (Manual/mechanical)	
How much quantity loaded of SW (approx.)		How much quantity unloaded of SW (approx.)	
Is vehicle overloaded, which may spill off		Is any sign of spill off noted	
What is state of SW (solid/semi-solid)			
What are major items in Solid Waste to be transported			
Is appropriate PPEs provided to workers/operators during loading		Is appropriate PPEs provided to workers/operators during unloading	
Is there cover provided for SW during transportation		Is cover fully tied at time of arrival	
Opening KM reading		Closing KM reading	
Time of Start		Time of end	

Total KM run in this trip-
Total Time taken in this trip-

Appendix 24: WHO Interim Guidance on Water, Sanitation, Hygiene and Waste Management for the COVID19 virus

World Health Organization

unicef

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.[1] 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,[2-4] and two studies detected COVID-19 viral RNA fragments in the faecal matter of COVID-19 patients.[5,6] However, only one study has cultured the COVID-19 virus from a single stool specimen.[7] 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.[8] 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[9] at 23°C to 2 weeks[10] 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.[11] 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.[12] 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.[10] 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.[13] 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 $\geqslant$0.5 mg/L after at least 30 minutes of contact time at pH $<$8.0.[12] 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 outerwear, 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.[14] 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 bedsheets 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.[14]

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".[15] 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.[16] When hands are visibly dirty, they should be washed with soap and water for 40–60 seconds using the appropriate technique.[17] 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.[18] 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.[19] 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,[20] together with standard wastewater treatment.[21] 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.[22] Similar concerns have been raised about the spread of the COVID-19 virus from faulty toilets in high-rise apartment buildings.[23] 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,[24] 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).[21] 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[18] 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.[25] 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.[26]

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 offsite, 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.[19] 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.[27] 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.[27]

6. Safely 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.[28]

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.[17] 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 beside 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,[29] and hand hygiene with an alcohol-based hand rub or soap and water should be performed after removing PPE.

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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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WHO reference number: WHO/2019-nCoV/IPC_WASH/2020.2