Initial Environmental Examination

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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

ACM	–	Asbestos containing Material
ADB	–	Asian Development Bank
AMP	–	Asbestos Management Plan
ASI	–	Archeological Survey of India
BOCW	–	Building and Other Construction Workers
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
CWR	–	Clear Water Reservoir
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
GLSR	–	Ground Level Service Reservoir
IEE	–	Initial Environmental Examination
IFC	–	International Finance Corporation
LPCD	–	Liters per Capita per Day
LSGD	–	Local Self Government Department
CMC	–	Million Cubic Meter
MLD	–	Million Liters per Day
MOEFCC	–	Ministry of Environment, Forest and Climate Change
NHAI	–	National Highways Authority of India
NOC	–	No Objection Certificate
OHSR	–	Overhead Service Reservoir
PHED	–	Public Health Engineering Department
PIU	–	Project Implementation Unit
PMU	–	Project Management Unit
PWD	–	Public Works Department
REA	–	Rapid Environmental Assessment
RIICO	–	Rajasthan Industrial Infrastructure Corporation
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
SCADA	–	Supervisory Control and Data Acquisition
SBR	–	Sequential Batch Reactor
SEIAA	–	State Environmental Impact Assessment Authority
SPS	–	Safeguard Policy Statement, 2009
STP	–	Sewage Treatment Plant
TEER	–	Treated Effluent Elevated Reservoir
TESR	–	Treated Effluent Storage Reservoir
ULB	–	Urban Local Body
WHO	–	World Health Organization
WRD	–	Water Resources Department
WTP	–	Water Treatment Plant

WEIGHTS AND MEASURES

m^3	–	cubic meter
dB	–	decibels
^oC	–	degree centigrade
dia	–	diameter
kg	–	kilogram
kl	–	kiloliter
km	–	kilometer
kmph	–	kilometer per hour
KLD	–	kiloliters per day
ha	–	hectare
HP	–	horsepower
LPCD	–	liters per capita per day
lps	–	liters per second
m	–	meter
mg	–	milligram
mm	–	millimeter
MCM	–	million cubic meter
MLD	–	million liters per day
km^2	–	square kilometer

NOTE

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 (RUDSICO), previously known as Rajasthan Urban Infrastructure Development Project (RUIDP). RSTDSP will support the ongoing efforts of the Government of Rajasthan towards improving the water and wastewater services in about 14 towns.[1] RSTDSP seeks to improve water supply and sewerage (WSS) 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 (km) of water supply pipelines will be commissioned through a district metered area approach for effective non-revenue water (NRW) management; (ii) about 100,000 households will be connected to an improved water supply system (including at least 95% below poverty line [BPL] households) with 100% functional meters allowing for the introduction of volumetric billing; (iii) 3 new water treatment plants (WTP) will be commissioned with total capacity of at least 28 million liters per day (MLD); and (iv) 2 WTP will be rehabilitated;
- **Output 2**: Sanitation systems in project towns improved with climate-resilient, cost-effective and inclusive features.[5] By 2027: (i) about 1,300 km of sewers will be constructed; (ii) 19 sewerage treatment plants (STPs) with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 million liters per day (MLD) 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 kiloliters per day (KLD) capacity will be commissioned; and (v) agreements for reuse of wastewater mainly for industry or agriculture will be signed in at least 5 project urban local bodies (ULBs); and
- **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 Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation (RUDSICO); (ii) about 500 staff and 500 elected representatives of project ULBs, including 80% of eligible women, will report increased knowledge on operation and maintenance (O&M) of WSS services, citywide inclusive sanitation (CWIS), financial sustainability and gender equality and social inclusion (GESI) action plan implementation; (iii) about 500 girls will report enhanced knowledge in

[1] The project towns under consideration for the sector loan are: Abu Road, Banswara, Didwana, Fatehpur, Khetri, Kuchaman, Ladnu, Laxmangarh, Makrana, Mandawa, Pratapgarh, Ratangarh, Sardarshahar and Sirohi. Of these towns, Khetri and Mandawa are heritage towns.

conducting water audits in schools and households; and (iv) data platforms will be established in all project towns.[6]

Khetri Town water supply and sewerage subproject is one of the subprojects proposed under the investment component of Phase IV of RUDSICO. At present, water supply in Khetri is intermittent, unreliable and suffers with huge losses and quality issues. Existing source of Khetri town is ground water. The town is benefited from 7 no. of tube wells situated about 2.5 km from Bankoti. There is no sewerage system in the town. Due to lack of sewerage system, most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage is let off into open drains which ultimately collect 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 Khetri water supply and sewerage subproject.

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

Khetri water supply and sewerage subproject is classified as environmental category B as per the SPS as no significant impacts are envisaged. Accordingly, this IEE assesses the environmental impacts and provides mitigation and monitoring measures to ensure that there are no significant impacts as a result of the project.

The subproject is formulated to address gaps in water and sewerage infrastructure in a holistic and integrated manner. The main objective of the RUDSICO-EAP Phase IV is to improve water efficiency, security, and provide safe sewage collection and with the on-going investments in sewage treatment, this will have an important effect on public health and environment. Investments under this subproject include: Water supply (i) construction of 1 clear water reservoir (CWR) of 500 kiloliter (kl) capacity and CWR pump house is proposed at Public Health Engineering Department (PHED) campus; (ii) proposed transmission mains of 6.625 km of ductile iron K-9 pipe with pipe diameter ranges 100-350 millimeter (mm); (iii) proposed distribution of 44 km of ductile iron K-7 Pipe with pipe diameter ranging 100-300 mm to cover 100% municipal area; (iv) provision for supervisory control and data acquisition (SCADA) system; (v) provision for 4,400 house service connections; (vi) refurbishment of existing CWRs, ESRs, for existing tube wells- submersible motor pumps, existing faulty/old cables, existing leaked/worn out riser pipe, the existing old and damaged panel board; (vii) provision of SCADA system; and (viii) electrical and mechanical works.

Sewerage Works includes: (i) construction of 1 STP of 3.15 MLD with sequential batch reactor (SBR) technology near Khariya Kua including co-treatment of fecal sludge; (ii) laying of 34 km sewer lines in Khetri Town including 0.30 km of sewer network having depth more than 3.5 m and of different diameter are proposed to be laid using trenchless technology; (iii) construction of 2231 manholes; (iv) 4300 house service connection and provide 2 trucks (1 nos.-4000 L & 1 nos.-1000 L) for desludging of septic tanks from 300 (at year 2026) household and safe transportation and disposal to new; (v) reuse of treated effluent - design, construction, execution, testing and commissioning of treated effluent elevated reservoir (TEER), treated effluent storage reservoir (TESR), effluent pumping station; (vi) disposal of treated effluent land sludge management; (vii) electrical and mechanical works; (viii) O&M - 10 years operating; and (ix) Maintenance of Sewerage System (from inspection chamber to STP) including collection.

Raw Water Source and Sustainability. Water demand of Khetri Town for year 2036 and 2051 are 3.78 MLD & 4.34 MLD respectively. Against demand of year 2036 and 2051 only 1.30 MLD is available with existing tube wells (TWs). Balance deficit demand will be supplied by canal water. Additional new source of surface water from "Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II" is being executed by PHED and at commissioning stage. Water has been reached at Khetri Town from surface source. Khetri will get deficit water (excluding groundwater) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal". The work of pipeline system from canal off take point to JE office has been completed. WTP of this scheme is at Malsisar Town around 80 km from Khetri. This will be a feasible source for water supply and the water allocation letter from the PHED Rajasthan is obtained.

Description of the Environment. Subproject components are located in Khetri Town in Jhunjhunu and in its immediate surroundings which were converted into urban use for many years, and there is no natural habitat left at these sites. The project sites are located in Government lands for structures and for pipe laying in existing road right-of-way (ROW). The town is beside a recently protected area–the Bansiyal Khetri conservation reserve but the subproject components are not within the conservation area. Soils are deep, and do not require cutting of rocks for pipe laying. The climate of Khetri is dry and hot in summers and cold in winters. Khetri is known to be a heritage town in Rajasthan. There are various physical and cultural resources[2] (PCRs) in the town such as state-protected monuments and heritage sites. Due planning and care are considered to ensure to avoid damages to these physical cultural resources.

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. The scope is not within the environmentally sensitive area in Khetri and there are several PCRs and historical sites in the town that require due consideration to avoid damage. These include Panna Sagar Talab, Gopinath Temple among others. Heritage Impact

2 ADB SPS, 2009 defines physical cultural resources 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.

Assessment is conducted, and corresponding mitigation measures recommended as part of this IEE providing guidance on preserving these important resources.

Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to be conducted during construction. The environmental monitoring program will ensure that all measures are implemented and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for corrective action will be reported to the ADB.

Measures such as appropriate scheduling of works (non-monsoon season, low traffic hours, etc.), and minimizing inconvenience by best construction methods will be employed like trenchless pipe laying for sewer for the depth of more than 3.5 m and in areas where traffic is more. Traffic management plan will be prepared by contractor before start of construction works for pipe/sewer-laying works on busy roads. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

Subproject includes rehabilitation of existing infrastructure like tube wells and overhead service reservoirs (OHSRs). Presence of asbestos containing material (ACM), mainly asbestos cement pipes in the existing infrastructure is a main concern. Asbestos is recognized as a cause of various diseases and is considered health hazard if inhaled. Nearly 22 km of underground water transmission and distribution system consists asbestos cement pipes of 80-250 mm diameter (dia). It is normal practice in Rajasthan that existing asbestos cement pipes are left as it is in the ground and new pipes will be laid in a new alignment. However, complete avoidance of handling and disposal of asbestos cement pipes may not be possible. Various measures are suggested including development and implementation of asbestos management plan (AMP).

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) selection of construction methodology for intake on dams; (ii) proper planning of sewer and water supply works to minimize the public inconvenience; (iii) barricading, dust suppression and control measures; (iiiv) 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 (vi) finding beneficial use of excavated materials to extent possible to reduce the disposal quantity. EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and include observations on- and off-site, document checks, and interviews with workers and beneficiaries. A copy of the updated EMP/site environmental management plan (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 raw and treated water quality, treatment efficiency of STP (raw and treated sewage quality), sludge at WTP and STPs. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the EMP. The estimated implementation cost of the EMP is INR 13,099,410 (USD 175,980). This indicative cost includes INR 1,400,000 for asbestos management (identification, inventory, removal, transport, temporary storage, disposal/treatment and overall supervision of contractor works related to asbestos materials) and INR 700,000 for heritage management (physical cultural resources survey and site verification, consultations, documentation of baseline conditions, assessment of mitigation requirements, supervision of contractors, documentation and reporting).

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/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 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 2 zonal offices in Jaipur and Jodhpur, and project implementation units (PIUs) in each project town/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 management 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 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/PMU websites.

Conclusions. The citizens of the Khetri Town will be the major beneficiaries of this subproject. With the improved water supply, they will be provided with a constant supply of better-quality water, piped into their homes. The sewerage system will remove the human waste from their homes safely and quickly. Combined with the ongoing investments in sewage treatment, this subproject, in addition to improved environmental conditions, will improve the over-all health condition of the town. People would spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

The subproject is 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. No further special study or detailed EIA needs to be undertaken to comply with ADB SPS, 2009 or Government of India EIA Notification, 2006. To conform to government guidelines WTP and STPs requires consent to establishment (CTE) and consent to operate (CTO) from Rajasthan Pollution Control Board. CTE will be obtained prior to construction, as the detailed designs will be undertaken by contractor.

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) Update the asbestos management plan per site-specific conditions;
(iv) Update and implement the recommendations from the heritage impact assessment (HIA), including the harmonization of architecture and design to the town’s physical cultural resources’ identity;
(v) Update/revise this IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location;
(vi) Conduct safeguards induction to the contractor upon award of contract;
(vii) Strictly supervise EMP implementation;
(viii) Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2000 and amendment) and solid waste;
(ix) Ensure contractor appointed qualified environment, health and safety (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 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 towards improving the water and wastewater services in about 14 towns.[3] RSTDSP seeks to improve water supply and sanitation (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;[4] and health status of urban population, especially the poor and under-privileged improved.[5] The project will have the following outcome: urban service delivery in secondary towns of Rajasthan improved. There are three outputs.

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

(ii) **Output 2**: Sanitation systems in project towns improved with climate-resilient, cost-effective and inclusive features.[6] By 2027: (i) about 1,300 km of sewers will be constructed, (ii) 19 STPs with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 MLD 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 kiloliters per day (KLD) 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.

(iii) **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

[3] The project towns under consideration for the sector loan are: Abu Road, Banswara, Didwana, Fatehpur, Khetri, Kuchaman, Ladnu, Laxmangarh, Makrana, Mandawa, Pratapgarh, Ratangarh, Sardarshahar and Sirohi. Of these towns, Khetri and Mandawa are heritage towns.

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

[5] Government of Rajasthan. 2016. State Sewerage and Wastewater Policy. Jaipur.

[6] 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.

ULBs, including 80% of eligible women, will report increased knowledge on O&M of WSS services, citywide inclusive sanitation (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.[7]

2. A series of subprojects will be implemented under the Project, with each subproject providing improvements to water supply or sanitation (on-site or off-site) or both in a project town. Khetri Town water supply and sewerage subproject is one of the subprojects proposed in RUDSICO. Presently, source of water for existing water supply in Khetri Town is ground water. Water supply is currently intermittent and suffers with huge losses and quality issues. At present no sewerage system exists in the town. Though some works of sewer is under progress in the town, but overall sewer system is non-functional in the town. Due to lack of sewerage system, most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage 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 water supply and sanitation in the town. For sanitation, sewerage will be limited to the core areas and fecal sludge management will be improved for areas not served by sewers. 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. 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 Water Supply and 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 Khetri water supply and 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

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

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.

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 11 section and 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. Khetri Town

8. Khetri is a town and a municipality in Jhunjhunu district in the Indian state of Rajasthan. It is part of Shekhawati region and belongs to Jaipur Division. Geographically, it is situated at 27.98^{o}N latitude and 75.8^{o}E longitude. It is located 145 km towards North from district Jaipur. It is a Tehsil head quarter. Khetri is one of the 42 project towns selected for implementation of the ADB-funded RUDSICO-EAP Phase IV projects. Under the investment component of the project, it is proposed to improve the water supply and sewerage system in Khetri Town.

B. Present Status of Water Supply and Sewerage

9. **Water Supply**. Presently source of water for existing water supply in Khetri Town is groundwater. The town is benefited from 7 tube wells situated about 2.5 km from Bankoti. Water collected from 7 tube wells are collected at 900 kiloliters (kl) CWR at Bankoti and from there reaches by gravity to clear water reservoir (CWR) at JE office and further it transferred to ESR/GLSRs in the town. Total water abstracted from tube wells is 1.3 MLD (7 TW). The tube wells are fitted with submersible pumps. Presently, 1.3 MLD water is abstracted from 7 TWs and present service level of Khetri Town is about 30-35 LPCD (frequency once in week). Three CWR are available of capacity 260, 450 and 900 kl.

10. **Transmission Mains.** For transferring water from CWR to overhead service reservoir (OHSR)/ ground-level reservoirs (GLRs), pumping machinery area used. At present one main pump house and one booster pump house running for pumping water to zonal OHSR/GLSRs. As all these pumps have served their useful lives, they work at very low efficiency. Refurbishing them under the present condition will be uneconomical. Water Collected at CWR at JE office from 7 no. of tube well is transferred through various OHSR's. All asbestos cement (AC) transmission mains need to be phased out as very heavy leakages are reported at joints There is 1 no of OHSR located in Khetri town. The capacity of the OHSR is 150 KL. In addition to this, 6 GLRs are also located in the town. Entire town has been divided into 7 water supply distribution zones with gravity fed from zonal OHSRs/GLRs.

11. **Distribution System.** Entire town has been divided into seven (7) water supply distribution zones with gravity fed from zonal OHSRs and GLRs. The existing distribution system with AC and PVC pipes are old with heavy leakages due to breakages due to aging and hence need to be phased out.

12. At present, an intermittent water supply system is running in the town with actual service level 30-35 LPCD (frequency once in a week) at consumers' end, which is less than standard of 135 LPCD. The supply duration is about 1 to 1.5 hours with low pressure. This is due to heavy losses in the existing distribution network of about 40-45%. Presently about 70-80% area of municipality limit is covered under the drinking water supply scheme by PHED.

13. **Sewerage.** Khetri Municipality does not have any organized sewerage system. Presently, the wastewater from kitchens and bathrooms is discharged into storm water drains culminating finally to the Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. Most of the residential and commercial buildings and educational institutions have on-site septic tanks and soak pits. Though septic tanks are an accepted onsite treatment, but as the septic tanks are not designed and

maintained properly, the effluent does not confirm to the standards. The effluent from the septic tanks is directly let into the open drains.

14. In the absence of a safe disposal system for sewage, the people of Khetriare facing unhealthy and unhygienic environmental conditions therefore public representatives are also demanding facilities of sewerage system on priority basis. Water supply is also not adequate in terms of quantity and quality therefore the town requires sound water supply and sewerage system

C. Proposed water supply and sewerage Infrastructure in Khetri under RSTDSP

15. Water Supply Works. As described above, the existing water supply system in Khetri suffers from various issues and resulting inadequate and intermittent supply. It is proposed to improve the water supply system in Khetri under RSTDSP to meet the following objectives:

(i) The subproject will benefit the total population of Khetri - currently 18,209 (based on 2011 Census) and estimated to increase to 36,457 by 2051.
(ii) Increase in per capita water supply availability for the residents from 30-35 LPCD to 135 LPCD;
(iii) To establish continuous pressurized water supply system to consumers with quality and quantity at required pressure;
(iv) To adopt energy efficient water treatment processes and electromechanical machinery;
(v) To reduce NRW as per performance indicators using district metering areas (DMA) approach;
(vi) To ensure 100 % house service connections with metering for water supply; and
(vii) 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.

16. **Water Demand and Supply.** Per capita water supply rate of 135 liters per day is considered for Khetri Town. Water demand of Khetri Town for year 2036 and 2051 are 3.78 MLD and 4.34 MLD respectively. Against demand of year 2036 and 2051, only 1.30 MLD is available with existing TWs (Table 1). Balance deficit demand will be supplied by canal water. Additional new source of surface water from “Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II” from where treated water will be available is being executed by PHED and at commissioning stage. The water treatment plant (WTP) of this scheme is at Malsisar Town around 80 km from Khetri. water has been reached at Khetri Town from surface source. Khetri will get deficit water (excluding GW) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal”. The work of pipeline system from canal off take point to JE office has been completed. This will be a feasible source for water supply and the water allocation letter from the PHED Rajasthan is obtained (Appendix 14 – Letter from PHED Office of the Chief Engineer).

Table 1: Population and Water Demand

Year	Stage	Population	Water Demand at Consumer end	Total Water Demand	Total Available Water (Surface+TWs)	Treated Surface Water*	TWs near Bankoti Village
			MLD				
2021	Base Year	20,594	2.78	3.15	4.40	3.10	1.30
2036	Interme diate Year	25,672	3.46	3.78	4.40	3.10	1.30
2051	Ultimate Year	29,549	4.00	4.34	5.75	4.45	1.30

17. Construction of Clear Water Reservoir and Pumping Station: There is no permanent/temporary land acquisition envisaged for implementation of proposed subproject components. 1 CWR will be constructed in the existing campus of PHED. Vacant land not under any productive use is available in the campus for the said works.

18. Groundwater quality is fit for drinking; therefore, only disinfection is proposed prior to supply. Chlorinator units are proposed at headworks and CWR locations in the town. These headworks will collect treated water from WTP, and groundwater from tube wells in CWRs and combined water is chlorinated prior to supply from CWRs.

19. **Water Distribution.** Sewer network and water supply pipeline are proposed within the boundaries of ROW of government roads. No impacts on structures (neither Temporary nor Permanent) and concrete protection and restorations (CPRs) is envisaged. However, during laying of pipeline, due to loss of access, temporary livelihood loss to roadside vendors, Kiosks, is envisaged. The diameter of pipeline ranges from 100 to 300 mm depending on the road width. Excavation for the pipe/sewer laying works will be undertaken through open trenching, which will be maximum width of 1 m only on one side of the road ROW with maximum length, an average 140 m per day for water supply lines and 70 m for sewers. Excavation, laying of pipes and backfilling will be completed within the day. Subsequent to completion of works, road reinstatement will be undertaken by the contractor as part of the civil works. The same shall be mentioned in the bid document to make it binding on the contractor.

20. **Operation and maintenance of water supply system.** The DBO contractor will operate and maintain the system for a period of 10 years after completion of construction and commissioning the new / improved system. This will include the following:

(i) Drawing water from TWs to CWRs including water pumping main and maintenance of entire underground water system
(ii) Operating and maintaining of all the Clear Water pumping stations to fill all the CWRs/OHSRs/GLRs through transmission pipelines and operation of chlorination system, maintenance of complete system including maintaining the infrastructure and specified water levels at each of the reservoirs throughout the O&M period.
(iii) Managing the distribution network for distributing water efficiently, equitably and minimizing non-revenue water (NRW) and maintaining the infrastructure on DMA basis in the distribution network.

(iv) Providing continuous pressurized water supply with improvement in level of service on continuous basis to the connected consumers and maintaining the infrastructure while meeting the performance indicators. A minimum of 12m water column pressure shall be maintained at all ferrule points but it shall not exceed the maximum allowable pressure.
(v) Meter reading, customer services and maintaining the infrastructure in water supply and sewerage sector.
(vi) Meter reading, bimonthly billing, bill distribution, revenue collection and customer services and maintaining the infrastructure in water supply.
(vii) Sampling treated water received at all the CWRs/ESRs/GLSRs and from random points within the Zones/DMA to ensure that it meets the Potable Water Specification and monitor on monthly basis;
(viii) Assessing and minimizing non-revenue water and locating the causes for high NRW and bringing down the NRW level within the 7% for DMA, 12% from clear water source.
(ix) Provide consumer service connections on approval or sanction by Employer Representative or line agency through Employer Representative.
(x) 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 Local Body.
(xi) Maintain environmental and safety norms at entire system components.

21. **Sewerage Works.** Under RSTDSP, sewerage system in Khetri town will be developed 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 78% of the total base year population (2021) is proposed to be covered by sewerage system, while the rest 22% 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 STP 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.
(vi) To ensure sustainability of the project by implementing a comprehensive asset management plan focusing on an integrated approach to O&M to minimize lifecycle costs.

22. 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 agreed between the government and the ADB.

23. **Sewage treatment.** Sequential batch reactor (SBR) will be developed 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. A sewage treatment plant of 3.15 MLD capacity is proposed for Khetri.

24. **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.

25. 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.

26. 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 each STP is 15% of respective STP treatment capacity. Treated effluent will be chlorinated and prior to its entry into TESR/TEER.

27. **Discharge of treated wastewater.** The excess / surplus treated wastewater that is not reused will be discharge into nearby water channels/drains, and necessary facilities like pipelines and pumping requirements, will be developed.

28. **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.

29. Operation and maintenance (O&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 Khetri
(vii) Maintaining environmental norms at entire system components.

30. **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. Khetri Town has 25 municipal wards and two wards (8 and 18) have density less than 100 persons per hectare. Base year (2021) population for the two wards is 3,444 (about 22% ward coverage under FSSM). 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.

31. Operation and maintenance (O&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, dispose-off septage to Inlet chamber/screen chamber of STP,
(iii) Cleaning of the tank, and proper garaging of the vehicle at designated place.

D. Subproject Components

32. Table 2 shows the nature and size of the various civil works components of this water supply and sewerage subproject in Khetri. Conceptual layout plans and alignments are shown in Figures 1 to 9.

Table 2: Proposed Khetri Subproject Components

Infrastructure	Function	Description	Location
Water Supply			
Tube Wells	Rehabilitation to meet the functional parameters per hydrologist report for sustainability	*New* • None *Rehabilitation* • 7 tube wells • Replacement of pipes, submersible pumps, cables, panels, valves, flow meters and synchronization with SCADA-enabled devices	Locations – 7 locations provided at various locations near Bankoti village (see Figure 2)
Clear water pump houses	To provide adequate pressure in water supply system to distribute to consumers directly/transmit water to overhead tanks for gravity supply	*New: 1 nos* • Civil, pipeline, pumps, motors, EOT crane with girders, other Electro-Mechanical equipments, instrumentation SCADA system and synchronization of SCADA-enabled devices *Rehabilitation* • Rehabilitation and refurbishment of the pump houses, OHSRs, GLSRs, CWRs at various locations	1. AEN Campus
Clear water pumping system in the existing clear water pump house (booster pump)	To provide adequate pressure in water supply system to distribute to consumers directly/transmit water to overhead tanks for gravity supply	*New: 1 no,s* • Civil, pipeline, pumps, motors, EOT crane with girders, other Electro-Mechanical equipment, instrumentation SCADA system and synchronization of SCADA-enabled devices *Rehabilitation* • Rehabilitation and refurbishment of the pump houses, OHSRs, GLSRs, CWRs at various locations	1. JEN Campus
Transmission Mains and Feeder Mains	Main feeder from water intake points	*New* • Design, optimization, supply, constructions, laying, jointing, testing and commissioning of	

Infrastructure	Function	Description	Location
(Figure 3 – existing transmission mains)		transmission main and feeder main • Total: 6.625 km; all DI-K9 pipes (100-350mm dia.) See Figure 3 for more details and locations.	
Clear water reservoirs (CWR)	Store clean water for supply	*New: 1 no.* • Design, supply, installation, construction, testing and commissioning *Rehabilitation* • Rehabilitation and refurbishment of the pump houses, OHSRs, GLSRs, CWRs at various locations	New CWRs at following places: 1. AEn Campus HW – 500kL No CWRs identified for refurbishing (existing 1 will be retired)
Ground level reservoir (GLR)	Store clean water for supply	*New:* • None *Rehabilitation* • Rehabilitation and refurbishment of the pump houses, OHSRs, GLSRs, CWRs at various locations	6 GLRs identified for refurbishment 1. Ward No. 17 – 250kL 2. Jojhu tanki – 370kL 3. Shastriwali tanki – 360kL 4. Ward 14 – 250kL 5. Hanuman gadi – 200kL 6. AEn office – 600kL
Overhead Service Reservoir (OHSR)	Store clean water for supply	*New:* • None *Rehabilitation* • Rehabilitation and refurbishment of the pump houses, OHSRs, GLSRs, CWRs at various locations	1 OHSR identified for refurbishment 1. Talab wali tanki – 150kL
Chlorinator system	Post chlorination / disinfection of water prior to supply	*New : 1 no.* Design, construction, supplying, installation, testing, trial run and commissioning	1. AEn Campus HW
Distribution network (Figure 4 – map of distribution network)	To distribute water to consumers	*New* 44 km • 44km of 100-300mm DI-K7 pipes	Pipes will be laid underground along the public roads/streets covering entire area of the town; Majority of the existing pipes

Infrastructure	Function	Description	Location
			are of AC; new pipes will be laid without distributing the existing pipes, which will be left as it is in the ground untouched
Water conveyance system	Deliver water to consumers	*New* • Design, optimization, supply, constructions, laying, jointing, testing and commissioning of water conveyance *Rehabilitation* Design, optimization and test the suitability of existing DI rising mains	
Bulk Water Meters	Monitor water flow in the improved network	*New* As per the requirement – to be finalized during the detailed design	Fixed at strategic locations in network as per the design., bulk meters will be fixed with the pipe section
Consumer Relation Management Centres (CRMC)	Provide water to consumers and measure water usage	*New* • All electromech, instrumentation, SCADA, etc.	
Master Control Centre (MCC)	Consumer relations and SCADA system control for entire water supply system	*New* • 1 No	
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 34.0 km • Manholes, house sewer connections	Sewers will be laid underground in the roads and internal streets in the town. Sewers will be located in the center of the road. The existing/proposed water pipes are/will be located on one or either side of the roads, and therefore sewers will be laid in the centre without distributing the water pipes. It is proposed that 0.5 km length of sewers will be laid by trenchless method; these will include highway /main road crossings, and the sewers to be laid deeper than 3.5 m
Sewage Treatment Plant (STP) Figure 5 – Sewerage	Treatment of collected wastewater to meet stipulated discharge standards	*New – 1 STPs* • 3.15 MLD Components • SBR (sequential batch reactor) based STP with primary, secondary, tertiary	1. Near Khariya Kua – 3.15MLD Figure 5 shows the location of the STP

Infrastructure	Function	Description	Location
components Figure 8 – STP Layout		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.,	
Treated wastewater storage tanks Figure 9 – TEER Technical Drawing	Store the treated wastewater for reuse, and also provide adequate pressure / elevation for supply	*New* • Treated Effluent Storage Reservoir (TESR)– 1 no 160kL • Treated Effluent Elevated Reservoir (TEER) – 1 no, 315kLfor mobile tanker filling points and rising mains/ distribution system, bypass/overflow arrangements at the TEER to facilitate reuse • Instrumentation, automation, SCADA etc.,	1. Near Khariya Kua – 3.15MLD Figure 5 shows the location of the STP
Effluent discharge point Figure 13 – EPS Technical Design	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	Discharge point coordinates
FSSM			
Truck mounted mobile desludging equipment (Figure 10 – FSSM network)	Desludging of septage from household pits/ septic tanks, transportation& discharge to STP	• mobile tankers with suction and discharge arrangements – number of tankers to be procured will be estimated during the detailed design	Mobile equipment FSSM coverage area provided in Figure 10

33. Subproject will be implemented under (Design-Build-Operate) modality, wherein which the successful bidder will design the water supply and 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 Khetri 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.

E. Subproject Benefits

34. The subproject is primarily designed to improve environmental quality and living conditions of Khetri Town through provision of water supply and sewerage. The benefits arising from this subproject include: (i) increased availability of potable water at appropriate pressure to all households including urban poor; (ii) reduced time and costs in accessing alternative sources of water. (iii) better public health particularly reduction in waterborne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards.

F. Implementation Schedule

35. After the completion feasibility study /preliminary designs, bids were invited in April 2019 for the subproject to be implemented under the design-build-operate (DBO) modality. Bids will be awarded in July/Aug 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 Khetri Nagar Palika.

Figure 1: Water Supply System Diagram of Khetri

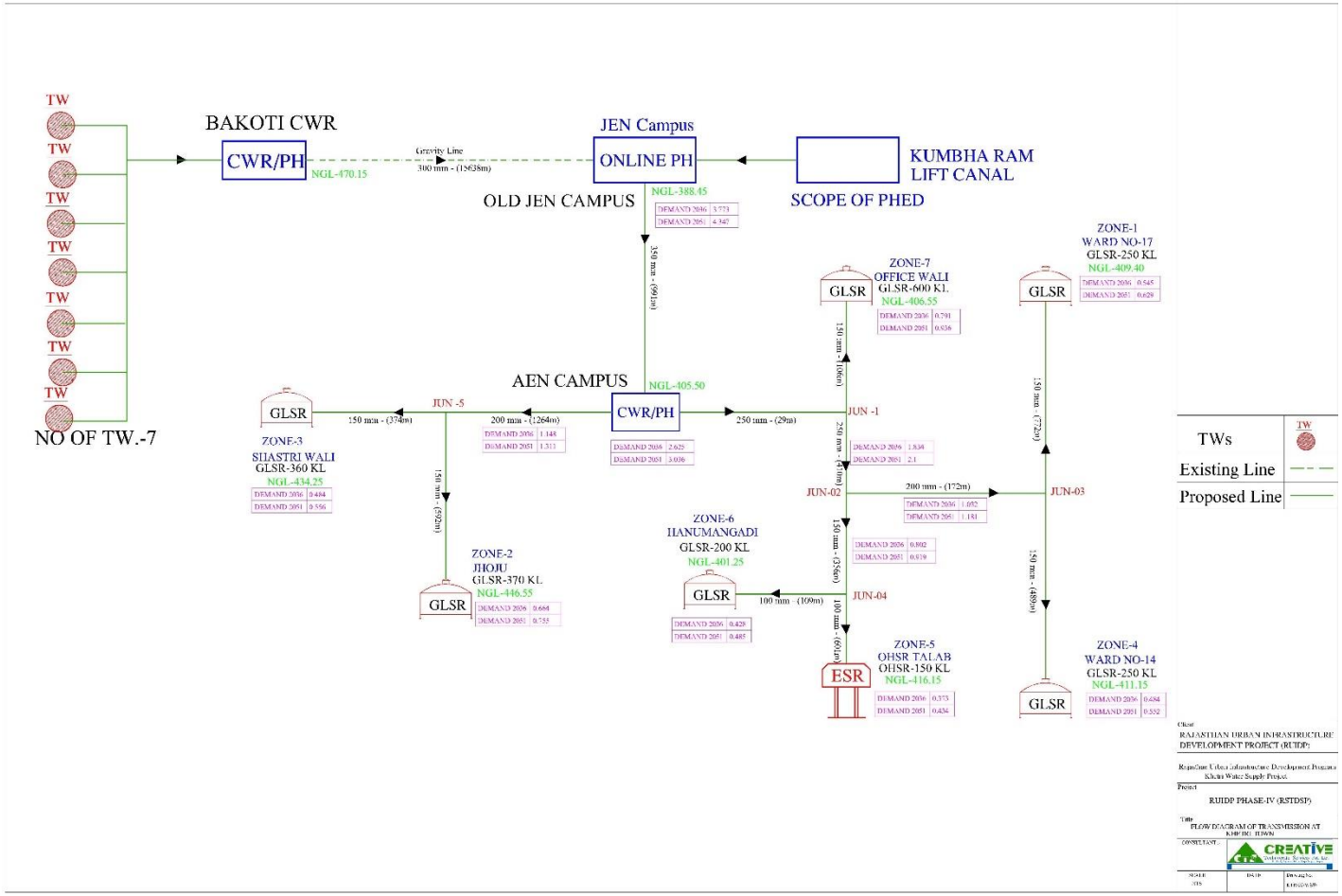


Figure 2: Location of Proposed Water Supply Components

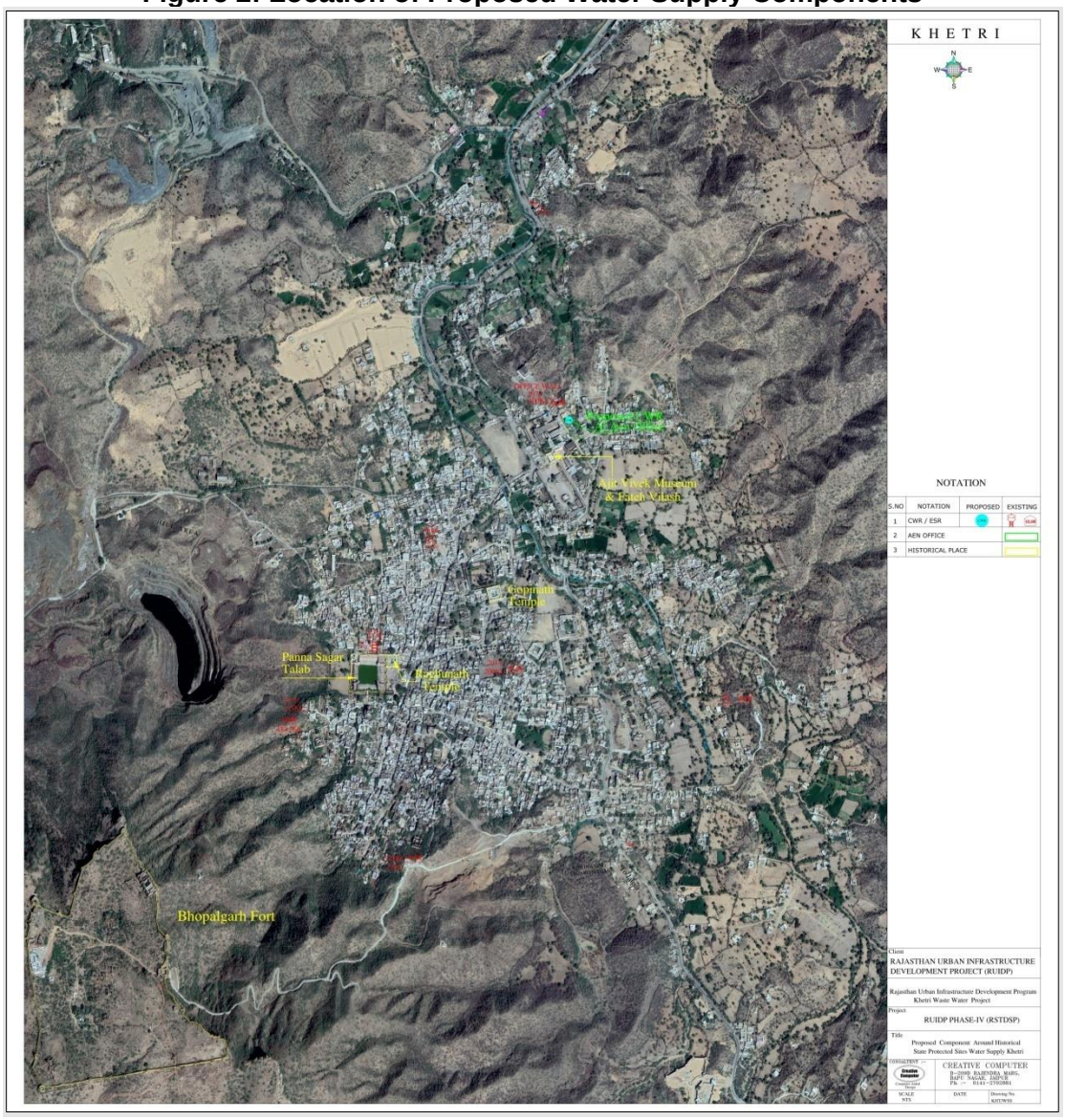


Figure 3: Pipe Network System around Historical and State-protected Sites in Khetri

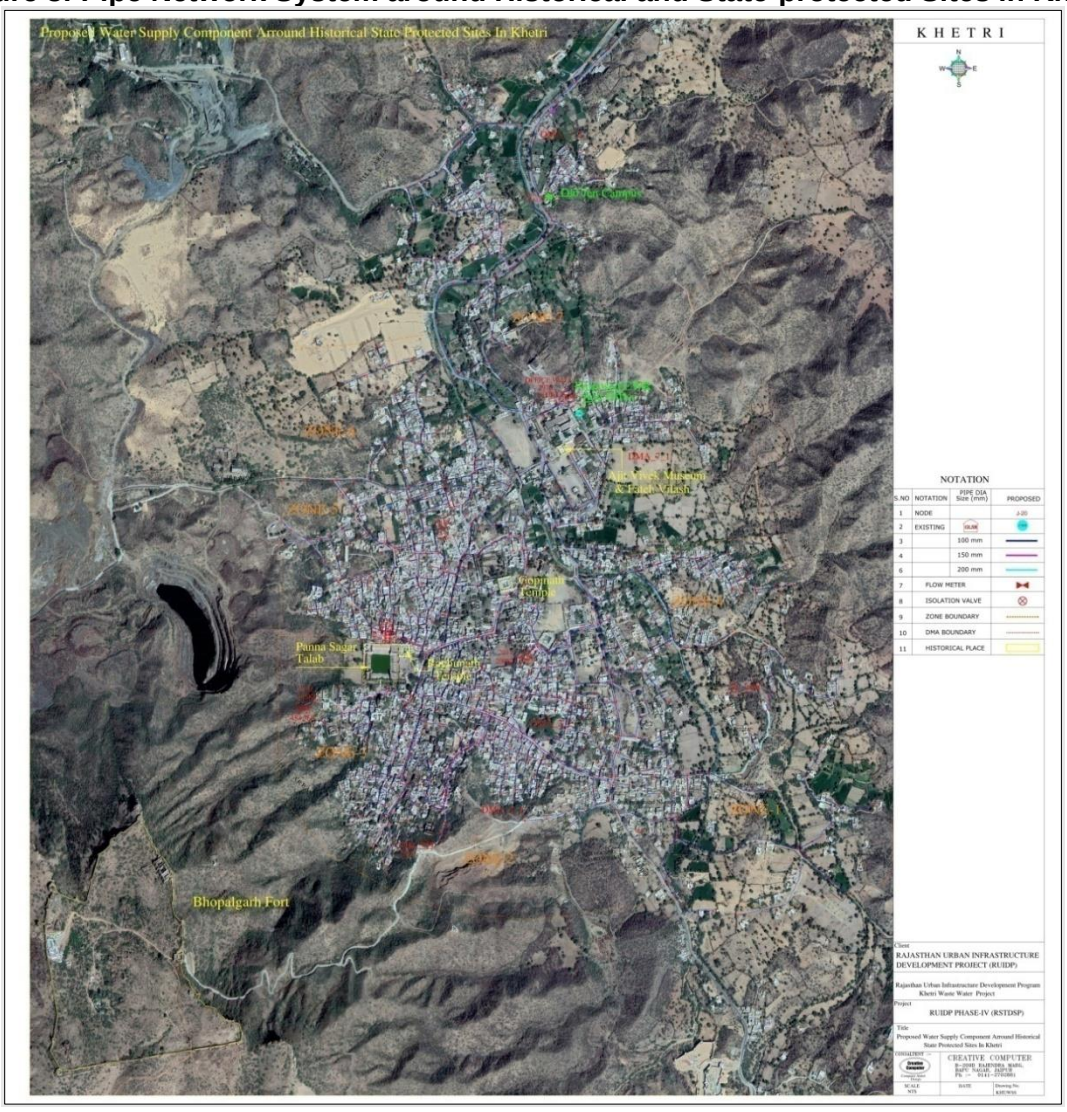


Figure 4: Proposed Water Supply Transmission Mains

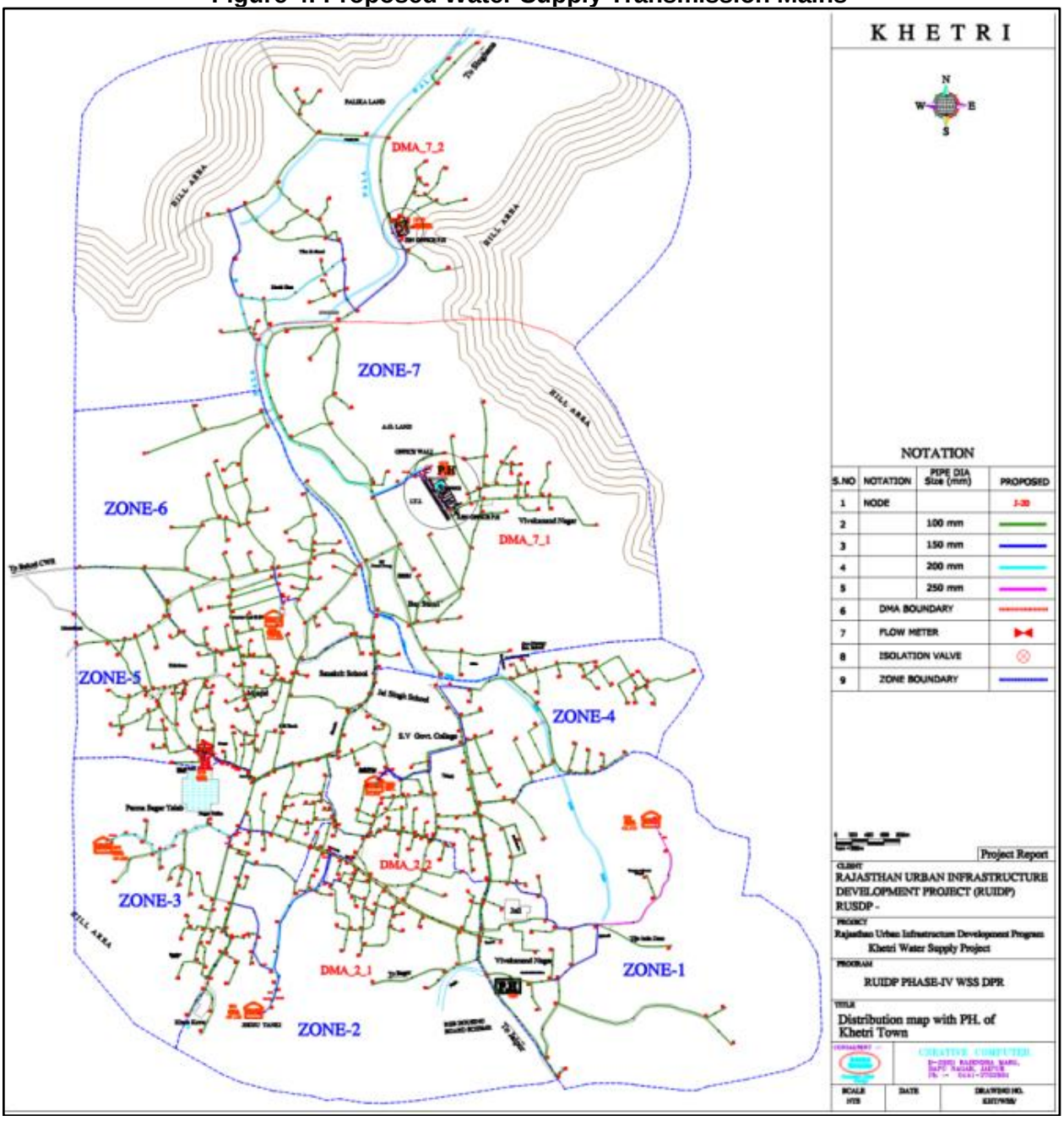


Figure 5: Location of Proposed Sewerage System Components



Figure 6: Proposed Sewer Network Coverage

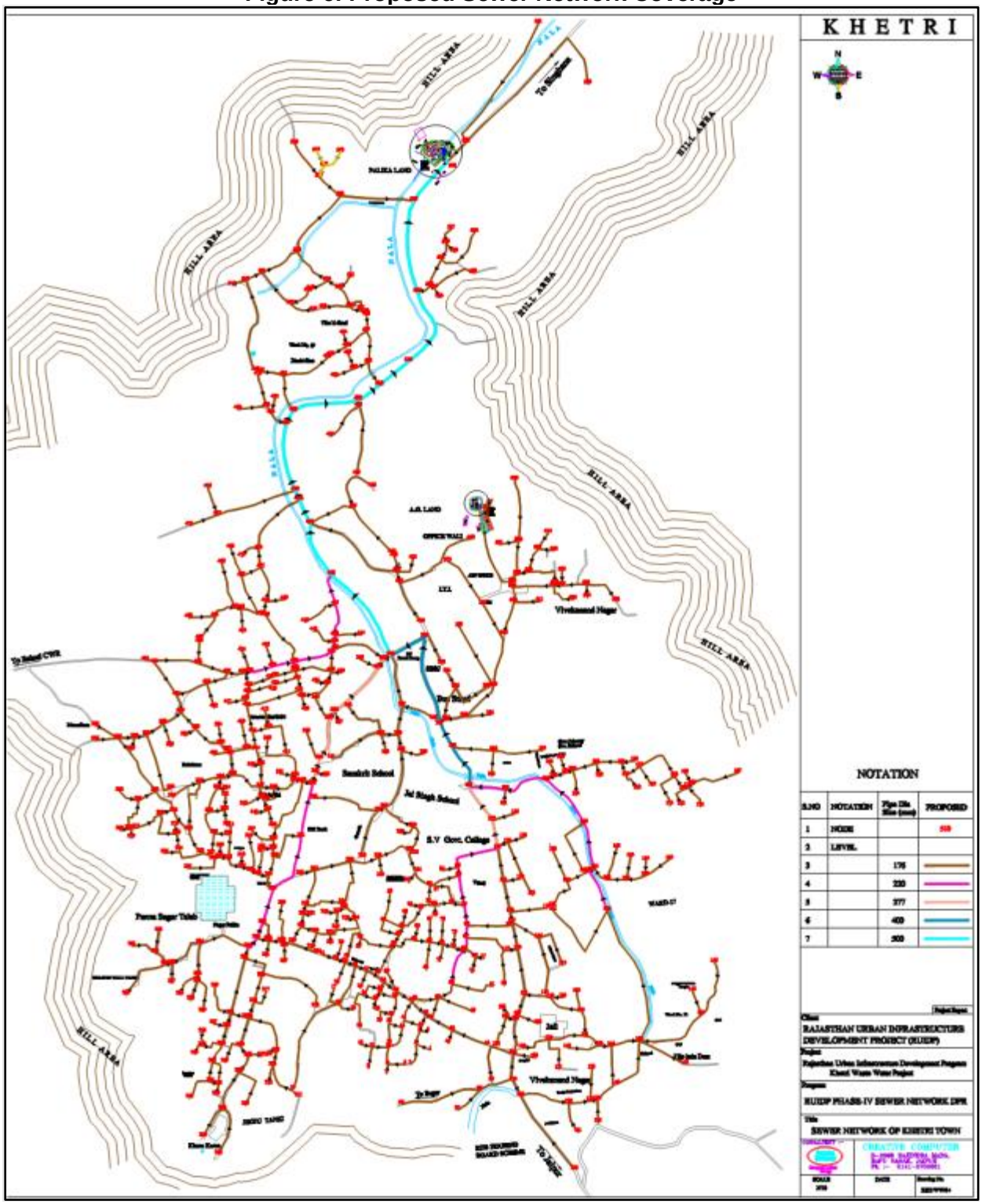


Figure 7: Schematic Layout of Proposed STPs

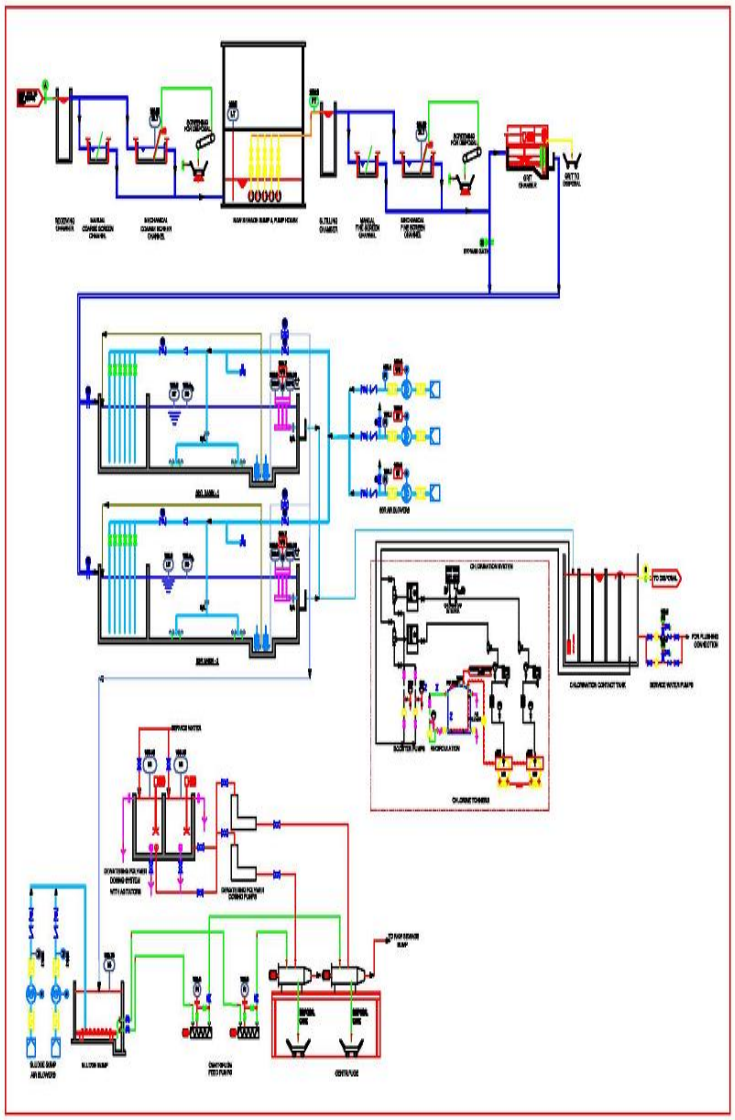


Figure 8: Layout Plan of Proposed STPs

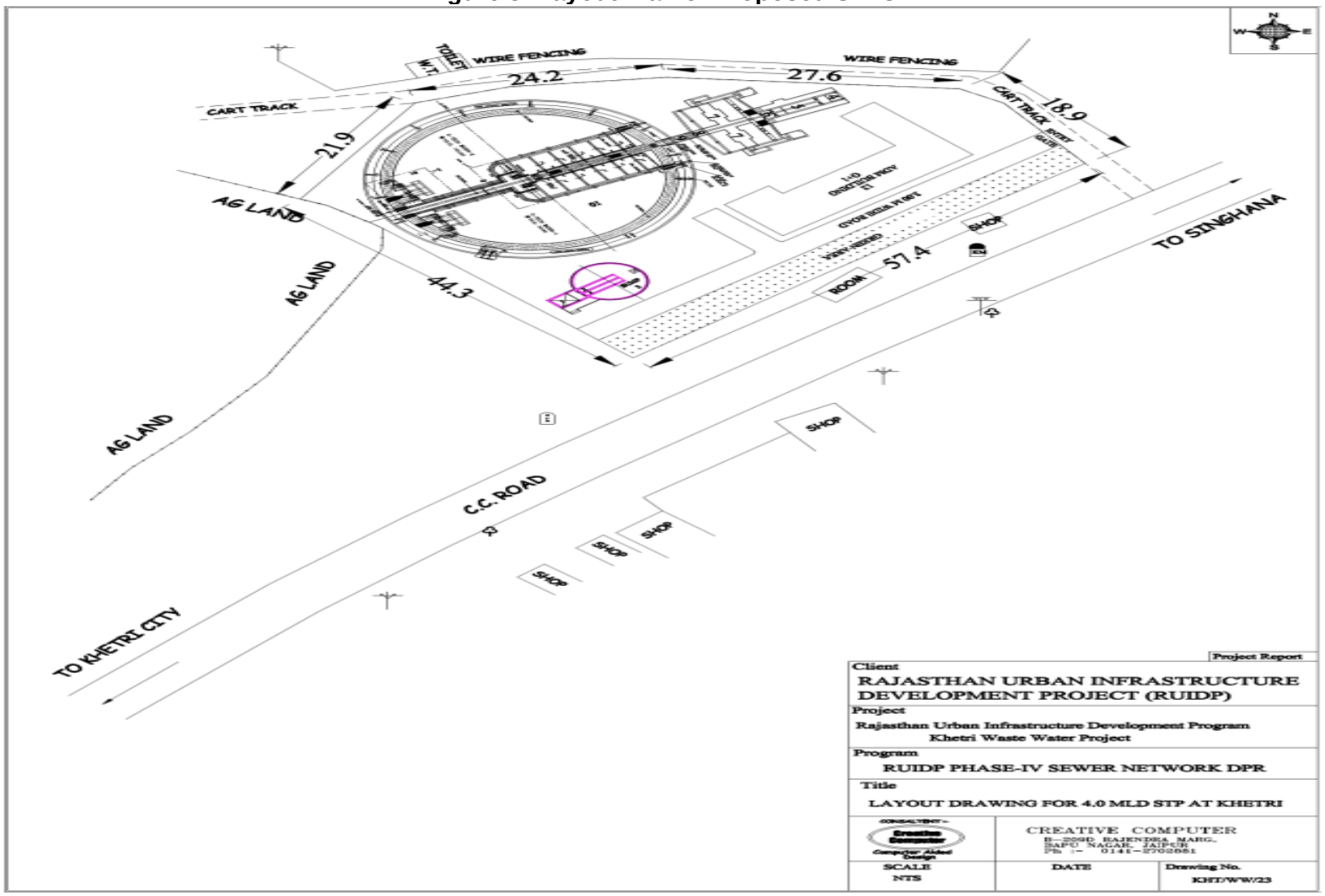


Figure 9: Layout of the Treated Effluent Elevated Reservoir (TEER)

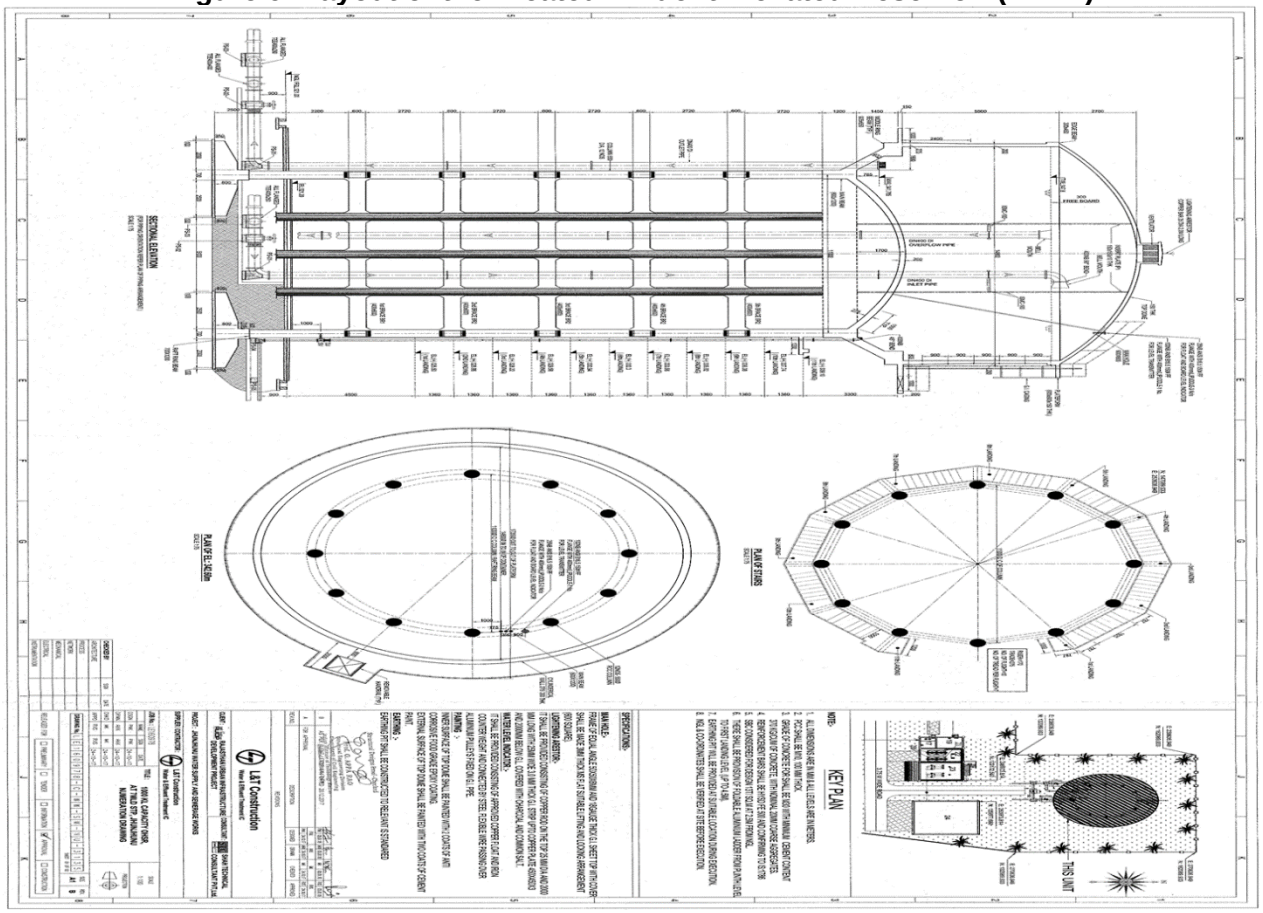
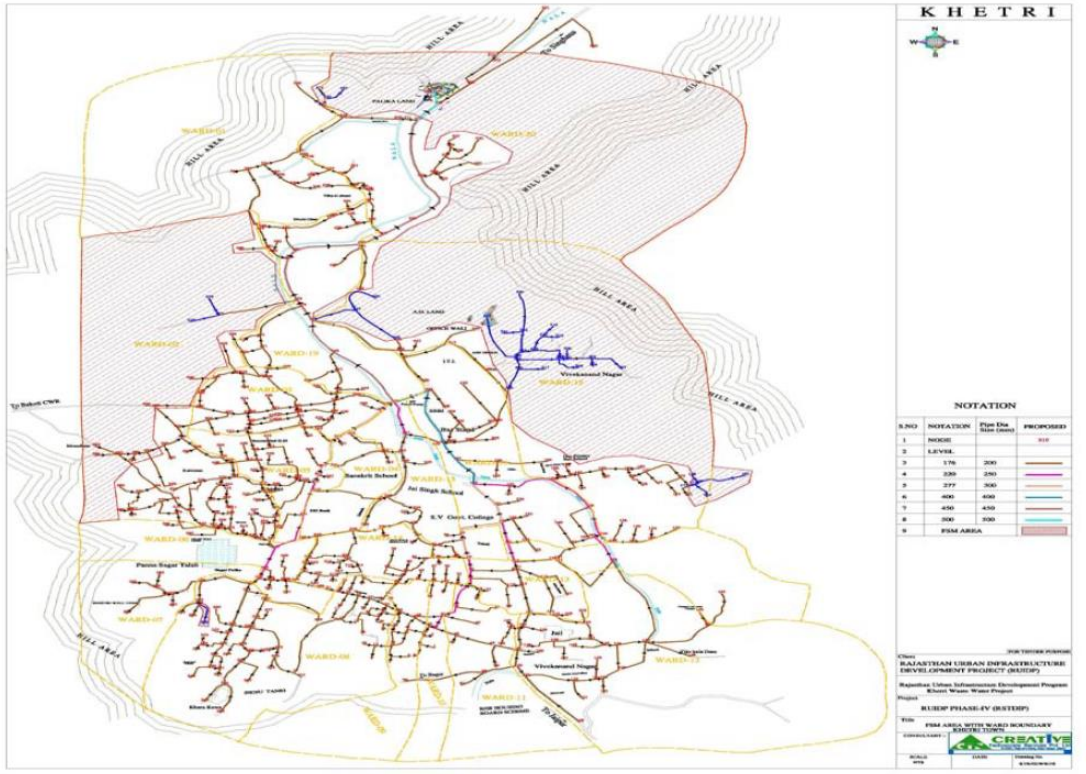


Figure 10: Area to be covered under FSSM System

Ward No.	Area (Ha.)		Projected Population	Density per hectare		Population proposed under FSM	Ward % Coverage under FSM
	Total	Habitated		Total	Habitated		
			2021	2021	2021	2021	
8	92.88	32.66	2238	24	69	60	35%
18	56.60	14.32	1206	21	84	668	55%
Total			**3444**			**728**	**22%**



Proposed Under FSSM in red Boundary

III. ANALYSIS OF ALTERNATIVES

36. The ADB SPS, 2009 requires an analysis of project alternatives to determine the best method of achieving project objectives (which is providing potable water to people, and safely collecting and disposing the human waste generated) 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.

37. The proposed water supply subproject component in Khetri Town include source augmentation to provide adequate water, water conveyance, treatment, storage and distribution. Similarly, the sewerage component 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 Table 3.

Table 3: Analysis of Alternatives

1.	**Project Need – No Project Alternative**
Type of alternative	'No project' alternative
Description of alternatives	Khetri subproject is proposed to improve the service levels of basic infrastructure – water supply and sewerage, which will ultimately improve At present, an intermittent water supply system is running in the town with actual service level 30-35LPCD (frequency once in a week) at consumers end, which is less than standard of 135 LPCD. The supply duration is about 1 to 1.5 hours with low pressure. This is due to heavy losses in the existing distribution network about 40-45%. The project intends to provide following benefits to the town population, and the "no project" alternative will deprive people of these benefits: (i) increased availability of potable water at appropriate pressure to all households including urban poor; (ii) reduced time and costs in accessing alternative sources of water. (iii) better public health particularly reduction in waterborne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards
Selected Alternative	Subproject was selected to provide benefits to the town of Khetri whose people would otherwise be continuously underserviced and impede social and economic development.
2	**Alternative source of water**
Type of alternative	'Water source'
Description of alternatives	**Groundwater.** Presently source of water for existing water supply in Khetri town is ground water. The town is benefited from 7 no. of tube wells situated about 2.5 Km from Bankoti. Water collected from 7 nos tube wells are collected at 900 kl CWR at Bankoti and from there reaches by gravity to Clear Water Reservoir at JE office and further it

<table>
<tr><td></td><td>transferred to ESR/GLSRs in the town. Total water abstracted from Tube Wells is 1.3 MLD (7 TW). The tube wells are fitted with submersible pumps. Presently, 1.3 MLD water is abstracted from 7 TWs and present service level of Khetri town is about 30-35 LPCD (Frequency once in week). Presently in Khetri town, three clear water reservoirs are available of capacity 260, 450 & 900 KL

Surface water. Treated water will be available from “Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II” of PHED up to Khetri Town JE Campus H/w. WTP of this scheme is at Malsisar Town around 80 Km from Khetri so issues associated with the WTP is not envisaged. It has to be assured by contractor that the supplied water should meet the drinking water standards set by IS 10500 (2012) and ensure compliances to all the conditions as mentioned in the CTO.

Combined ground and surface source – adoption of conjunctive use: Additional supply from surface water is envisaged to provide for the optimal supply of clean water to the town of Khetri.</td></tr>
<tr><td>Selected Alternative</td><td>Selected source:
Combined ground and surface source – Existing tube wells and intake from the commissioned Drinking Water Project</td></tr>
<tr><td>3</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 flushing and gardening tertiary</td><td>can only be used for low end usages like flushing and gardening</td><td>can only be used for low end usages like flushing and gardening</td><td>Can be used for low end usages as well as for high end usages</td></tr>
</table>
</td></tr>
</table>

			treatment required for high and usages like construction water, industrial usages, cooling water etc.	tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	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	Highest treatment efficiency with crystal quality power requirement is 50% of conventional technologies land requirement is less than 50% of conventional technologies

<table>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td></td><td>type of past treatment adopted</td><td></td></tr>
</table>
</td></tr>
<tr><td>Selected Alternative</td><td>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 characteristics applicable are as shown in table below:

<table>
<tr><th>Paramater</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>Faecal 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>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 West Banas River, and necessary facilities – pipelines and pumping facilities, will be developed.</td></tr>
</table>

Selected Alternative	Under proposed project, treated effluent from STP will be reused in beneficial purposes and a plan shall be developed by Nagar palika for beneficial uses of treated effluent. Treated effluent shall meet the minimum criteria set by RPCB/CPCB/MOEF & CC and disinfected treated effluent shall be stored in elevated service reservoir for further reuse under this project. Digested and disinfected sludge can be used as manure (as quality of sludge from SBR process can be used in agriculture practices after testing of sludge for toxicity), keeping in mind that there are vast agricultural practices nearby the STP site. Nagar palika will develop a mechanism of reuse of treated sludge and its safe disposal (if not reused) before start of operation of STP.

IV. POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

38. ADB SPS, 2009 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.

39. **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.

40. The environmental impacts of Khetri Town water supply and sewerage subproject have been identified and assessed as part of the planning and design process. An environmental assessment using ADB's REA checklist for Water Supply and Sewerage (Appendix1) 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.

41. **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.

42. **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.

43. **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.

44. **Consultation and Participation.** ADB SPS require borrower to conduct meaningful consultation[8] 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.

45. **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.

46. **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.

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

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[8] 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

48. **Occupational Health and Safety.** ADB SPS, 2009 requires the borrower[9] to ensure that workers[10] are provided with a safe and healthy working environment, taking into account risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. Borrower shall take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work, including: (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

49. **Asbestos-containing Materials (ACM).** Based on (1) field visits in RSTDSP towns and (2) available records from the PMDSC, concerns on asbestos-containing materials (ACM) such as, but not limited to, pipelines, sheets, insulations, are present in the existing infrastructures. Asbestos is known as a hazard and can cause various diseases. International guidelines and national policies provide framework on the identification, management, handling and disposal of ACM in-situ or stored in existing RSTDSP sites.

50. **Community Health and Safety.** ADB SPS, 2009 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.

51. **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.

52. **Critical Habitat.** ADB SPS 2009 does not allow implementing subproject activities in areas of critical habitats or in areas that would lead to significant conversion and degradation of natural / modified habitats. A precautionary approach shall be applied to management and use of renewable natural resources.

53. Global database such as the Integrated Biodiversity Assessment Tool (IBAT) will be used to conduct preliminary assessment on the site locations in reference to critical habitats,

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

[10]Including 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.

key biodiversity and key protected areas alongside the IUCN red list of species affected – critically endangered, endangered, endemic or restricted-range.

54. **ADB SPS International Best Practice Requirements.** ADB SPS, 2009 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 Guidelines[11] and Sector Specific (Water and Sanitation) Guidelines[12]). 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

55. 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, 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.

56. **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 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.

57. **Category A** projects require environmental clearance 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 environmental clearance if appropriate.

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

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

58. **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.

59. None of the components of this water supply and sewerage system subproject falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or environmental clearance is not required for the subproject.

60. **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 4.

Table 1: Applicable Environmental Regulations

Law	Description	Requirement	Relevance to Project Phase
EIA Notification,2006	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	-
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	Proposed STP will require CTE (prior to start of construction works) and CTO (prior to start of operation) from Rajasthan State Pollution Control Board (RPCB) 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)	Operation

Law	Description	Requirement	Relevance to Project Phase
	(CTO) before commissioning.		
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 CTE and CTO 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 RPCB: (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 RPCB 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 benefits arising out of the use of these resources and knowledge to the country and the people.	Not Applicable	-
Wildlife Protection Act, 1972 and amendment 1991	This overarching Act provides protection to wild animals, birds, plants and matters connected with habitat protection, processes to declare protected areas, regulation of wildlife trade, constitution of state and national board for wildlife, zoo authority, tiger conservation authority, penalty	There is a nearby conservation area to the town of Khetri. The subproject's scope are not within the conservation area's boundary (Figure 11). Preliminary IBAT results do not indicate any other protected or key biodiversity areas nearby the town (Appendix 10).	Construction

Law	Description	Requirement	Relevance to Project Phase
	clauses and other important regulations.		
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 4 provides applicable standards for ambient air quality, emission limits and emission stack height requirements for diesel generators Appendix 5 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
Solid Waste Management Rules 2016	Responsibility of Solid Waste Generator segregate and store the waste generated in	Contractor to follow all the rules during construction works	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	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.		
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	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 7.	Constructio n

Law	Description	Requirement	Relevance to Project Phase
	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;		
Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016,	Responsibilities of the occupier for management of hazardous and other wastes.- (1) For the management of hazardous and other wastes, an occupier shall follow the following steps, namely:- (a) prevention; (b) minimization; (c) reuse, (d) recycling; (e) recovery, utilization including co-processing; (f) safe disposal. (2) The occupier shall be responsible for safe and environmentally sound management of hazardous and other wastes. (3) The hazardous and other	Contractor to comply all the requirements of this Act during construction works. There are asbestos cement (AC) in the existing water supply system. As per these Rules, any waste with asbestos concentration limit exceeding 10,000 mg/kg (i.e. 1%), and is in the form of friable, powdered or finely divided state, is classified as hazardous waste. As per Bureau of Indian Standards (BIS), “AC pipes generally contain about 10-15% asbestos fibers in a cement matrix that comprises the rest of the materials and are termed as locked in asbestos products as these products have the asbestos fibers bound in cement. There is very little possibility of generation of airborne asbestos fibers during any reasonable handling, storage, and use of such products. However, during storing and installation, recommended work practices shall be followed to avoid harmful exposure”.	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	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.	Except over the ground connections near CWRs, almost all the AC pipes were laid underground. In RSTDSP, no AC pipes are proposed, existing AC pipes will be left as it is. However, some pipes may have to removed / handled, and if such waste pipes confirm to the provisions of this act, waste shall be treated as hazardous waste and disposed as per the rules. Appendix 17 is a sample Asbestos Management Plan.	
Wetlands (Conservation and Management) Rules, 2017	The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization,	Not applicable as subprojects components are not located in or near to designated wetland area.	

Law	Description	Requirement	Relevance to Project Phase
	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.		
Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010.	The Act designates areas within 100 meters (m) of the "protected monument/area" as "prohibited area" and beyond that up to 200m 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 ASI- protected monuments / places of archeological / historical places in or near Khetri 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
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	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	Construction

Law	Description	Requirement	Relevance to Project Phase
	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 Limit of weight to be lifted by workers	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 Chapter XX- ladders and step ladders Chapter XXII- structural frame and formworks Chapter XXIV- medical facilities and first aid box	

Law	Description	Requirement	Relevance to Project Phase
	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		
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	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 8 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.	Construction and operation

Law	Description	Requirement	Relevance to Project Phase
	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.,		
The Child Labour (Prohibition and Regulation) Act, 1986	Prohibits employment of children below 14 years of age in certain occupations and processes Employment of child labor is prohibited in building and construction Industry.	No child labour shall be employed	Construction and operation
Minimum Wages Act, 1948	Minimum wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of buildings, roads and runways are scheduled employment.	Applicable to all construction works in the project All construction workers should be paid not less than the prescribed minimum wage	Construction and operation
Workmen Compensation Act, 1923	Provides for compensation in case of injury by accident arising out of and during the course of employment.	Compensation for workers in case of injury by accident	Construction and operation
Equal Remuneration Act, 1979	Provides for payment of equal wages for work of equal nature to male and female workers and not for making discrimination against female employees in the matters of transfers, training and promotions etc.	Equal wages for work of equal nature to male and female workers	Construction and operation
Rajasthan State Environment Policy, 2010 including And Rajasthan Environment	Follows the National Environment Policy, 2006 and core objectives and policies are: -Conserve and enhance environmental	- 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	Operation

Law	Description	Requirement	Relevance to Project Phase
Mission and Climate Change Agenda for Rajasthan (2010-14).	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	- 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-	
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	Applicable - there are several protected monuments in the town Appendix 9 discusses the Heritage Impact Assessment for Khetri. In case of chance finds, the contractor/ PIU will be required to follow a protocol (Appendix 12) as defined in the Environmental Management Plan (EMP).	Constructio n

Law	Description	Requirement	Relevance to Project Phase
	permission, including time for completion, procedures to be followed during the work and for chance finds etc.		
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
IS 11768: 1986/2005: Recommendations for disposal of asbestos waste material	The standard emphasis that every employer who undertakes work which is liable to generates asbestos containing waste, shall undertake adequate steps to prevent and /or reduce the generation of airborne dust during handling, storing, transportation and final disposal of final disposal of asbestos and asbestos containing products.	The crux is waste avoidance: the practice inculcated should focus the on minimal waste generation. Waste Collection: In the project circumstance, the waste is referred to the damaged powered asbestos which will be collected in the Permissible plastic bags to be disposed to the nearest TSDF facilities.	Construction
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

Law	Description	Requirement	Relevance to Project Phase
			
IS 11451: Safety and Health Requirements related to Occupational Exposure to Asbestos contaminated Products.	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
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
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	There are no Ramsar sites in or near Khetri. Not applicable to Khetri water supply and sewerage subproject.	-

Law	Description	Requirement	Relevance to Project Phase
	plans.		
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	India is a signatory of this convention which aims to control international commercial trade in endangered species	Not applicable in this project as no endangered species of wild fauna and flora is found in project town.	-
Montreal Protocol 1992	India is a signatory of this convention which aims to reduction in the consumption and production of ozone-depleting substances (ODS), while recognizing differences in a nation's responsibilities. Ozone depleting substances are divided in two groups Chlorofluorocarbons (CFCs) and 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	Not applicable to this project as no migratory species of wild animals are reported in the project areas.	-

Law	Description	Requirement	Relevance to Project Phase
	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.		

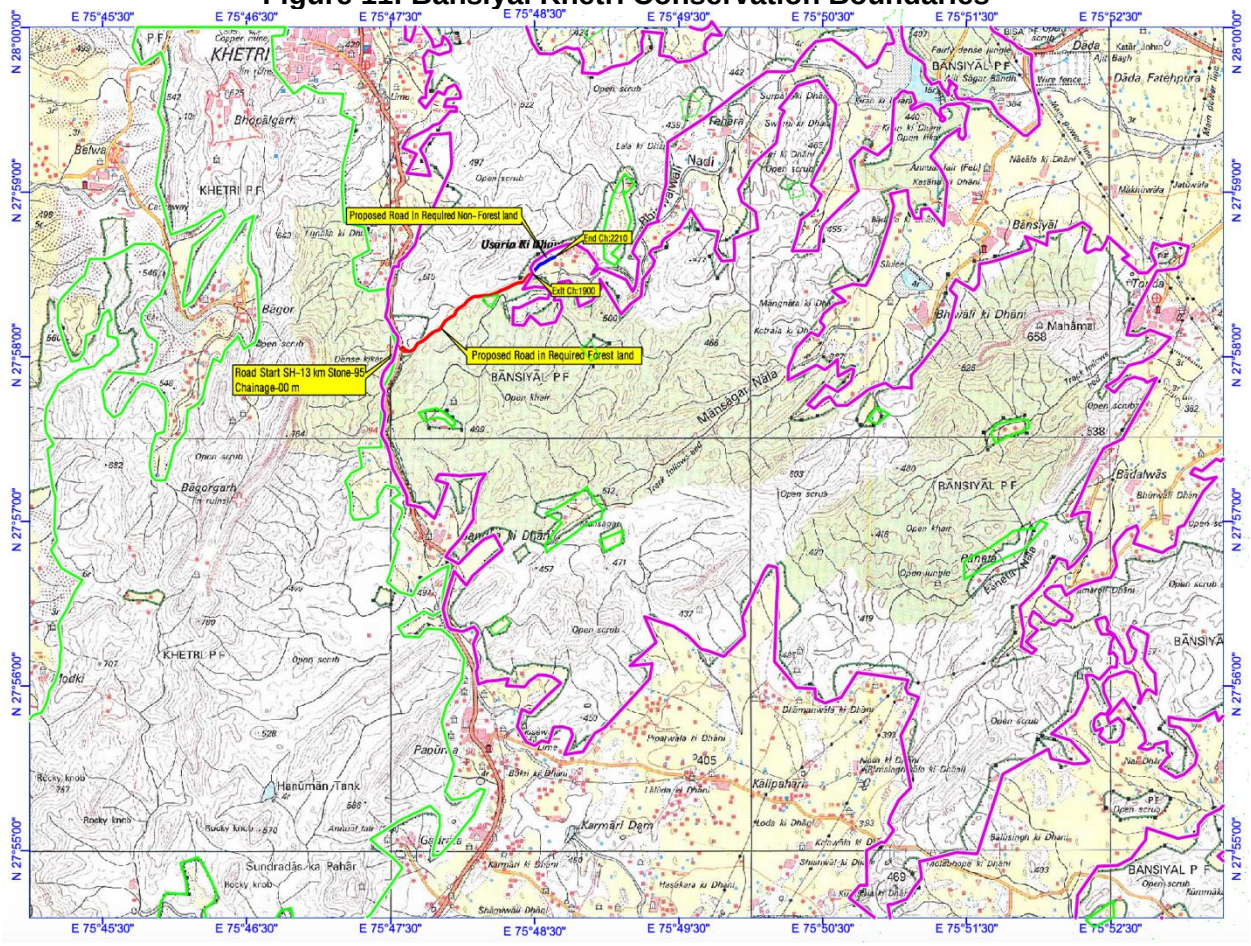
61. **Clearances / permissions to be obtained prior to start of construction.** Table 5 shows the list of clearances/permissions required for project construction. This list is indicative, and the contractor should ascertain the requirements prior to start of the construction and obtain all necessary clearances/permission prior to start of construction.

Table 2: Clearances and permissions required

S. No	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
1	Construction of new STP	Consent to establish and consent to operate under Water Act, 1974 from RSPCB	PIU and Contractor	PIU
2	Tree Cutting	State forest department/Revenue (Tehsildar)	PIU	PIU and PMU
3	Hot mix plants, Crushers, Batching plants and DG set	Consent to establish and consent to operate under Air Act, 1981 from RSPCB	Contractor	PIU
4	Storage, handling and transport of hazardous materials	Hazardous Wastes (Management and Handling) Rules. 2016 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 from RSPCB	Contractor	PIU
5	Sand mining, quarries and borrow areas	Permission from District Collector/ State Department of Mines & Geology	Contractor	PIU
6	New quarries and borrow areas	Environmental clearance under EIA Notification 2006	Contractor	PIU
7	Temporary traffic diversion measures	District traffic police	Contractor	PIU
8	Pipe laying works	Permission from Nagar Palika and PWD and State Archaeology and Museums Dept (for areas covered state-protected heritage sites)	PIU and Contractor	PMU
9	Construction Waste and Demolition Debris Management	Approval from Nagar Palika for disposal site is required as per Construction and Demolition Waste Management Rules 2016	Contractor	PIU
10	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
11	Establishment of construction camps	Allotment and approval for specific land use	Contractor	PIU
12	Use of vehicles and equipment	Pollution under control certificate (PUC) form RTO	Contractor	PIU

62. 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.

Figure 11: Bansiyal Khetri Conservation Boundaries



V. DESCRIPTION OF THE ENVIRONMENT

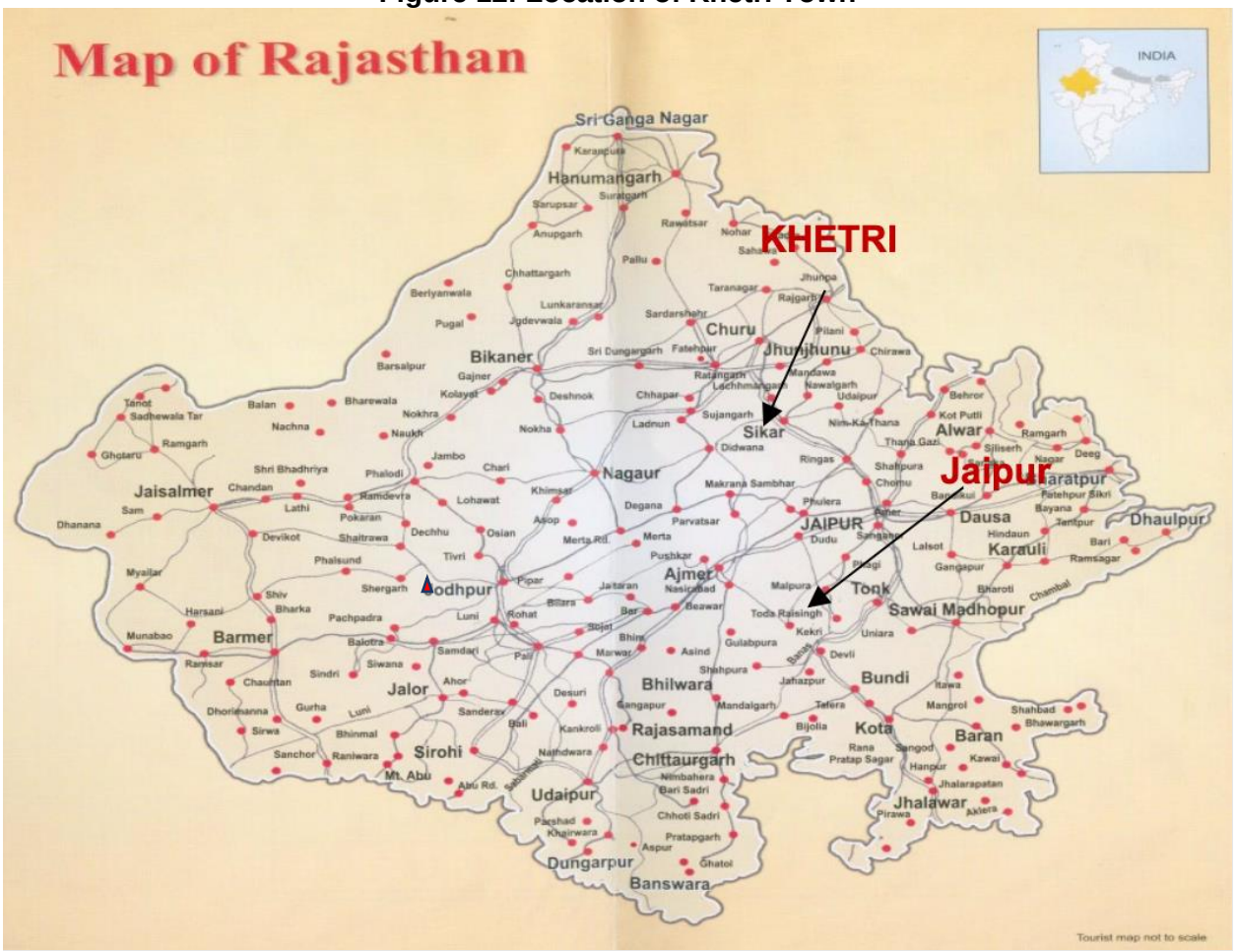
A. Physical Resources

1. Location, Area and Connectivity

63. Khetri is a town in Jhunjhunu district of Rajasthan in India (Figure 12). It is part of Shekhawati region. Khetri is situated 145 km off Jaipur in the north. The town lies between 27.98°N 75.8°E. Khetri is well connected by Road. Travel is possible to the city by either public or private bus or private vehicles. The nearest railway station is Chirawa, Neem Ka Thana, Narnaul and Nizampur at a distance of 30 km. Khetri is at a distance of 190 km from Delhi and 165 km from Jaipur. Best way to reach is from New Delhi Sarai Kale Khan ISBT having direct buses. Also, it can be reached with very frequent and direct buses from Jaipur. Nearest international airport is Jaipur International Airport, Jaipur.

64. The geographical area of the city is about 7.42 square kilometer (km^2) city is situated in between Aravali ranges. As per Census of India (2011) Khetri had a population of 18,209.

Figure 12: Location of Khetri Town



2. Topography, Soils and Geology

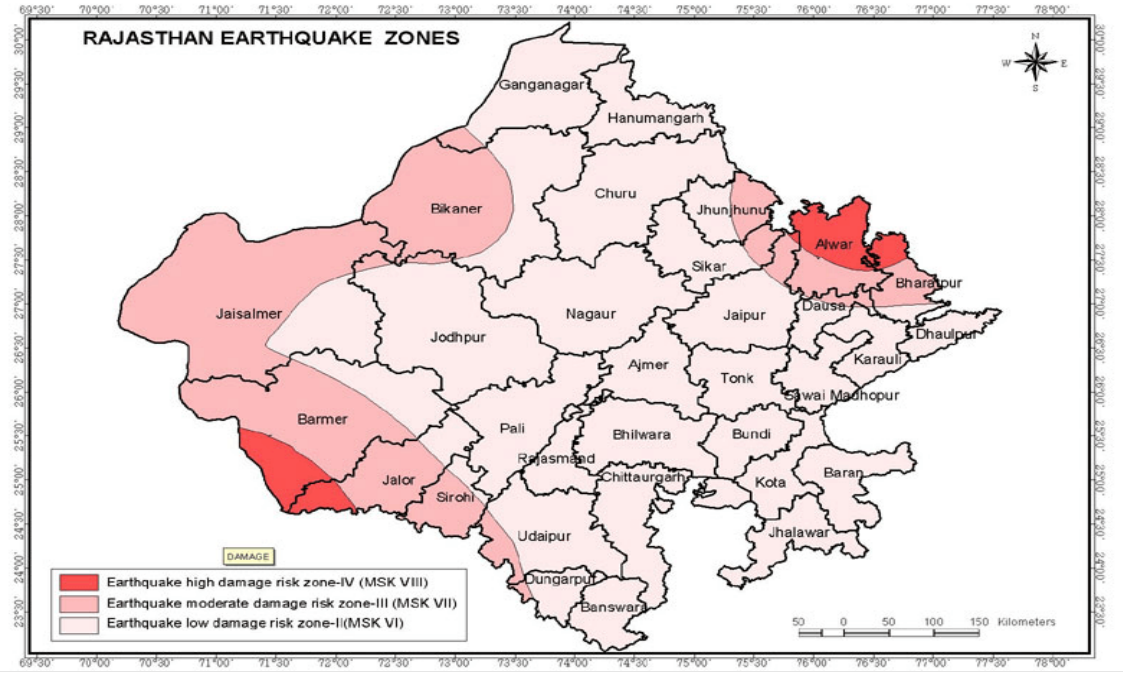
65. Most of the part of the Jhunjhunu district is characterized by blow sand and dunes which is part of the Great Thar Desert sand, and the shifting and active dunes are main hazards to cultivation. Soil erosion is prevalent resulting from deforestation and high winds. Soils are yellowish brown, sandy to sandy loam, loose, structure less, well drained with high permeability. Part of Jhunjhunu district is also covered by red desert soil. These are pale brown to reddish brown, structure less, loose and well drained having texture from sandy loam to sandy clay loam. They are suitable for agriculture but suffer from adverse climatic conditions. As stated above, major part of the district is covered by blow sand. A small area in the eastern part of the district is occupied exclusively by the rocks of Delhi super stoup and later intrusive. The Delhi super group is represented by quartzite, phyllite/ schist, gneisses and limestone and granites, pegmatite and amphibolite of Post Delhi.

66. Khetri is situated at the foothills of the Aravalli Range, which hosts copper mineralization, giving rise to an 80 km long metallogenetic province from Singhana in the north to Raghunathgarh in the south, popularly known as Khetri Copper Belt. The belt comprises tightly folded Proterozoic metasediments that rest over basement gneisses and is a part of the North Delhi fold belt.

67. Hindustan Copper Limited. The Khetri Copper Complex of Hindustan Copper Limited is situated at 10 km from Khetri town. It is one of the largest Copper mines in India with concentrator & refinery and produces copper. It also has by-products i.e. Sulphuric acid, fertilizer raw materials, etc.

68. **Seismology.** As per the seismic zoning map of India (Figure 13), Jhunjhunu falls partly under the Zone II and Zone III. Zone II is the “low damage risk zone” and Zone III is the “moderate damage risk zone”.

Figure 13: Earthquake Zoning Map of Rajasthan



3. Climatic Conditions

69. The climate of Khetri is arid, typical of desert. The summer seasons are long starting in the month of March and ends in the month of June. The maximum temperature during summer months goes above 44°C quiet frequently. The temperature during winter months normally touches 4.2^{o}C. The mean annual rainfall is around 560 mm.

70. **Climate Change Projections:** Average temperature projections from global climate models (PRECIS) suggest a strong increase in temperature for state of Rajasthan. Baseline data of temperature from 1975 to 2005 has been considered. Projections of maximum temperature predicted that temperature varies from 0.6°C in 2020s to 3.2°C in 2080s. Projection trends of minimum temperature increases clearly stated that minimum temperature of atmosphere in the state is slightly increases from 0.9°C in 2020s to 3.9°C in 2080s. The projections of maximum temperature increase for the project design period i.e., by 2050s is 2.1°C and projections of minimum temperature increase for the project design period i.e., by 2050s is 2.6°C.

71. In context of precipitation, available rainfall projection from global climate models (PRECIS) suggest an increase in average rainfall for state of Rajasthan depicts that based on the baseline data of precipitation from 1975 to 2005, projection of average annual rainfall varied from 6.6% in 2020s to 9.1% in 2080s. The projections of annual rainfall change for the entire state for the project design period i.e., by 2050s is 3.9 %. The models also suggest an increase in the duration of dry spells as well as a tendency towards more intense rainfall events. Any likely increase in precipitation would occur in the northern part of the state and any decrease in the southern part of the state. Climate of Rajasthan is varied in nature. Temperature and rainfall are the main climatic factors that determine eco-climate of the area. Diurnal variations in temperature could be seen in the state of Rajasthan. Temperature reaches above 50°C in summer and 0° in winter in some of district in the state. Pattern of rainfall is uneven and erratic in nature.

72. 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.

4. Surface Water

73. Most of the Jhunjhunu district is drained by Kantli River, while south eastern part is drained by Singhana River and a small area in south western corner of district is drained by Budhi nala. The south and east of hill ranges in Khetri area is drained by Dohana River. Sukh River flows from South to North ad various nallahs meet with the river. All the rivers/nallahs are ephemeral in nature and flow in response to heavy precipitation during monsoon. Being mostly deserted terrain, Northern part of the district, has inland drainage and rainwater is mostly collected in depressions. Due to lack of sewerage system, wastewater from the Khetri town flows in open drains and accumulates in these depressions at several places. There are no any surface water sources near to any proposed site under this project.

5. Groundwater

74. Quaternary alluvium is the principal water bearing formation in Jhunjhunu District. Besides, hard rocks of Delhi Super Group including post Delhi Intrusive form ancillary aquifers in Jhunjhunu. Alluvium (composed of sand, silt, clay, kankar and gravel) forms the principal and potential aquifer in the area. Area and thickness of sediments varies widely from 15 to 140 m whereas saturated thickness varies from 30 to 70 m. Ground water occurs under unconfined to semi-confined conditions in the primary porosity i.e. pore spaces. Aquifer system is present to a depth of 100 m in general. The depth to water level varies from 7.53 to 75m below ground level. In Jhunujhunu town, groundwater occurs under alluvial conditions and thickness of alluvium ranges from 80 to 100 m. Groundwater table is very deep in the town, and ranges between 70 to 80 m.

75. According to Central Ground Water Board (CGWB) Report of Jhunjhunu District (2008), ground water is alkaline in nature. The electrical conductivity ranges between 450 and 3000 ms/cm. Fluoride, Nitrate and Iron concentration is more than permissible limit (1.5 mg/l,45 mg/land 1.0 mg/l respectively) in some of parts of the district.

76. Study conducted on ground water of Khetri town reflects the elevated concentration of copper in water and soils at the vicinity of Khetri mining sites. In the water sample collected from region metal concentration ranges from 22.5 mg/liter to 695.56 mg/liter, whereas in soil sample at a depth of 12 inches metal concentration ranges from 9.37 mg/kg to 194.16 mg/kg and soil sample on surface ranged from 4.9mg/kg to 143.72mg/kg (source: International Journal of Research in Science And Technology (http://www.ijrst.com) (IJRST) 201 3 , Vol. No. 2, Issue No. V I, July – September ISSN: 2249 – 0604).

77. **Groundwater Quality.** PHED is doing monitoring of tube wells installed at different locations of town for existing demand of water supply in town and results of their monitoring of groundwater is shown in Table 6 below.

Table 6: Ground Water Quality Results at Khetri Town

Parameter	**TW 1 Badau vill.**	**TW 2 Badau vill.**	**TW 3 Badau vill.**	**TW 4 Badau vill.**	**TW 5 Badau vill.**	**TW 6 Badau vill.**	**TW 7 Badau vill.**	**TW 8 Jasrajpur**
Date of Sampling	09.05.16	09.05.16	09.05.16	09.05.16	09.05.16	09.05.16	09.05.16	09.05.16
pH	7.0	7.8	7.6	7.5	7.4	7.5	7.2	7.6
Odour	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
Chlorides as Cl mg/l	70	60	60	60	130	70	70	200
Nitrate as NO3	36	36	43	41	29	31	35	230
Total Dissolved Solids (mgfL)	545	315	385	385	630	385	350	980
Fluorides (as F) mg/l	0.4	0.2	0.2	0.2	0.5	0.2	0.2	1.1
Total Alkalinity	250	110	230	230	320	240	220	320

Parameter	TW 1 Badau vill.	TW 2 Badau vill.	TW 3 Badau vill.	TW 4 Badau vill.	TW 5 Badau vill.	TW 6 Badau vill.	TW 7 Badau vill.	TW 8 Jasrajpur
(as Caco3) mg/l								
Total Hardness (as Caco3) mg/l	200	150	180	180	220	160	180	420
Calcium Hardness	100	80	100	100	120	90	90	220
Magnesium Hardness	100	70	80	80	100	70	90	200

6. Air Quality

78. Ambient air quality in Rajasthan is monitored by Rajasthan Pollution Control Board. However, at present there is no monitoring station in Khetri or Jhunjhunu. However, few monitoring in past have been done in Jhunjhunu District by RUDSICO-EAP and it was observed ambient air quality in district Jhunjhunu is well within the permissible limits. But as these monitoring locations in Jhunjhunu are more than 40 kms (aerial distance from Khetri) so it is not having worth to consider it as air quality for Khetri.

79. There are several mining activities being conducted in nearby areas of Khetri therefore concentrations of pollutants in this town may be higher than the national standards.

80. 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

81. As there are mining activities nearby the Khetri therefore resultant traffic load is higher in town. 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 quiet and peaceful.

82. Baseline ambient noise quality monitoring of Khetri is not done during initial design phase and shall be done during pre-construction stage (SIP period) by contractor and shall be updated in IEE.

B. Ecological Resources

83. Due to harsh physiographic and climatic condition, the forest and other ecological resources in Jhunjhunu District is limited. About 6.8% of total area of district is under forest cover. These are open forests with very less tree cover and the vegetation is characterized by tropical thorn species and tropical dry-deciduous species represented by Prosopis cineraria, Acacia leucophloea, Acacia nilotica, Salvadora oleoides, Capparis decidua, Opuntia species, Tephrosia purpuria, Aerva persica, Cenchrus ciliaris etc. Having the blend of varied habitat

types, there is rich diversity of bird species in Jhunjhunu district. Some of the most common birds found in Jhunjhunu are Grey Francolin, Black Francolin, Indian Peacock, Yellow-Crowned Woodpecker, Asian Koel, Spotted Owlet, Spotted Dove, Black Kite, and White-Throated Kingfisher.The town also hosts the Khetri-Bansial Conservation Reserve per Gazette Notification F3 (13)/ Forest 2016 dated 01.03.2017 (Figure 11).

84. Preliminary critical habitat assessment was conducted using the IBAT and noted that neither protected nor key biodiversity area is present within the 50km radius of the subproject components (Appendix 10).

85. Proposed subproject components are located in the Khetri town area of Jhunjhunu District, an urban area located in arid dry deserted zone covered mostly with sand and surrounded by a harsh desert environment of wind-blown sand and dunes. Natural vegetation is very limited, and consists of mainly sparse, scattered shrubs and grasses. The fauna of the town comprises mainly domesticated animals. Within the town, tree cover is very limited. Major trees found within town are mostly planted beside the roads in open public areas and comprises mainly Babool, Keekar, Neem, Pipal, Sheesham, Mango and Ber etc. There are may open and reserve forests in Khetri and nearby locations but no project component is proposed within or near to these forests.

C. Economic Development

86. According to the base data of Khertri Master Plan 2010, total 742 hectare land comes under urban area, out of which 600 hectare comes under developed area which is 80.86% of urban area. Out of total developed area, at present 44.5% land is being used for residential purpose, 14.5% is under industrial use and 24% land is under circulation and 9.5% of land is under public and semipublic use. Land use patter of Khetri is given in Table 7 below.

Table 7: Existing Land Use of Khetri (2010)

S. No	Land use	Area	Developed Area	Urbanized Area
		Hectare	%	%
1	Residential	267	44.5	35.98
2	Commercial	15.6	2.5	2.10
3	Industrial	87	14.5	11.73
4	Govt & Semi Govt Office	7.8	1.2	1.05
5	Recreation	22.4	3.8	3.02
6	Public & Semi-public	57.2	9.5	7.71
7	Circulation	143	24	19.21
	Sub Total (Developed Area)	**600**	**100**	80.86
8	Open area	130		17.52
9	Hilly	8		1.08
10	Reservoir	4		0.54
	Total (Urbanized Area)	**742**		**100**

Source: Khetri Master Plan 2010.

87. **Industry and Agriculture.** Industrial development in Jhunjhunu district is limited. Availability of mineral resources, which includes both metallic and non-metallic, in the district has led to development of mineral based industries. The metallic minerals include copper and iron ore whereas the non-metallic minerals include calcite, dolomite, soapstone and fireclay. In

Jhunjhunu district Rajasthan State Industrial Development and Investment Corporation (RIICO) has developed four industrial areas viz., Jhunjhunu, Chirawa, Pilani and Singhana. In Jhunjhunu district RIICO has established 6 industrial areas. The district houses about 7990 industrial units including 2 large scale units viz. M/s. Hindustan Coppers Ltd., Khetri Nagar and M/s. Bhagwati Gases Ltd., Banwas, Khetri Nagar of which about 225 small and micro industrial units are located in and around Jhunjhunu city. Major small units are leather, cotton, wool, food and mineral based units.

88. The Khetri Copper Complex of Hindustan Copper Limited is situated at 10 km from Khetri town. It is one of the largest Copper mines in India with concentrator & refinery and produces copper. It also has by-products i.e., Sulphuric acid, fertilizer raw materials, etc.

89. On the basis of climatic conditions and prevailing agricultural practices, Jhunjhunu district falls under Internal Drainage Dry Zone as per the agro-climatic classification. The area is covered in sand dunes and inter-dunal sandy plains. Climatically, this zone is slightly wetter as compared to the western arid zone. Kharif (April to September) season cultivation is rain-fed and Rabi (October to March) cultivation is mostly based on ground water. The main kharif crops grown in the District are Bajra, Guar, Cow Pea (Chola), Moong, Moth whereas principal rabi crops are Wheat, Gram, Mustard etc. In the town, about 2% of the land is under cultivation.

90. **Water Supply.** Presently source of Khetri town is groundwater. The Public Health Engineering Department takes care of the water supply in the town.The town is benefited from 7 no. of tube wells situated about 2.5 Km from Bankoti. Water collected from 7 nos. tube wells are collected at 900 kl CWR at Bankoti and from there reaches by gravity to Clear Water Reservoir at JE office and further it transferred to ESR/GLSRs in the town. Total water abstracted from Tube Wells is 1.3 MLD (7 TW).

91. A package “Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II” is sanctioned by PHED and under execution. Khetri will get deficit water (excluding GW) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal.” The work of pipeline system from canal off take point to JE office has been completed. 500 mm DI K-7 pipe has been laid from canal off take to JE office.

92. **Sewerage.** Presently, the town lacks a comprehensive sewerage system. The sewage is culminating finally to the Nallah or on ground. 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 into the open drains.

93. **Solid Waste Management.** Solid Waste Management in Khetri is done by Nagar Palika through door to door waste collection. Nagar palika has provided 2 dustbins to each household for collection of dry and wet solid waste. Nagar Palika is having 4 auto tippers and 2 tractors for door to door collection and disposal. Solid waste disposal is not proper and collected solid waste is disposed without segregation through open dumping near Chandbari in ward no.2 in abandoned mining trenches.

94. **Power Supply.** Power distribution is provided by a regional company. Power is supplied from the Sub Grid by Overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. Power supply in town is reliable and continuous power supply is maintained in town through Babai Substation.

95. **Transport.** Buses are the major source of transport in Khetri. There is no rail connectivity in Khetri. The nearest railway station is Neem Ka Thana at a distance of about 30 km.

D. Socio Cultural Resources

1. Demography

96. Demographics as of 2011 India census, Khetri had a population of 18209. Males constitute 9451 of the population and females 8758. Khetri has an average literacy rate of 70.25%, lower than the national average of 75.30%: male literacy is 58.97%, and female literacy is 41.03%. In Khetri, 12.89% of the population is under 6 years of age. Total children (0-6) are 2347 as per figures of Census India report 2011.There are 1271 boys and 1076 girls. Sex Ratio of the city is 927 females per 1000 males. Sex ratio of child is 847 females per 1000 boys.

97. Khetri Municipality has total administration over 3,708 houses to which it supplies basic amenities like water and sewerage. It is also authorize to build roads within Municipality limits and impose taxes on properties coming under its jurisdiction.

98. The town has been growing steadily since 1951 (Table 8). The growth of the town has been phenomenal during 1951-61 when there was an influx of population of immigrants to this town. However, thereafter also the growth was not stable. The average decadal increase is 18.19%. However, the last decadal (2001-2011) growth is 4.76%.

Table 8: Population Growth in Khetri

Census year	Population	Increase in Population	Growth rate (%)
1951	7,148		
1961	8,058	910	12.73
1971	8,669	611	7.58
1981	12,594	3,925	75.28
1991	17,725	5,131	40.74
2001	17,382	-343	-1.94
2011	18,209	827	4.76
Average increase		1,844	18.19

Source: Census of India 2011

2. History, Culture and Tourism

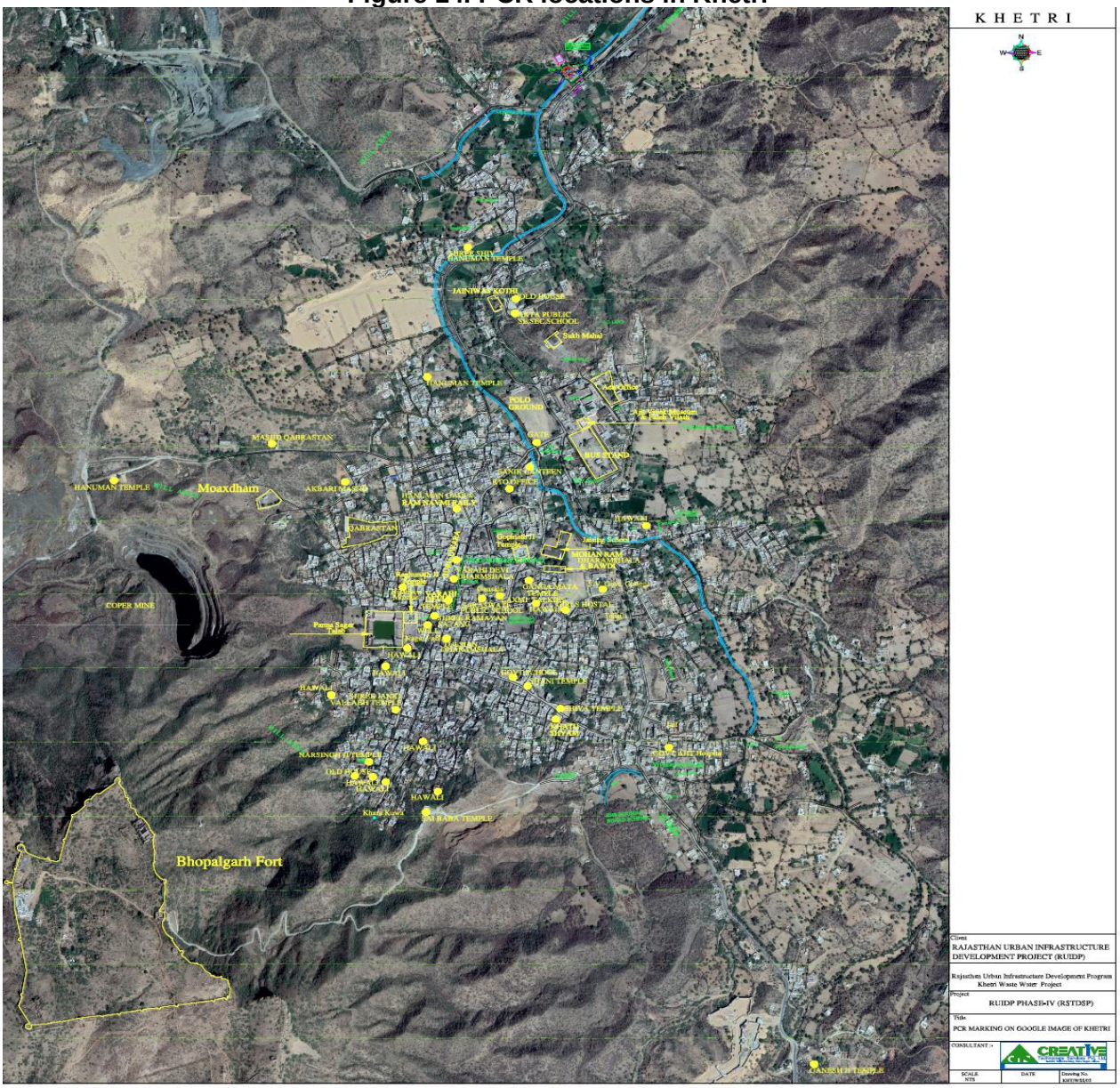
99. Located 160 kilometres north-west of Jaipur, the princely state Khetri is surrounded by hills from all sides and is known for its rich copper mines. But what makes this small town stand out is its interesting historical past. It was founded by Raja Khet Singh Nirban of the Nirban Chauhan Rajput clan and later conquered by the Shekhawat Rajputs. It is their second largest thikana and part of the Panchpana estates of Maharao Shardul Singh's descendants. Khetri also has a strong association with Swami Vivekananda. Mahraja Ajit Singh, ruler of Khetri from 1870 to 1901, came in contact with Swamiji and became a very close friend and disciple. In honour of this life-long bond, Maharaja Ajit Singh's grandson, Raja Bahadur Sardar Singh donated the Futteh Billass Palace built in 1866 to Ramakrishna Mission. Places worth seeing in Khetri include the Khetri Fort, Ramakrishna Mission Center, Vivekananda Museum, Gopinath ji temple and Pannasar Talab.

100. **Physical Cultural Resources.** Khetri is a heritage town in Rajasthan. There are various state-protected sites[13] (listed) that require due consideration especially for pipeline network installations that are close to these sites. Furthermore, ADB SPS, 2009 does not limit PCRs to state-identified monuments but any site, object or features that have archeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance. A full Heritage Impact Assessment (Appendix 9) is conducted to ensure compliance to the ADB SPS, 2009. The site locations are shown in Figure 14.

101. The region has witnessed a momentous history ranging from early civilizations to Post Independence. The culturally rich towns and cities are a living example of this significant history. Cultural heritage encompasses both tangible and intangible assets. Monumental forts, chattris, historic living habitats such as the core areas of city and towns, residential mansions known as 'haveli', step wells and tanks, known as bawdi, temples, and others, form the significant tangible assets. The intangible heritage includes a variety of crafts, arts, festivals, dance forms and music, amongst others. The architecture marvels and living traditions are the main attraction for domestic and international tourists. Heritage is rooted in the physical, social and economic context of the region.

[13] List from http://museumsrajasthan.gov.in/uploads/monument_list/file1533134306_14.pdf

Figure 14. PCR locations in Khetri



E. Environmental Settings of Investment Program Component Sites

102. Subproject components are located in Khetri 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 (Table 9). The wastewater subproject includes construction of one STP, laying of sewer pipes in the municipal area of Khetri town. Sewers will be laid along the roads/streets in the town within the road right-of-way (ROW). In wider roads pipes/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 water and sewer pipeline in those roads. Trenchless technology is also suggested at congested places and critical crossings.

103. Proposed site of construction of STP with SBR technology is away from city area in the available vacant land not under any productive use near Khariya Kua. The land is under the possession of Nagar Palika. Total land required for STP will be around 4800 m^2 and sufficient land approximately 8000 m^2 is available. Nagar Palika has issued a NOC for the proposed STP mention that the land is free from any encroachment (Appendix 27).

104. There are few households that exists near to proposed STP site (50 to 100 m distance). Nearest sensitive receptor in the form of house is located at a distance of 50 m from the proposed STP site. Some trees and shrubs are present at these sites. No wild fauna is found in these locations. STP will be constructed on available vacant Govt. Land. Vacant and encumbrance free Land will be made available by Nagar Palika, Khetri for the construction of STP. There is natural drain flowing beside the proposed STP site at a distance of 80 m. The excess/unused treated effluent can be discharged through pipeline, as this drain is not being used as any water usage source and municipal drains of nearby areas are discharged into it.

105. Mitigation measures to avoid smell and visual pollution shall be taken in consideration during design in Service Improvement Plan preparation period by DBO contractor. Dense plantation in the periphery of STP campus shall be done to avoid adverse impacts on aesthetics and reduce smell also. It is also worth to mention here that proposed SBR technology of STP will evolve low foul smell and smell generated can be mitigated through dense plantation around STP site.

106. Land for construction of one CWR is available in PHED A. En. campus where there is existing office of PHED and 3-4 staff quarters exist in which 3 families are residing. There are few trees of Neem, Pipal, Bargad and Bel exist. which need to be demolished for site clearance. Measures should be taken for safety during demolitions works and safe disposal of demolished muck. Mitigation measures will be required during construction so that no impact may be on habitants. 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.

107. It is proposed to reuse the treated effluent for use of agriculture, horticulture, development of urban forestry etc. and remaining treated effluent is proposed to be discharged into a nearby drain. In order to safeguard the interest of downstream users it is proposed to apply technology/process to achieve very low BOD (BOD 10) and suspended solids in the treated effluent. Sequential batch reactor (SBR) technology has been adopted in RUDSICO-EAP, Phase-IV Treated effluent shall be mostly for beneficial purposes for which proposal of construction of Treated Effluent Elevated Reservoir (TEER), Treated Effluent Storage Reservoir (TESR) and Effluent Pumping Station (EPS) has been taken. Contractor will propose the best methods of reuse of treated effluent and sludge as per guidelines of CPHEEO and best international practices in consultation with RUDSICO-EAP and Nagar palika and submit a plan in RUDSICO-EAP for approval.

Table 9: Site Environmental Features

S. No	Subproject component	Environmental Features of the Site	Photographs
1	Clear water reservoir (CWR), pump house and chlorinator system A En Campus (28^{0}0'22.18''N, 75^{0}47'13.67''E)	Will be constructed in the existing campus of PHED. Vacant land not under any productive use is available in the campus for the said works. There are few trees of Neem, Pipal, Bargad and Bel exist. which need to be demolished for site clearance. Permission from PHED obtained. Existing structures in the existing campus will also be demolished to provide space for the clear water reservoir.	 
2	Sewage Treatment Plant (STP) – 3.15MLD and one OHSR and treated water reservoir Near Khariya Kua – 3.15MLD (28^{0}0'54.32''N, 75^{0}47'11.19''E)	Area is beside the road and is natural low point with already existing stream. The area is clear with minimal shrubs. Meaningful consultation conducted and presented in Appendix 22. This will be constructed on the available land (Municipal Land) not under any productive use. Nagar Palika has issued a NOC for the proposed STP mention that the land is free from any encroachment. Disposal point available nearby STP location.	

S. No	Subproject component	Environmental Features of the Site	Photographs
			
3	Transmission and pipe networks	Pipe network systems include areas in close proximity with heritage sites. Figure 6 show a map that defines the pipe network around these identified heritage sites. There are several state-protected sites at Khetri (some known and visited while few are not known to the local communities). Heritage impact assessment covered in Appendix 9. Figure 6 shows pipe network system around heritage sites.	 Photo taken from the road side (below) 

Figure 15: Map showing distance of STP Location to the nearest receptor and to the effluent discharge point

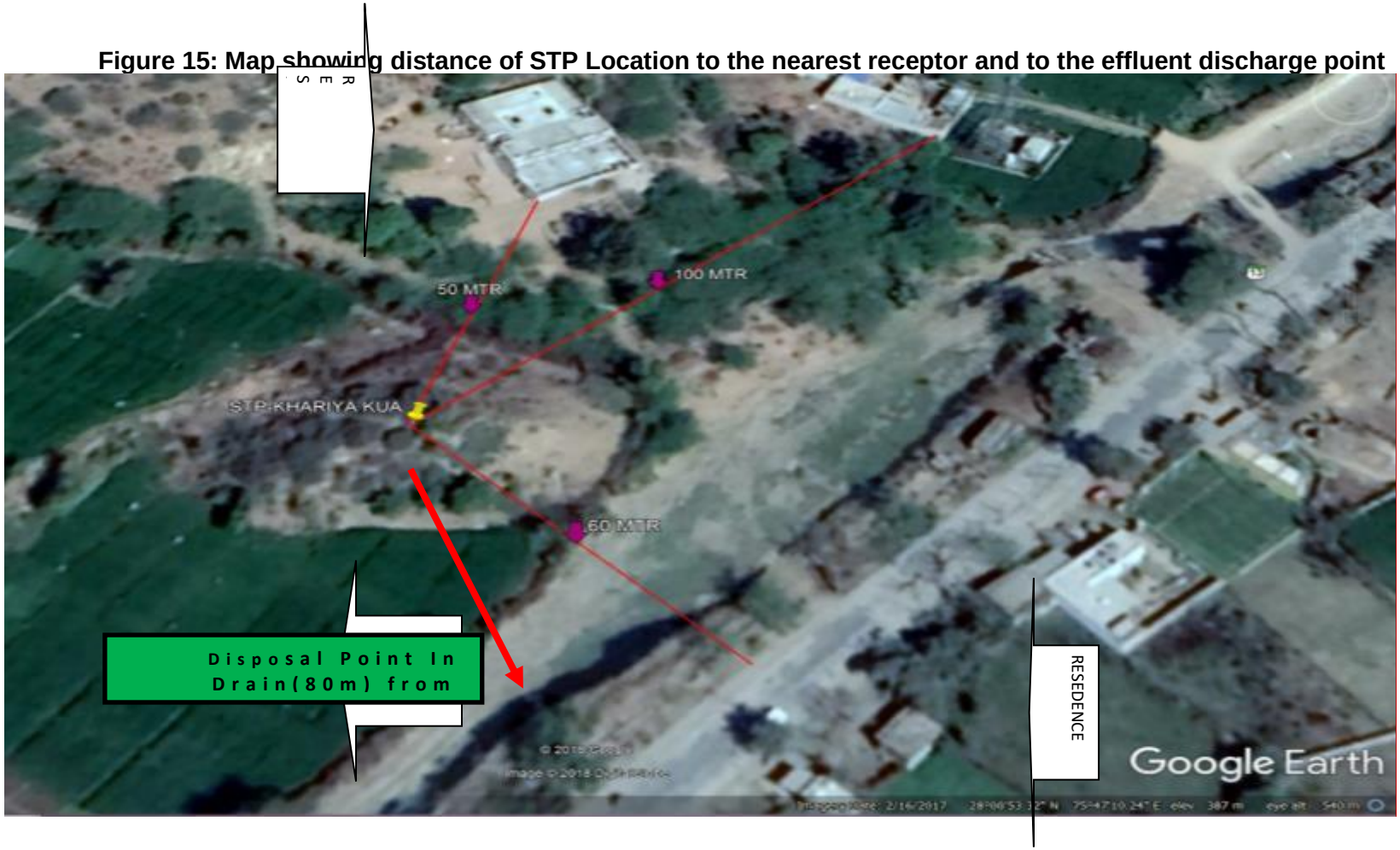
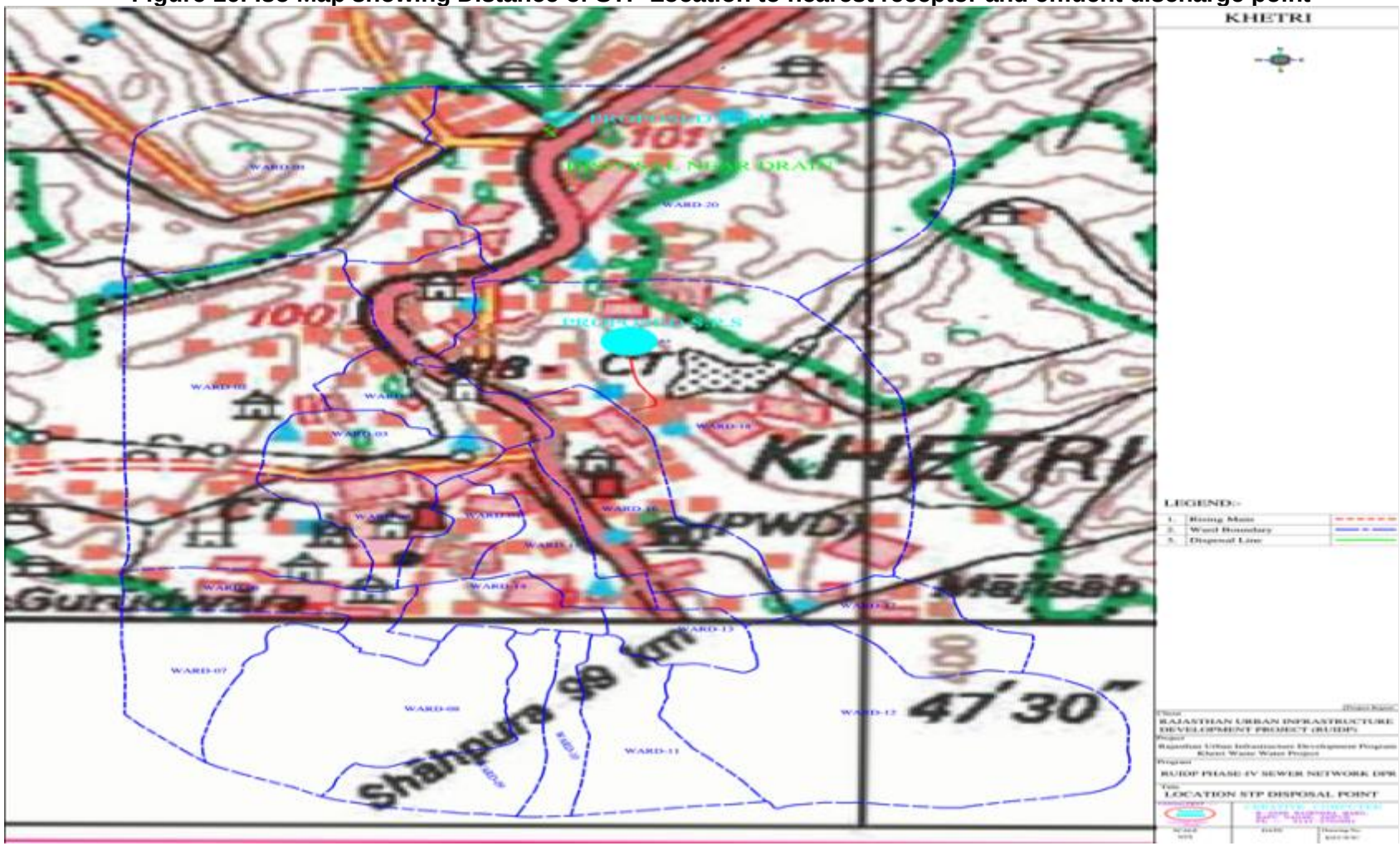


Figure 16: Iso Map showing Distance of STP Location to nearest receptor and effluent discharge point



VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

108. 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.

109. 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,
(iii) including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.
(iv) **Construction impacts** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
(v) **Operation and maintenance (O&M) impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

110. 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).

111. 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.

112. The ADB Rapid Environmental Assessment Checklist for water supply and sewerage (Appendix 1) has been used to screen the project for environmental impacts and to determine the scope of the IEE.

113. 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

1. Location Impacts

114. **Odour Nuisance from STPs.** STP of 3.15 MLD is proposed in the Govt. land located near Khariya Kua which belongs to Nagar Parishad. There are few households within 100 mtrs near to proposed site, therefore there will be impact on nearby habitations due to foul smell and insects and mosquito menace during operation of STP. Nearest sensitive receptor in the form of house is located at a distance of 50m from the proposed STP site. Design of STP should be done to reduce foul smell as much as possible. During operation phase, measures should be adopted to reduce mosquito and insect menace. As per preliminary survey few trees, shrubs and bushes are present at site therefore tree cutting may be required during construction of STP. During final design (SIP), contractor is required to avoid tree cutting as much as possible and replantation to be done in the ratio of 1:3 as per RUDSICO-EAP policy. There is no wildlife reported at this site. To enhance the environmental benefits following measures should be included in the STP site planning and design:

(i) Provide a green buffer zone of 10-20 m wide all around the STPs as far as possible with local/native varieties of trees in 2-3 rows. This will act as a barrier and visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation, agriculture and other gainful purposes.
(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.

115. **Location impacts of Sewerage Networks.** Laying of 34.50 km sewer lines in Khetri Town including 0.50 km of sewer network having depth more than 3.5 m and of different diameter are proposed to be laid using trenchless technology. The sewerage collection networks will traverse through different city roads within ROW. Therefore, no impacts shall be envisaged regarding location. These works will require advance permission from concerned authority (Nagar Palika) for road cutting and traffic diversion etc. No tree cutting will be required as per preliminary design and if any tree cutting will be required during execution mitigation measures shall be adopted. Trenchless technology is suggested at critical crossings.

116. **Construction of Clear Water Reservoir and Pumping Station.**Land for construction of one CWR is available in PHED A. En. campus where there is existing office of PHED and 3-4 staff quarters exist in which 3 families are residing. There are few trees of Neem, Pipal, Bargad and Bel exist. which need to be demolished for site clearance. Measures should be taken for safety during demolitions works and safe disposal of demolished muck. Mitigation measures will be required during construction so that no impact may be on habitants. During detail design all efforts should be done to reduce numbers of trees to be cut for construction works. 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

117. **Location Impacts of Water Supply Transmission and Distribution System.** There are total 6.265 km of water transmission and 44 km of distribution system proposed under the project within existing ROW of different roads. There are no forest land being affected due to proposed pipe line works and no trees being affected due to proposed works. Some temporary rehabilitation and resettlement impacts may be envisaged which shall be addressed in resettlement plan separately.

118. **Physical Cultural Resources.** Khetri is a known heritage town. Any work involving ground disturbance may affect, uncover and damage Physical Cultural Resources (PCRs) including state-protected monuments, archaeological and historical remains. For this project, excavation will occur in urban area and existing roads spread over the entire town, so it could make high risk of such impacts if sites contain any archaeological and historical remains. Except pipeline works, none of the proposed project components are located within protected monuments. Due mitigation shall be considered to ensure no risk to any structure. The PIU shall:

(i) consult Department of Archaeology and Museums to obtain an expert assessment of the archaeological potential of the site;
(ii) consider alternatives if the site is found to be of high risk;
(iii) include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and
(iv) develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved. This should involve:
- Having excavation observed by a person with archaeological field training; contractor should employee a person with a formal certification course in archaeology from recognized (such as Institute of Archaeology, ASI, Delhi) during the ground excavation activities
- Conduct awareness training to contractor & supervision staff prior to start of excavation;
- Stopping work immediately to allow further investigation if any finds are suspected;
- Calling in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ

119. Tree cutting at project sites. There are no notable tree cover or vegetation in STP sites. Water pipelines and sewers will be laid along the road within road right of way. 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 or any other site with trees
(ii) Obtain prior permission for tree cutting at STP site or at any other site that may require tree cutting finalized during detailed design
(iii) Plant and maintain 3 trees for each tree that is felled.

2. Design Impacts

120. **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 water supply and sewerage components. It is proposed to consider 2051 as the design year for all the components in order to maintain unanimity in the design period and design population. Accordingly, 2021 shall be the base year and 2036 the intermediate year to cross check the designs pertaining to intermediate demand. The rate of water supply has been taken as 135 LPCD for 100% population. Sewage generation is 85 percent of water supply (including 5% to account for infiltration). Technical design of all the

elements of water supply (intake, WTP, reservoirs, pumping, transmission and distribution system etc.), and 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.

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

(i) Adopting conjunctive use approach in water use; utilizing feasible surface water sources and groundwater source optimally thereby reducing the existing groundwater abstraction to the extent possible
(ii) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically).
(iii) Recovering wash water from treatment process to optimise the water use
(iv) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs
(v) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage
(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 fecal 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

122. **Water Source Sustainability.** Presently source of Khetri town is ground water. The town is benefited from 7 no. of tube wells situated about 2.5 km from Bankoti. Water collected from 7 nos. tube wells are collected at 900 kl CWR at Bankoti and from there reaches by gravity to Clear Water Reservoir at JE office and further it transferred to ESR/GLSRs in the town. No new tube wells will be added in the subproject.

123. **Surface Water availability.** A package “Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II” is sanctioned by PHED and under execution. Khetri will get deficit water (excluding groundwater) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal”. The work of pipeline system from canal off take point to JE office has been completed. 500 mm DI pipe has been laid from canal off take to JE office. Appendix 14 provides the water allocation letter from PHED for the remaining items.

124. **Groundwater Abstraction and Sustainability**. The unfulfilled demand from the surface water will be supplemented by the groundwater. As per the CGWB data, in Khetri Block/Tehsil, the estimated net annual groundwater availability is 65.5769 MCM, the total utilization for all uses is estimated as 65.163 MCM (99.37% utilization). Khetri Tehsil is classified as “Semi Critical” with significant long-term decline in groundwater. CGWB recommend cautious groundwater development in over exploited areas, and conjunctive use of surface and groundwater resources. Accordingly, under the project, it is proposed utilize surface water sources to the extent possible, and dependence on groundwater reduced. Ground water resources need to be used judiciously.

125. Over exploitation of groundwater resources i.e., abstracting more than the net annual ground water available in the area will lead to several environmental and economic issues. Abstracting water from static water resources may lead to contamination due to geo-hydro chemical processes and may also lead to land subsidence. Tube wells will dry up quickly, with falling water table pumping costs will go up, and the effect on competing uses can cause social conflicts.

126. To ensure groundwater sustainability, the following measures should therefore be implemented during the implementation:

(i) Prepare a groundwater harvesting and artificial recharge plan;
(ii) Creation of artificial recharge pits in public places / public buildings. Local body can issue a notification to this effect.
(iii) Household level artificial recharge (like roof top rainwater harvesting) should be encouraged.

127. **Groundwater Quality.** As presented in the baseline profile, Groundwater quality of tube wells and open wells in Khetri is presented in Table 9 and 10. Groundwater is alkaline in nature with pH ranging from 7.0 to 8.0, and within the acceptable range of drinking water quality. Most of the tested parameters are well within the desirable limits of drinking water standards (IS 10500-2012). Fluoride content in most of the samples, exceeding the desirable limit of 1.0 mg/l and also above the permissible limits (1.5 mg/l) in 7 samples. Except two tube well samples the Chloride content in all the open /tube wells are below desirable limit (250 mg/l), TDS content in all the tube wells and open wells monitored is exceeding the desirable limit (500 mg/l), but within the permissible limit (2000 mg/l), except for two tube wells where TDS contents are above the permissible limit.

128. High Fluoride and TDS is only in isolated cases, and the water is mixed with other tube wells and groundwater, the blending effect thus will reduce the concentration to a great extent. In any case, the DBO contractor must ensure that supplied water to the household meets the drinking water standards, and if any additional / specific treatment (such as defluorination or softening) required, it must be included in the treatment process. As there is no sewerage system at present, groundwater is at risk of contamination due to discharge of untreated wastewater. Open defecation is not uncommon, and indiscriminate solid waste disposal is prevalent. The sewerage system being developed under the project will prevent the untreated sewage flow in open drains. A source protection plan shall be prepared to avoid source contamination at tube wells.

(i) Prepare a source protection plan for tube wells and open wells
(ii) Prevent flow of untreated wastewater in the drains
(iii) Ensure proper construction of tube wells including casing pipes to prevent water contamination from well spaces, and due to flooding
(iv) Measures should be taken to control the open defecation, and to close all unsafe latrines (for example pit latrines).
(v) Awareness programs shall be conducted regarding the sanitation practices and its effect on groundwater quality

129. **Use of Hazardous / Harmful Substances in Water and Wastewater Treatment.** Water and/or wastewater treatment may involve application hazardous / harmful chemicals such

as in coagulation, disinfection etc. 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. In addition, chlorination will be conducted at CWRs. It is proposed to establish chlorination system at five CWRs. Groundwater from the tube wells/open wells will be directly pumped to CWRs where it will be mixed with the treated surface water from the WTP, and the mixed water will be chlorinated prior to distribution. 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 (water treatment); 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
(ix) Develop emergency response procedures

130. **Design of Sewage Treatment Plant.**1 STP - 3.15MLD will be constructed at the identified site to treat the sewage generated from Khetri Town. The STP will be 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 10 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.[14] 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.

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

Table 10: Proposed Raw and Treated Wastewater Characteristics for STP Design

S. No	Parameter	Proposed Discharge Standards for Khetri STPs	MOEF and CC STP Discharge Standards, 2017	CPCB discharge standards, 2015#	IFC Guideline value for sewage discharge	WHO Guideline Value for safe use in agriculture
1	pH	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	<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 (Desirable) <230 (Permissible)	<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.

131. **Treated wastewater Reuse / disposal.** 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 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.

132. 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 15).

133. **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
(xii) Individual Users

134. **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. Memorandum of understanding between ULB and the users of the treated water.

135. **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 Khetri 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 Khetri, 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). 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 Khetri 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 Khetri, 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

136. **Use of treated wastewater for irrigation.** Use of wastewater for irrigation is associated with some health risks – from germs in wastewater, which may contaminate food and spread disease, health risk to farm workers from worms (helminths) and nematodes and chemical risk 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.

137. **Disposal of treated wastewater.** Proposed STP sites are located close to dry water channels (drains) and the excess / surplus / unused treated wastewater will be discharge into this drain. As the wastewater is treated to stringent disposal standards, no notable impacts envisaged. Both the drains are mostly dry except during monsoon. They carry untreated wastewater from the surrounding areas town. The disposal of treated wastewater meeting the set quality standards, in fact, will improve the quality of water by dilution. There are no water intakes or abstraction points in the downstream proximity. STP sites are surrounded mostly by agricultural and barren lands. Considering the existing status of drains, and the degree of treatment, no significant impacts envisaged. Proper systems should be put in place at the proposed STP to ensure that treated wastewater at all times meet the stipulated standards prior to its disposal into drains. No Objection Certificates (NOCs) are provided in Appendix 27. Any change / lowering of treatment efficiency during operation may lead to poor quality of wastewater and may further pollute the water body. It is therefore critical that STP treats the sewage as designed. Operation and maintenance of STP and change in incoming sewage quality will have impact on the treatment efficiency. This therefore requires monitoring:

(vi) Obtain of consent of RSPCB for discharge of treated wastewater into nearby drains.

(vii) Regularly monitor the treated wastewater quality at STP and ensure that it meets the discharge standards
(viii) Monitor water quality periodically during operation phase as per the EMP.

138. **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.

139. 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”.

140. 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.

141. Contractor will propose the sludge management plan with best methods for reuse of sludge as per guidelines of CPHEEO (guidelines are attached as Appendix 16) 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 11: 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)**

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

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

(i) Prepare a dried Sludge utilization plan for Khetri 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 Khetri 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), 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
(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)

143. **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 marble, granite, cement plant, leather, textile, plastic, synthetic yarns, resins industries are in Khetri. 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
(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

144. **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, Khetri Nagar Palika should ensure that all existing septic tanks in areas that are being provided by sewers are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. are some of the issues that needs to be critically looked into during the sewer system design. A properly designed system is a must for system sustainability. Measures such as the following shall be included in sewer system design to ensure that the system provides the benefits as intended:

(i) Limit the sewer depth where possible
(ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);

(iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at 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 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

145. **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 22% 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

(ix) Prepare Health and Safety Plan for FSSM

C. Environmental Audit of Existing Water Supply Infrastructure

146. It is proposed to utilize existing water supply infrastructure like tube wells, clear water reservoirs, pump houses etc. with necessary improvements. As per the ADB SPS 2009, these are associated facilities and therefore the component operation shall comply with the ADB and applicable environmental laws of India. Besides, ADB SPS lays emphasis on impacts and risks on biodiversity and natural resources, pollution prevention abatement including hazardous waste, occupational health and safety, community health and safety, and physical cultural resources. A random environmental audit is conducted to (i) assess the compliance of the existing infrastructure with environmental legislations and (ii) improve environmental performance to minimize future potential liabilities. The preliminary audit note is given in Table18. A more detailed environmental audit and risk assessment shall be carried out during detailed design stage and incorporated into the final IEE.

147. All the existing infrastructure facilities are located in Khetri Town, which is an urban area and where there are no protected or sensitive environmental areas such as forests, wildlife sanctuaries or archeologically protected areas. Therefore, there are no risks or impacts on biodiversity and natural resources. The proposed project will optimally utilize the surface and groundwater sources. Due to nature of components, the existing infrastructure components do not fall under the ambit of any environmental related regulations, and therefore there is no requirement of permissions or clearances. Presence of Asbestos Containing Material (ACM) in the form of asbestos cement pipes in the existing water supply infrastructure is a cause of concern due to its potentially hazardous nature. Project, however, do not include rehabilitation or repair of AC pipes, and the project, in fact, proposes to discontinue the use of AC pipes. Presence of AC pipes in the existing facilities may create hazardous conditions for the workers and surrounding community. Besides, the generation and disposal of debris and discarded materials, and construction phase health and safety need to be considered and mitigated to comply with the SPS provisions. Following table provides component wise compliances and concerns. Corrective actions for the identified environmental concerns are discussed in the following section.

Table 12: Environmental Audit of Existing Facilities

Infrastructure	Details	Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns

Tube wells	7 tube wells	• Replacement of pipes, submersible pumps, cables, panels, valves, flow meters and synchronization with SCADA enabled devices • Depth of the tube well will not be increased	No requirements under existing laws New tube wells require permission from State Groundwater Department; however, these are existing, and permission not required	Occupational health and safety, public safety during the construction works Disposal of discarded material, debris
Clear water reservoirs (CWRs)	6 GLRs 1 OHSR	• Civil repairs and rehabilitation, replacement of pipes, connections, electrical and mechanicals parts as required • Cleaning	No requirements under existing laws	Occupational health and safety, public safety during the construction works Disposal of discarded material, debris including AC pipes
Transmission and distribution		• Replacement; new pipes will be laid in the place of existing pipes • Pipes will be left as it is in the ground, no rehabilitation / removal proposed	No requirements under existing laws	Presence of underground AC pipes Accidental disturbance / need to remove in narrow roads Occupational health and safety, public safety during trenching Disposal of AC pipes / debris
Infrastructure	Details	• Proposed Rehabilitation	Compliance with environmental regulatory framework	Environmental Concerns
Tube wells	7 tube wells	• Replacement of pipes, submersible pumps, cables, panels, valves, flow meters and synchronization with SCADA enabled devices • Depth of the tube well will not be increased	No requirements under existing laws New tube wells require permission from State Groundwater Department; however, these are existing, and permission not required	Occupational health and safety, public safety during the construction works Disposal of discarded material, debris

Clear water reservoirs (CWRs)	6 GLRs 1 OHSR	• Civil repairs and rehabilitation, replacement of pipes, connections, electrical and mechanicals parts as required • Cleaning	No requirements under existing laws	Occupational health and safety, public safety during the construction works Disposal of discarded material, debris including AC pipes
Transmission and distribution		• Replacement; new pipes will be laid in the place of existing pipes • Pipes will be left as it is in the ground, no rehabilitation / removal proposed	No requirements under existing laws	Presence of underground AC pipes Accidental disturbance / need to remove in narrow roads Occupational health and safety, public safety during trenching Disposal of AC pipes / debris

148. **Corrective Measures.** As presented in the above table, there are no regulatory non-compliance issues in the existing infrastructure. The environmental concerns are mainly related to occupational health and safety, public safety, disposal of debris, discarded materials etc., A work specific environmental management plan needs to be prepared for these aspects. The exact nature of rehabilitation and repair works will be known only during the detailed design phase as the detailed technical audit will be conducted by the DBO contractor and the required rehabilitation and repair measures will be proposed accordingly. Therefore, a separate EMP will be prepared for rehabilitation works during the detailed design phase by the DBO contractor, and reviewed and approved by PMU/consultants, and the same will be implemented by the DBO contractor. These are included in the EMP.

149. Presence of asbestos containing material (ACM), mainly AC pipes, in the existing infrastructure is the main concern. Asbestos is recognized as a cause of various diseases and is considered health hazard if inhaled.

150. Nearly 22 km of underground water transmission and distribution system consists Asbestos Cement (AC) pipes of 80-250 mm diameter. Most of the AC are old. There is no use of new AC pipes but for repairing work in the existing network, and for replace the damaged sections, AC pipes are being used. There will be no use of any AC pipe in the future as under the present project, water supply network is being provided in the entire town with non-AC pipes. It is normal practice in Rajasthan that existing AC pipes are left as it is in the ground and new pipes will be laid in a new alignment. In wider roads, there will be adequate space to lay the new pipelines, and therefore there is no need to remove the existing pipelines.

151. However, complete avoidance of handling and disposal of AC pipes may not be possible. There are narrow lanes, where AC pipes may be encountered during the laying of new pipes. Some connections / inlet / outlet pipes at the existing CWRs are also of AC pipes. These will be removed and replaced with new non-AC pipes. At present no maps available on the exact location / position of AC pipes. The local long serving O and M staff of PHED seem to be well aware of the location of AC pipes in the roads. Consultation with the staff indicates that of the total 106 km of underground AC pipes, about 20% may be required to be removed, especially in the narrow lanes to lay the new lines. This will be about 21 km length of water pipes.

152. A temporary storage area shall be provided in the project site by the PMU. Asbestos materials present and removed from the construction activities will be temporarily maintained at the identified area. The temporary storage area shall be constructed by the DBO contractor based on the specifications of the asbestos management service contractor.

153. Bureau of Indian Standards (BIS) Guidelines for Safe Use of Products containing Asbestos states that "Asbestos cement products (such as AC pipes) generally contain about 10-15% asbestos fibers in a cement matrix that comprises the rest of the materials and are termed as locked in asbestos products as these products have the asbestos fibers bound in cement. There is very little possibility of generation of airborne asbestos fibers during any reasonable handling, storage, and use of such products. However, during storing and installation, recommended work practices shall be followed to avoid harmful exposure". According to Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, any waste having asbestos concentration limit of 10,000 mg/kg (i.e. 1%), however this will apply only if the asbestos containing substances are in a friable, powdered or finely divided state. Under the Basel Convention[15], asbestos or asbestos waste in the form of dust and fibers is classified as hazardous waste.

154. Working with or handling AC pipes in manner that produces dust, fibers, air borne particles etc., is very harmful and hazardous to the workers and general public around the work sites. The condition of existing underground AC pipes is not known, however, as these are old, pipes may be in deteriorated conditions. Condition needs to be assessed to check whether it is in friable form or in a condition in which it can release fibers before it is subjected any disturbance or removal.

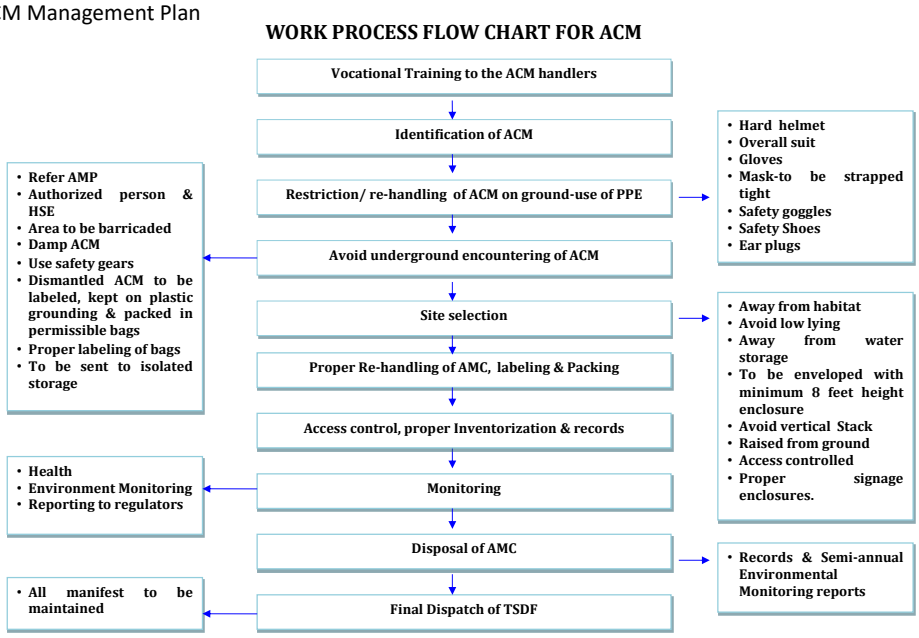
155. During the IEE preparation, an expert on Asbestos and ACMs was mobilized to assist PMU to conduct an assessment and field validation of the extent of asbestos cement materials covered under the RSTDSP subprojects. The assessment has indicated that specific measures are necessary to safeguard the health and safety of the nearby communities and the potential contractors consistent with the requirements of the ADB SPS 2009. Activities such as clearing, transfer and disposal of AC pipes, work in narrow streets, and interventions in existing AC pipes may have adverse impacts on workers and surrounding population. Air borne asbestos if handled unsafely, cut, drilled or broken into pieces that may cause health issues such as Inflammation of the lungs, Mesothelioma, Peritoneal mesothelioma, Pleural plaques, Asbestosis and Bronchogenic Carcinoma. Following measures are to be implemented to avoid any impacts:

[15] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, adopted in 1989

(i) Develop and implement the ACM Management Plan (AMP) that includes identification of hazards, the use of proper safety gear and disposal methods. Sample AMP is provided in Appendix 17. Adhere to the workflow process suggested in Figure 17.
(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
(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.
(vi) Appropriate actions as defined in the Asbestos Management Plan will have to be adhered to
(vii) Maintain records of AC pipes as per the AMP

Figure 17: ACM Management Plan – Work Process Flow Chart

ANNEX 1 – ACM Management Plan



156. Requirement for the Contractor and the Subcontractor. The following are operational requirements related to works involving asbestos:

(i) engaging certified and competent asbestos service provider to identify, handle and remove the asbestos materials present and encountered in the project sites;
(ii) adopting good practices per EHS Guidelines to minimize the health risks associated with asbestos materials by avoiding their use in new construction and renovation, and, if installed asbestos-containing materials are encountered, by using internationally recognized standards and best practices to mitigate their impact;

(iii) training of workers and supervisors, possession of (or means of access to) adequate equipment and supplies for the scope of envisioned works, and a record of compliance with regulations on previous work;
(iv) removal, repair, and disposal of ACM shall be carried out in a way that minimizes worker and community asbestos exposure, and require the selected contractor to develop and submit a plan, subject to the PMU and PIU's acceptance, before doing so;
(v) providing adequate protection to its personnel handling asbestos, including respirators and disposable clothing;
(vi) notifying the Rajasthan State Pollution Control Board (RSPCB) of the removal and disposal according to applicable regulations as indicated in the technical requirements and cooperating fully with representatives of RSPCB during all inspections and inquiries.

157. PMU will engage an Asbestos Management Specialist to provide training and awareness, and to coordinate with various stakeholders on the risks, management, and mitigation measures required for the identification, safe handling, transport and disposal of the asbestos materials.

D. Pre-construction Impacts

158. 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

159. 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.

(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

160. 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.

E. Construction Impacts

161. The civil works for the subproject includes construction of STP and CWR. 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 the WTP 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.

162. Laying **of Sewer Networks.** The maximum depth for sewers depends on the design, and in Khetri 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 5m. 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 2 m will be protected by 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.

163. Subproject also include linear works (laying of 44 km of distribution water pipes, and 34 km of sewers along the roads). Distribution lines / small sewers (tertiary sewers) will be laid in

all streets and roads, the larger sewers and water mains will be laid mostly on wider main roads. Pipes / sewers will be laid by open cut method. Water pipes will be laid in the ground without a maximum cover of 1 m, so that depth of excavation will be up to 1.5-1.8 m. The maximum depth for sewers depends on the design, and in Khetri 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 km length of sewers will be laid by trenchless method; these will include highway /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.

164. 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:

165. **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.

166. **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 & 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 valid 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
(ix) Conduct ambient air quality monitoring periodically as per Environmental Management Plan (EMP)

167. **Proposed Water Supply Pipeline.** A detail survey is needed after finalization of alignment to access the feasibility of the alignment for need of any tree cutting, demolition of any structure, road and railway crossings, pipe laying in any private land, presence of any sensitive receptor along alignment, disturbance to public or business etc. Mitigation measures have been prepared for potential adverse impacts. Prior consent from landowners (if pipe laying is required in private land) and NOC from concerned departments (for pipe laying in roads, road/railway crossings etc) prior to start of construction works, is required. To mitigate the impacts of disturbance to road users during pipe laying works on road, it is strongly recommended that contractor dig only those length of road, up to which extent he can lay pipe on the same day and can back fill the trench and restore the road up to motorable conditions. All the safety measures for work on road such as barricades, road signage, traffic assistance etc. is required to be adopted by contractor during construction works. Further if night works are required (however unlikely, applicable only in extreme conditions) all the mitigation measures to reduce impacts of disturbance to minimum level to nearby habitants and road users should be ensured by contractor.

168. **Surface Water Quality.** Construction works in the reservoir may lead degradation of water quality due to increase in turbidity and chemical contamination from fuels and lubricant used in construction work. Increase in silt content and water turbidity, chemical quality can affect the aquatic life, silting/chocking of spill ways/ canals etc., Though there are no notable aquatic life, to ensure that any negative impacts are mitigation, the following measures shall be implemented:

(i) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition, and able to complete the construction work prior to onset of monsoon
(ii) Schedule the construction works during low water level period – late winter months to pre monsoon (February – June/July); ensure that works are completed during the same period to prior to onset of monsoon;
(iii) Erect temporary barriers to form enclosed construction area with least disturbance

(iv) Allow adequate time to settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt laden water should be pumped to a silt pond
(v) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage
(vi) Clear the work site after completion at least to pre project conditions, ensure that there are no materials, debris, spills etc., and prior to removal of temporary barriers / coffer dam
(vii) Implement work site safety at works in water bodies

169. **Noise and Vibration Levels.** Construction works will be conducted along the roads in Khetri 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.
(viii) Conduct Noise monitoring according to the Environmental Management Plan (EMP).

170. **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.

171. **Groundwater 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 Khetri 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 (Appendix18);
(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).

172. **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 19)
(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.

173. 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:

(ix) Inform the affected local population 1-week in advance about the work schedule
(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.

174. **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 19)
(iii) Duly consider and select sections for trenchless method of pipelaying based on traffic conditions
(iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
(v) Keep the site free from all unnecessary obstructions;
(vi) Coordinate with Traffic Police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours;
(vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.
(viii) Maintain sufficient access to houses and shopkeepers (commercial establishments) during pipe/sewer laying work through metal sheets and temporary bridges

175. **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 18);
(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; and
(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.
(viii) Provide alternate sources of clean water until water supply is restored.

176. **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.

177. **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 (see Appendix 8);
(ii) Following best practice health and safety guidelines: IFC's General EHS Guidelines[16] , WHO Interim Guidance (and its updates) on Water, Sanitation, Hygiene and Waste management for the COVID19 virus (Appendix 28), and Sector Specific (Water and Sanitation) Guidelines[17]
(iii) Develop and implement site-specific occupational health and safety (OHS) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training[18] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
(iv) 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

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

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

[18] 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.

(v) Ensure that qualified first aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(vi) Provide medical insurance coverage for workers;
(vii) Secure all installations from unauthorized intrusion and accident risks;
(viii) 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:
(ix) Work schedule should be adjusted to avoid peak temperature hours (12 – 3 PM)
(x) Provide appropriate shade near the workplace; allow periodic resting and provide adequate water
(xi) Provide necessary medicine and facilities to take care of dehydration related health issues
(xii) Provide supplies of potable drinking water;
(xiii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
(xiv) 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 workers;
(xv) 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;
(xvi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(xvii) Ensure moving equipment is outfitted with audible back-up alarms;
(xviii) 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
(xix) 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.
(xx) Conduct regular health check-ups for workers
(xxi) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites
(xxii) 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.

178. **Asbestos Containing Materials.** No Asbestos containing material (ACM) is proposed to be used in the subproject construction. There are however ACM in the existing water supply infrastructure, which may be disturbed or come in contact with the workers and general public and may have serious health implications. This is already discussed in under the existing facilities audit, and necessary measures are suggested.

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

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

180. Central 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
(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

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

(i) Consult PIU before locating project offices, sheds, and construction plants;
(ii) Minimize removal of vegetation and disallow cutting of trees;

(iii) Provide drinking water, water for other uses, and sanitation facilities for employees;
(iv) Provided temporary rest and eating area at all work sites
(v) Ensure conditions of livability at work camps are maintained at the highest 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[19] 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 20)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.

182. Physical Cultural Resources. PMU will ensure subproject designs and implementation will avoid damage to physical cultural resources (PCRs) within or adjacent to project sites. For subproject towns with potential PCRs, a heritage impact assessment (HIA) is to be conducted as part of the IEE. The HIA will document all PCRs, assess the potential impacts and recommends measures to avoid any negative impact. If an impact is unavoidable, mitigation measures and/or compensatory measures are to be implemented as part of the EMP. No works will be allowed until the HIA is completed. The HIA will also include the protocol and coordination arrangement with the regulatory agency (Archaeology and Museum Department of Rajasthan) in case of chance find during execution of works. The EARF and IEE of Khetri water supply and sewerage subproject includes an HIA as a guide for developing subproject-specific HIAs. The concepts and designs of structures will incorporate heritage, historical and cultural qualities to the extent possible to ensure new structures/facilities are harmonized with existing environment. PMU will also engage a Heritage Management Specialist to update the Khetri HIA based on detailed design, conduct HIAs of remaining heritage towns (Mandawa), provide technical support in obtaining statutory clearances, advise the PMU and PIUs on matters related to PCRs, provide training and awareness and

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

coordinate with the various stakeholders, review and approve the detailed architectural drawings prepared by the contractor, assist team leader and structural expert in review and approval of all drawings from architectural and heritage perspective, promptly address any site-specific issues regarding architectural and heritage aspects, and provide supervisory support in works within or adjacent to PCRs.. The construction contractor will be required to:

(i) Adjacent to religious/historic sites, undertake excavation and construction work in such a way that no structural damage is caused to the building. Refer to Appendix 9 Heritage Impact Assessment.
(ii) Follow the protocol for chance finds in any excavation work;
(iii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work;
(iv) Stop work immediately to allow further investigation if any finds are suspected;
(v) Inform local Archaeological Department / Museum office if a find is suspected; take any action they require ensuring its removal or protection in situ.

183. **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.[20]
(iii) No residential areas shall be located within 100 m downwind side of the site.
(iv) The site is minimum 250 m. away as far as possible from sensitive locations like hospitals, religious places, ponds/lakes or other water bodies.
(v) The local governing body and community shall be consulted while selecting the site.

184. **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

[20] 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.

(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
(xxvi) Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.

F. Operation and Maintenance Impacts

185. Water Supply System. Operation and Maintenance of the water supply and sewerage system will be carried out by Khetri Nagar palika. The system has a design life of 30 years, during which shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts. It has to ensure by contractor that desired consents from RPCB are obtained for operation of STP further to ensure that treated effluent meet the parameters as set by CPCB/RPCB will be contractor's responsibility. Emerging sludge from STP should be disposed in designated site only in scientific manner adhering guidelines as set by CPCB/RPCB. Contractor will also ensure compliances to all the conditions as mentioned in the CTO.

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

187. Recurrence of pipe bursting and leakage problems in water supply system will be managed by the leak detection and water auditing surveys. The operating agency will be required to ensure that the leak detection and rectification time is minimized.

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

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

189. Following measures are suggested for implementation / compliance during the operation phase:

(i) Judiciously utilize the available water in surface and groundwater resources by adapting conjunctive use; prepare a water utilization plan every year post monsoon season depending on the water availability;
(ii) Prepare and implement Contingency Plan for low rainfall years that will result in low water availability in dams; in such cases revise the water supply rate appropriately to ensure uninterrupted water supply throughout the year; provide prior information to stakeholders
(iii) Ensure that water supplied to the consumers at all times meet the drinking water standards; carry out regular sampling and testing, and disseminative information

190. **Sewerage System.** Operation and Maintenance of the sewerage system will be carried out by DBO contractor for 10 years and then by Khetri 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.

191. 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 into local drains/streams. These run dry except during monsoon. It carries untreated wastewater from habitations along its course. Considering the existing status of streams, and the degree of treatment proposed, no significant impacts envisaged. However, any change / lowering of treatment efficiency during operation may lead to poor quality of wastewater and affect the reuse. Mixing of industrial effluents in sewers may affect the inlet quality of sewage. It is therefore critical that STP receives the sewage with intended quality and treats the same to design discharge standards.

192. 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.

193. 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 172 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.

194. 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 21
(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;

(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:

195. 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:
(ii) 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.
(iii) 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
(iv) Monitoring of sewer flow to identify potential inflows and outflows
(v) 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);
(vi) 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;
(vii) 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.
(viii) 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
(ix) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.
(x) Provide necessary health and safety training to the staff
(xi) Provide all necessary personnel protection equipment
(xii) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works.
(xiii) As far as possible use remote / CCTV mechanism to identify/detect the problems in sewers and do not engage persons for this purpose
(xiv) 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

(xv) Ensure that maintenance staff and supervisors understand the risks; provide proper instructions, training and supervision.
(xvi) Use gas detector to detect any hazardous or inflammable gas in confined areas like sewers /manholes prior to maintenance process
(xvii) 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.
(xviii) Provide adequate welfare facilities, including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers.
(xix) For remote locations portable welfare facilities should be provided.
(xx) Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities.
(xxi) Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive dressings.
(xxii) Make effective arrangements for monitoring the health of staff.
(xxiii) Keep emergency preparedness plan ready before starting the work of sewage system cleaning

196. 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 28). Measures on managing wastewater and fecal waste and keeping water supplies safe is critical to avoid the start or spread of any disease.

197. **Operation of FSSM.** About 22% of total households 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
(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

198. In Khetri, 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.

G. Cumulative Impacts

199. 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 urban water supply and sewerage in Khetri Town, by rehabilitating, augmenting, and creating required new infrastructure.

200. Both water supply and sewerage works are proposed to be taken up simultaneously in Khetri Town, which is a small town 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 Khetri is 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 Khetri, 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. There is also a need to streamline water and sewer line works to avoid repeated excavations in the same road/street. 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.

201. **Project Benefits.** The citizens of the Khetri will be the major beneficiaries of the improved water supply and sewerage systems. The subproject is primarily designed to improve environmental quality and living conditions of Khetri Town through provision of water supply and sewerage. The benefits arising from this subproject include: (i) increased availability of potable water at appropriate pressure to all households including urban poor; (ii) reduced time and costs in accessing alternative sources of water. (iii) better public health particularly reduction in waterborne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

202. 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.

203. 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, Khetri Nagar Palika, 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

204. 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 sites, raw water Intake, WTP and CWR locations and other locations of proposed sewerage and water supply network to access the awareness of general public, present water supply 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 4 April 2018 and 6th October 2018. The proposed CWR and STP facilities will cover the entire Khetri town and the people consulted were all residents of Khetri and are direct beneficiaries. Public consultations were also done at nearest habitations of CWR and STP locations. Details of public consultations are given in Appendix 22.

1. Consultation during Project Preparation

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

206. 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 ROW of the city. The subproject details have been explained in detail to the people who are involved in public consultation and also asked their suggestions and willingness to complete the proposed civil work. It is observed that people shown their willingness in favour of the sewerage and water supply project at Khetri. They are agreed to take up house service (swear and water) connections. Few environmental issues like availability of access during construction, generation of dust and noise are for short period and not a major concern for residents. Details of public consultations are attached in Appendix 22 with this report. Main 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.

207. 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.

208. City level Stakeholder Committee (CLC) meeting was organized in Udaipur on 25 August 2017 to discuss the matter of proposed sewerage works and water supply in Khetri under the chairmanship of District Collector, Khetri 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 Palika in beneficial uses. Executive Engineer PIU, RUDSICO-EAP (Udaipur) 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 22.

2. Consultation during construction

209. Prior to start of construction, Nagar Palika Khetri 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.

210. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction and operational phases and also regarding the grievance redress mechanism. Nagar Palika Khetri / 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

211. 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 Khetri. 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.

212. 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.

213. 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.

214. 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.

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

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

216. 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

217. 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)[21] the system was effective in timely resolution of grievances in a transparent manner.[22] 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.[23]

218. **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.

219. 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.

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[21] The procedures followed for grievance redress during implementation of RUSDP Phase III included the project GRM and the pilot GRM software application (smart check) in Pali, the Sampark portal of Government of Rajasthan, and the Chief Minister's helpline. Complaints received through various channels were mostly minor and pertained to damage to existing water supply pipelines and disruption of water supply during construction, delays in road restoration, and pending new connections. Complaints related to damage to private property (compound walls/steps, etc.) were less in number. The grievances were mostly possible to resolve in coordination with the contractors. Complaints received were immediately referred by the CAPC/PMDSC supervision staff to the PIU Nodal officer (safeguards) and concerned engineer at PIU, who advised them on further action. Follow up with the contractor on complaint resolution was undertaken by PIU Nodal officer CAPC and PMDSC and final feedback sought from complainant upon resolution. Complaints requiring inter-departmental coordination were referred to the PMU for resolution, and feedback provided to complainant. The PMU kept regular track of grievances through WhatsApp and email alerts, ensuring registration and follow-up until resolution.

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

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

220. 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[24] or by sending a WhatsApp message to the PIU[25] or by dialling the phone number of town level PIU/CAPPC or by dialling a toll-free number.[26] 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.[27] 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)[28] 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

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[24] RUSDP piloted an online application based live GRM counter for resolution of public grievances over and above the usual process of grievance registration and redressal. This app based GRM - "RUIDP Smart Check" is available at Google play store (free of cost) and is operational. The RUIDP Smart Check "app" was launched in Pali town in July 2017 and is proposed to be scaled up in RSTDSP project towns. For persons without access to the application, the traditional channels will continue to be available.

[25] It is suggested for each PIU to have a dedicated WhatsApp group for registration of grievances and receipt of quick feedback, to be followed by more formal communication.

[26] Project contractors in all project towns will have a toll-free number with specific working hours for registration of grievances related to RSTDSP.

[27] http://www.sampark.rajasthan.gov.in/RajSamWelcome.aspx

[28] The CLMC has been formed at the town/city level for planning and monitoring of work, resolve issues related to departmental coordination etc. It is headed by Commissioner/Executive Officer ULB (Chairman) and city engineer of public health engineering department (PHED), public works department (PWD) and head of PIU acting as Member Secretary.

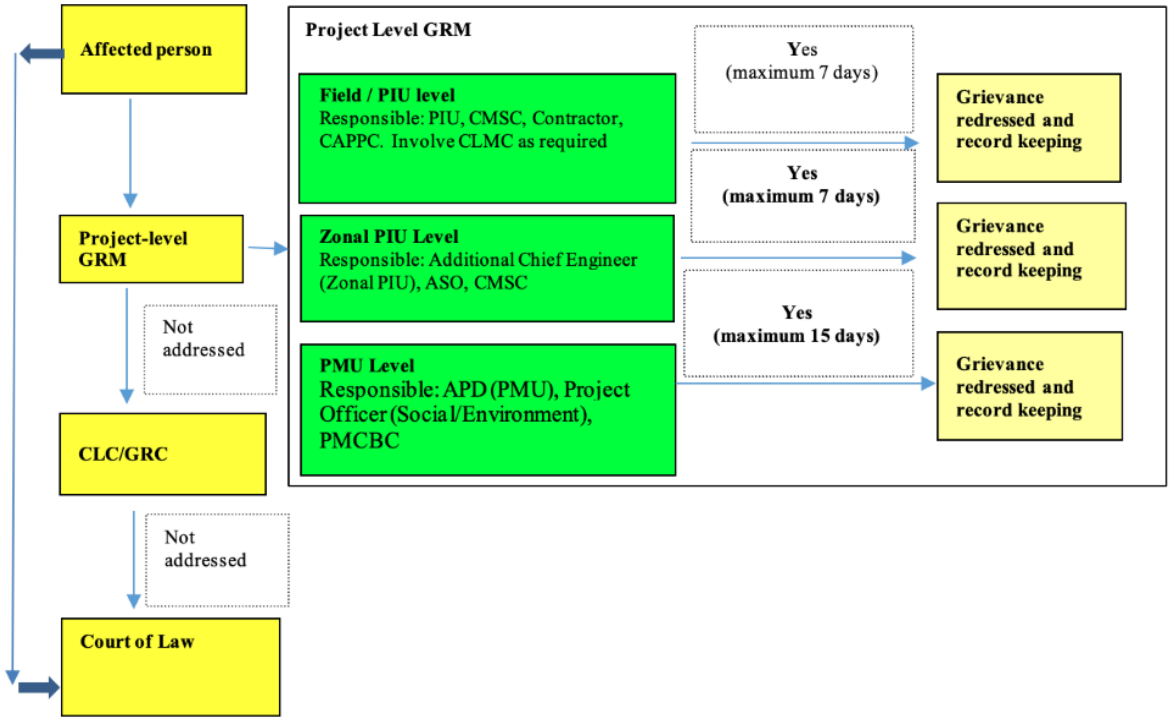
nature of grievance, the Project Officer (Social/Environment) at PMU will resolve the grievance within 15 days of receipt of grievance with necessary coordination of Zonal PIU and CMSC and guidance/instruction of Additional Project Director (APD-PMU).

(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.[29] 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 18), 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.

[29] City Level Committee (CLC)/grievance redress committees (GRCs) has been constituted for each town/city under the Chairmanship of District Collector to provide overall subproject guidance and "to sort out issues and remove hindrances, if any". CLC formed at city-level/district level with members composed of: District Collector as Chairperson, and following as members: ULB Commissioner/Mayor/Chairman; Deputy Mayor/Vice Chairman ULB; Chairman/Secretary Urban Improvement Trust (UIT); Head of Zonal/field level PIU as Member Secretary; one representative each from relevant government departments as appropriate (PWD/PHED/Town Planning Department etc.). All CLCs in their role as GRCs will have at least one-woman member/chairperson. In addition, for project-related grievances, representatives of affected persons, community-based organizations (CBOs), and eminent citizens will be invited as observers in GRC meetings. The concerned Member of Parliament (MP) and Member of Legislative Assembly are also part of the CLC.

Figure 18: 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.

221. 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.[30]

222. 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

[30] The Authority admits grievance only with reference to the Land Acquisition and R&R issues under the RFCTLARRA, 2013.

by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.[31]

223. **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 23.

224. **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.

225. **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.

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

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

226. 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.

227. The purpose of the 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.

228. 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.

229. 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.

230. 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.

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

Table 13: 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 with trees in 2-3 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	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of STP or any other site with trees (ii) Obtain prior permission for tree cutting at STP site or at any other site that may require tree cutting finalized during detailed design (iii) Plant and maintain 3 trees for each tree that is removed	DBO Contractor / PIU	Project costs
Design of water supply and 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) Adopting conjunctive use approach water source; utilizing feasible surface water sources and groundwater source optimally thereby reducing the existing groundwater abstraction to the extent possible (ii) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically). (iii) Recovering wash water from treatment process to optimise the water use (iv) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs (v) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage (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	DBO Contractor / PMU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		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 III)	(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
Groundwater source	Source sustainability and over exploitation of groundwater	(i) Prepare a groundwater harvesting and artificial recharge plan; (ii) Creation of artificial recharge pits in public places / public buildings. Local body can issue a notification to this effect. (iii)Household level artificial recharge (like roof top rainwater harvesting) should be encouraged. (iv)Groundwater regulation – options to close / discontinue all the tube wells in houses used for domestic purposes in Abu Road in a phased manner once the project is implemented.	DBO Contractor/PIU	Project costs
	Groundwater contamination	(i)Prepare a source protection plan for tube wells and open wells (ii)Prevent flow of untreated wastewater in the drains (iii)Ensure proper construction of tube wells including casing pipes to prevent water contamination from well spaces, and due to flooding (iv)Measures should be taken to control the open defecation, and to close all unsafe latrines (for example pit latrines). (v)Awareness programs shall be conducted regarding the sanitation practices and its effect on groundwater quality	DBO Contractor and ULB/PIU	Project costs and ULB costs
STP and CWR	Hazardous / harmful chemicals	(i) Reduce the use of chemicals in the treatment process to the extent possible (water treatment); 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 /	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>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
(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 and NGT order, 2019</td><td>(i) 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 RPCB/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/100ml</td><td>100 (desirable), 230 (permissible)</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>(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.
, (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
STP	Use of treated wastewater for reuse applications	Develop wastewater reuse plan for Khetri Town in consultation with CLC as per the Sewerage and Wastewater Policy, 2016. The Reuse Plan shall inter alia include the following: (i) Identify potential reuse application in Khetri, 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 Khetri, 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	Treated effluent discharge into water channel/drains and associated impacts on river water and downstream users	(i) Obtain of consent of RPCB for discharge of treated wastewater into drains (ii) Conduct a baseline water quality assessment of receiving water body (iii) Regularly monitor the treated wastewater quality at STP and ensure that it meets the discharge standards (iv) Monitor water quality periodically during operation phase as per the Environmental Monitoring Plan	DBO Contractor/PIU	Project Costs
STP	Sludge management and reuse	(i) Prepare a sludge management plan (ii) Prepare a dried Sludge utilization plan for Khetri within the help of Agriculture Department / CLC; plan should also include if any additional processing is required for sludge to use as soil conditioner (iii) Plan should clearly various potential uses and demand in Khetri and surroundings (iv) Establish usage limits, where required,	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(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. (v) 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)		
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 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	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
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
Physical Cultural resource	Encroachment/ damage to protected monuments and chance finds	(i) consult Department of Archaeology and Museums to obtain an expert assessment of the archaeological potential of the site; (ii) consider alternatives if the site is found to be of high risk; (iii) include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and (iv) develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved. This should involve: • Having excavation observed by a person with archaeological field	PIU	

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		training; contractor should employee a person with a formal certification course in archaeology from recognized (such as Institute of Archaeology, ASI, Delhi) during the ground excavation activities • Conduct awareness training to contractor & supervision staff prior to start of excavation; • Stopping work immediately to allow further investigation if any finds are suspected; • Calling in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ		
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 (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 (vii) (viii) Refer to the instructions of the Asbestos Expert	DBO Contractor/PMU	Project costs
Asbestos materials stored in existing campus	Health impacts due to air borne asbestos if handled unsafely, cut, drilled or broken into	(i) Conduct survey and inventory of existing asbestos materials on site (ii) Conduct risk assessment to determine extent of asbestos materials currently on-site (ii) Coordinate and provide support to the asbestos management service provider on the requirement of sampling, testing and disposing	DBO Contractor/PMU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
	pieces	existing asbestos materials (iii) Ensure the selected area for temporary storage is suitable for safe storage of asbestos materials (iv) Incorporate international and national standards considered in designing the temporary storage (v) Ensure that handling and disposal of asbestos materials are carried out by specially trained service provider/s following Government of India requirements, or in their absence, internationally recognized procedures Refer to the requirements of the Asbestos Management Plan (Appendix 20) and instructions of the Asbestos Expert		
Preparation of plans and protocols	Various impacts	(i) Preparation of ACM Management Plan (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 14: 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 Khetri 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 Failure to obtain necessary consents Permits, NOCs etc. can result to	(i)Obtain all consents, clearances (CTE/CTO from RPCB), permits NOCs etc. before start of construction works Ensure that all necessary approvals for	PIU/Consultants in coordination of Nagar Palika	PMU	Cost of obtaining all consents, permits, clearance, NOCs etc. prior to start of civil works responsibility of PIU.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
	design revisions and /or stoppage of works	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- RPCB 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. (intake works) (iv)Include in detailed design drawings and documents all conditions and provisions; if necessary			
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of	DBO Contractor in collaboration with PIU and with approval of PMU	(i) List of affected utilities and operators; (ii) Bid document to include requirement for a contingency plan for service interruptions	No cost required. Mitigation measures are part of TOR of PMU, PIU and Consultant

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 18) and traffic management plan (Appendix 19)		(example provision of water if disruption is more than 24 hours), spoil management plan (Appendix 18), and traffic management plan (Appendix 19)	
Physical Cultural Resources	Ground disturbance can uncover and damage archaeological and historical remains Encroachment/ damage to protected monuments and chance finds	• 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. • consult Department of Archaeology	DBO Contractor and PIU	Heritage Impact Assessment and Chance Finds Protocol	No cost required. 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
		and Museums to obtain an expert assessment of the archaeological potential of the site; • consider alternatives if the site is found to be of high risk; • include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and • develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved. This should involve:			

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		• Having excavation observed by a person with archaeological field training; contractor should employee a person with a formal certification course in archaeology from recognized (such as Institute of Archaeology, ASI, Delhi) during the ground excavation activities • Conduct awareness training to contractor & supervision staff prior to start of excavation; • Stopping work immediately to allow further investigation if any finds are suspected; ● • Calling in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ			
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	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.	No cost required. 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
		that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies as far as possible; (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,		(ii) Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land	and also part of contractual terms

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		ponds/lakes or other water bodies.			
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Prioritize sites already permitted by the Department of Mines and Geology (ii) If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of PMU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PIU.	DBO Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents (including CTE for STP and WTP from RPCB), 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	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
		areas- Department of mines and Geology Traffic diversion/road cutting- local authority, traffic police (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. (iv) Include in detailed design drawings and documents all conditions and provisions if necessary			

Table 15: 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 and S), 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 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 RPCB, 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 pipelines can	(i) Prepare and implement a spoils management plan (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along trenches leading to water bodies; (iii) Records of surface water quality	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
	contaminate nearby surface water quality.	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 (xii) Conduct surface 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
		inspection according to the Environmental Management Plan (EMP).			
Surface water quality	Degradation of water quality	(i) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition, and able to complete the construction work prior to onset of monsoon (ii) Schedule the construction works during low water level period – late winter months to pre monsoon (February – June/July); ensure that works are completed during the same period to prior to onset of monsoon; (iii) Erect temporary barriers to form enclosed construction area with least disturbance (iv) Allow adequate time to settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt laden water should be pumped to a silt pond (v) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage (vi) Clear the work site after completion at least to pre project conditions, ensure that there are no materials, debris, spills etc., and prior to removal of temporary barriers / coffer dam (vii) Implement work site safety at works in water bodies	Construction Contractor	(i) Construction methodology for intake construction (iii) Records of water quality inspection; (iv) Effectiveness of water management measures; (v) No visible degradation of water quality	Cost for implementation of mitigation measures responsibility of contractor.
Noise Levels	Increase in noise	(i) Plan activities in consultation	Construction	(i) Complaints from	Cost for

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	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	Contractor	sensitive receptors; (ii) Use of silencers in noise-producing equipment and sound barriers; (iii) Equivalent day and nighttime noise levels (see Appendix 6 of this IEE)	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 materials, empty containers, spoils, oils, lubricants, and other similar items.	(i) Prepare and implement spoils management plan (Appendix 18); (ii) Avoid stockpiling of excess excavated soils; (iii) Coordinate with ULB/PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas; (iv) Recover used oil and lubricants and reuse or remove from the sites; (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel (iii) Worksite clear of any excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(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.			
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 three native trees for every one that is removed as per RUDSICO-EAP Circular.	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 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 19)	Construction Contractor	(i) Traffic route during construction works including number of permanent signage, barricades and flagmen on worksite; (ii) Complaints from sensitive receptors; (iii) Number of signage placed at project location.	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(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.			

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 18). 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. (vi) Notify community/ water users in advance about likely interruptions in water supply. (vii) Provide alternate sources of clean water until water supply is restored.	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 (i. (iii) 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.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Comply with all national, state and local core labor laws (see Appendix 8 of this IEE); Following best practice health and safety guidelines: IFC's General EHS Guidelines[32] and Sector Specific (Water and Sanitation) Guidelines[33] (ii) Develop and implement site-specific occupational health and safety (OHS) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) OH and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (iii) Conduct work in confine spaces, trenches, and at height with suitable precautions and using standards and safe construction methods; do not adopt adhoc methods; all trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper	Construction Contractor	(i) Site-specific OH and S Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H andS 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	Cost for implementation of mitigation measures responsibility of contractor.

[32]https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES
[33] 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
		than 3.5 m by adopting trenchless technology (iv) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (v) Provide medical insurance coverage for workers; (vi) Secure all installations from unauthorized intrusion and accident risks; (vii) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following: (a) work schedule should be adjusted to avoid peak temperature hours (12 – 3 PM); (b) provide appropriate shade near the workplace; allow periodic resting and provide adequate water, and (c) provide necessary medicine and facilities to take care of dehydration related health issues (viii) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (ix) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the		equipment, and areas for storage and disposal. (xii) Compliance to core labor laws (see Appendix 8 of this IEE)	

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

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		awareness camps and special trainings for workers for health issues and risks in construction sites (xvii) 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. 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. (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.			
Occupational and community health and safety	Hazardous working conditions due to presence of asbestos containing material / AC Pipes in work sites: clearing, transfer and disposal; work in	(i) implement the ACM Management Plan (AMP) that includes identification of hazards, the use of proper safety gear and disposal methods. Sample AMP is provided in Appendix 17. Adhere to the workflow process suggested in Figure 18. (ii) Conduct awareness	Construction Contractor	(i) Asbestos management plan preparation and implementation (iii) quantity and characteristics of asbestos containing material removed/handled	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
	narrow streets, and interventions in existing AC pipelines Health impacts due to air borne asbestos if handled unsafely, cut, drilled or broken into pieces	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 (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. (vi) Appropriate actions as defined in the Asbestos Management Plan will have to be adhered to (vii) Maintain records of AC pipes as per the AMP		and disposed safety	
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	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
		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 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	Construction Contractor	Complaints from neighbourhood and monitoring of accidents	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
		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			
Night Works	Public inconvenience due to traffic diversion, disturbance due to excessive noise and access loss, occupational health and safety issues etc.	Prepare a night work protocol and obtain prior approval from PIU, and strictly implement and report on implementation of protocol during the workers; Contractors should have handheld noise level meter for measurement of noise during night hours Contractors should have handheld lux meter for the measurement of illumination during night hours Preferably electrical connection is available for running equipment otherwise soundproof/super silent Diesel Generator set should be available Sound level should not increase as prescribe by CPCB Illumination should be as prescribed in protocol As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime	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
		Workers engaged in night works should have adequate rest/sleep in daytime before start of night works Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests Horns should not be permitted by equipment and vehicles Workers should not shout and create noise First aid and emergency vehicles should be available at site Emergency preparedness plan should be operative during night works Old persons and pregnant women and women having small kids should not work in night-time All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		reduce noise All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works PIU/DSC site engineers and contractor's safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and video graphic records as well as register the observations. Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement After completion of night works all the site should be cleaned and maintained obstruction free for daytime movement of vehicles and pedestrians Drivers and workers should be alert and responsive during 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	will pose high risk	(i) Conduct awareness program on			responsibility of

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
streets	to children and elders in the locality	safety during the construction work (ii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iii) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches (iv) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned			contractor.
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	(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	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
	conditions for workers	at the highest standards possible; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be used as accommodation for workers; accommodation shall meet the IFC standards for workers accommodation which include: provision of safe housing, availability of electricity, plumbing, water and sanitation, adequate fire protection and dormitory/room facilities; accommodation shall be in the range from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters (surface) per worker, a minimum ceiling height of 2.10 meters; a reasonable number of workers are allowed to share the same room – (standards range from 2 to 8 workers); workers with accompanying families shall be provided with a proper and safe accommodation (IFC benchmark standards for workers accommodation is provided in Appendix 20) (vi) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vii) Recover used oil and			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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.			
Physical Cultural Resources	Risk of damage to existing sites and archaeological chance finds	• Adjacent to religious/historic sites, undertake excavation and construction work in such a way that no structural damage is caused to the building. Refer to Appendix 9 Heritage Impact Assessment. • Follow the protocol for chance finds in any excavation work; • Create awareness among the workers, supervisors and engineers about the chance finds during excavation work; • Stop work immediately to allow further investigation if any finds are suspected; • Inform local Archaeological Department / Museum office if a find is suspected; take any action they require ensuring its removal or protection in situ.	Construction Contractor	Records of chance finds	Cost for implementation of mitigation measures responsibility of contractor.
Monsoon preparedness	Disruption of utilities and water logging in trenches	(i) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (ii) if open trenches are not	Construction Contractor	Monsoon preparedness plan	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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			
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of supervisor to ensure EMP implementation (ii) Timely submission of monitoring reports including pictures	Construction contractor	Availability and competency of appointed supervisor Monthly report	Cost for implementation of mitigation measures responsibility of contractor.
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and re-grassed using the guidelines set out in the re-vegetation specification that forms part of this document. (vii) The contractor must arrange	Construction Contractor	PIU/Consultant report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O andM are removed; and (iv) worksite clean-up is satisfactory.	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
		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.			

Table 16: 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) Conduct baseline water quality assessment of receiving water body prior to start of operation (iii) Ensure implementation of Reuse Plan, and ensure intended quality for each direct reuse (iv) Assess composition and characteristics of sludge from the first batch operation at the initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan (v) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO =	O and M contractor for 10 years and then Nagar Palika	Nagar Palika, Khetri	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 RPCB for operation of STP (vii) Ensure that all conditions/standards prescribed by RPCB are compiled duly (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 21 (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			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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: (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	O andM contractor for 10 years and then Nagar Palika	NagarPalika, Khetri	O and M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		near capacity; and suspected infiltration or exfiltration; and • Monitoring of sewer flow to identify potential inflows and outflows • Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages); (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			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		system leaks, burst and overflows, etc. (vi) Provide necessary health and safety training to the staff (vii) Provide all necessary personnel protection equipment (viii) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works. • As far as possible use remote / CCTV mechanism to identify/detect the problems in sewers and do 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,			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers. • For remote locations portable welfare facilities should be provided. • Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities. • Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive 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 water supply and 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 25.	O andM contractor for 10 years and then Nagar Palika, Khetri	NagarPalika, Khetri	O andM cost of contractor
Asset management	Reduction in NRW Increased efficiency of the system	Preparation and implementation of O&M Manual	O andM contractor for 10 years and then Nagar Palika	NagarPalika, Khetri	O andM cost of contractor

Table 17: Environmental Monitoring Plan for Construction Stage

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Construction	All work sites	Implementation of dust control,	Weekly during	Supervising staff	No costs required

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
disturbances, nuisances, public and worker safety,		noise control, traffic management, chance find protocol, asbestos pipes management. and safety measures. Site inspection checklist to review implementation is appended at Appendix 25.	construction	and safeguards specialist	
Tree cutting and plantation	STP CWR 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	5 locations (STP, CWR site, pipe laying, construction camps and workers camp)	PM10, PM2.5, NO2, SO2, CO	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor
Ambient noise	5 locations (STP, CWR site at PHED campus, 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	3 locations (STP, CWR site, construction camps, workers camps)	pH, Elect. Conductivity (at 250C), Moisture (at 1050C), 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
Ground Water Quality	03 locations (STP, CWR site and construction/worker camp)	pH, TDS, Total Hardness, Zn, Chloride, Iron, Copper, DO, Manganese, Suplhate, Nitrate, Fluiride, Hg, Cadmium, Cr+6, Arsenic, Lead, Total Alkalinity, Phosphate, Phenolic compound	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor

Table 18: 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 andM contractor for 10 years and then Nagar Palika	Contract O and M cost / Nagar Palika, Khetri
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 andM contractor for 10 years and then Nagar Palika	Contract O andM cost / Nagar Palika, Khetri
Raw water quality		Parameters as per drinking water standards (IS 10500-2012)	Monthly once	O and M contractor for 10 years and then Nagar Palika	Contract O and M cost / Nagar Palika, Khetri
Treated water quality		Parameters as per drinking water standards (IS 10500-2012)	Monthly once	O and M contractor for 10 years and then Nagar Palika	Contract O andM cost / Nagar Palika, Khetri
Monitoring of quality of water supplied to consumers	Consumer end- random sampling in all zones	Parameters as per drinking water standards (IS 10500-2012)	Monthly once	O and M contractor for 10 years and then Nagar Palika	Contract O andM cost / Nagar Palika, Khetri
Monitoring of quality of water supplied to consumers	Consumer end- random sampling in all zones	Parameters as per drinking water standards (IS 10500-2012)	Monthly once	O and M contractor for 10 years and then Nagar Palika	Contract O and M cost / Nagar Palika, Khetri
Consent to operate (CTO) from RPCB	WTP and STPs	CTO should be renewed before expired	As per RPCB	KhetriNagar Palika	Contract O and M cost /

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
					Nagar Palika, Khetri

B. Institutional Requirements

232. 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.

233. 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.

234. 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.

235. 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

(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.

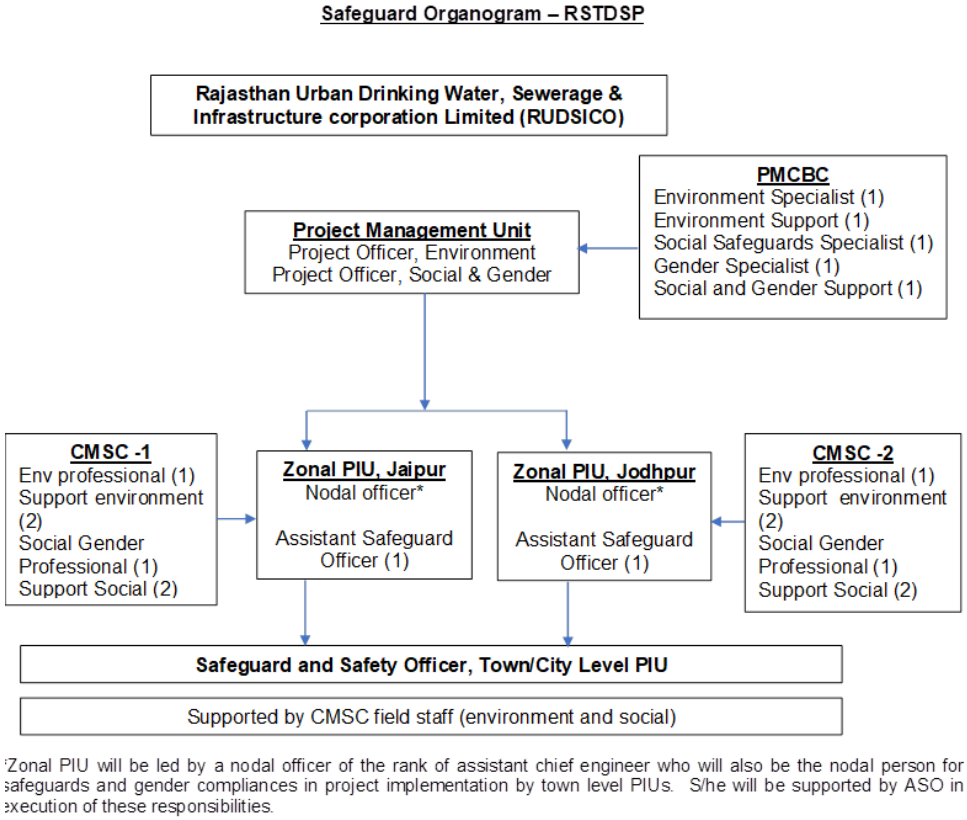
236. There will be two zonal PIUs and a PIU at every town. PIUs at the town-level shall be headed by a Superintending Engineer / Executive Engineer, who shall work as Project Manager and shall sign the contract documents, manage the contract and disburse payments as Drawing and Disbursing Officer.

237. 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.

238. 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.

239. Table 19 to 20 summarize the institutional responsibility of environmental safeguards implementation at all stages of the project.

Figure 19: Safeguards Implementation - RSTDSP



240. **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) OHS, (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

(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

241. 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.

242. **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.

243. 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.

244. **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.

245. **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,[34] consultations with interested/affected people, (iv) field-level grievance redress; and (iv) reporting.

246. 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.

247. 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.

248. **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 19: 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.

[34] Reasonable size social outreach team (SOT) to be appointed by contractor to facilitate community liaison, consultations and R&R implementation (including resolution of grievances). Requirement of SOT will be included in bid document.

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 • Secretary, Finance (Budget) Department - Director • Director, Department of Local Bodies • Executive Director, RUDSICO • Project Director, RUDSICO • Independent Director • Independent 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)
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 PMU Staff • 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,	**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.

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 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	• 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. **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** –	**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.

• 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)	
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 20: 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	(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	Compliance monitoring to review the environmental performance of project component, if required and as specified in EMP

	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 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.	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 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	(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;	(i) Conducting environmental monitoring, as specified in the EMP. (ii) Issuance of clearance for contractor's post-construction activities as specified in the EMP.

	found during the course of implementation.	(vii) address any grievances brought about through the grievance redress mechanism in a timely manner as per the IEEs; and	
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 (v) Seek approval for camp sites	(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,	(i) Ensure EMP post-construction requirements are satisfactorily complied (ii) Request certification from PIU

	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.	and laborers; (vi) Ensure any sub-contractors/ suppliers who 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.	

C. Capacity Building and Development

249. 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.

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

251. 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 21.

Table 21: 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 -Traffic management plan -Spoils management plan -Waste management plan - Chance find protocol - O&M plans - Post-construction plan	All staff and consultants involved in the project All contractors before start of construction worksor during mobilization stage. At PIU	PMU cost Contractors cost as compliance to contract provisions on EMP implementation
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

D. Monitoring and Reporting

252. 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.

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

254. The PMU will include safeguards implementation status in the quarterly progress report using the suggested checklists in Appendix 25 and separate semi-annual environmental and social safeguards monitoring reports to ADB, which will be reviewed and disclosed on ADB's website. The monitoring reports will be prepared by PMU with assistance from the PMU-Consultant and inputs from the PIU's safeguard officers, contractors and NGOs, where relevant. The status of safeguard implementation, issues, and corrective actions including associated cost and schedule are to be clearly reported to ADB. The status of safeguards implementation will also be discussed at each ADB review mission and with necessary issues and agreed actions recorded in Aide Memoires. ADB will also carry out annual environmental and/or social (including gender) reviews of the Project. The outline of the semi-annual environmental monitoring report is in Appendix 26. 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 submiited to ADB until PCR is issued.

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

E. EMP Implementation Cost

256. 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 22.

Table 22: 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	lump sum	-		100,000	Civil works contract
	Subtotal (A)					**100,000**	

S. No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
B.	Monitoring Measures**						
1	Air quality monitoring	Pre-construction and construction	per sample	53	4920	260760	Civil works contract
2	Noise levels monitoring	Pre-Construction and construction	Per sample	52	1980	102960	Civil works contract
3	Ground Water Quality	Pre-Construction and construction	Per sample	26	1560	40560	Civil works contract
4	Soil Quality	Pre-construction and construction	Per sample	35	5880	205800	Civil works contract
	Subtotal (B)					**610,080**	
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
4.	Plans and Protocols	Construction	lump sum			25,000	PMU
			lump sum			25,000	Civil works contract
5.	Experiences and best practices sharing	Construction/Post-Construction	lump sum			100,000	PMU
6.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	lump sum			25,000	Civil works contract
	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	Lump Sum	2000000	Civil works contract
4	Barricading						

S. No	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
	Barricading with MS pipe and PVC Tape	Construction	m	137370	38.50	5288745	
	Barricading with MS pipe and Nuts and bolts	Construction	m	9075	50	453750	
	GI corruglated sheets	Construction	m	16335	101	1649835	
	Sub Total (D)					9,614,330	
E	**Asbestos Management**	Inventory Testing Overall Supervision for Asbestos Removal Storage Transportation Disposal / Treatment Documentation and Reporting			Lump sum	1,400,000	Civil works contract
	Sub Total (E)					1,400,000	
F	**Heritage Management**	Physical Cultural Survey and Site Verification, Consultations, Documentation of Baseline Conditions, Assessment of Mitigation Requirements, Supervision of Contractors, Documentation and Reporting			Lump sum	700,000	Civil works contract
	Sub Total (F)					700,000	
G	**Grievance Redressal Mechanism Resolutions**				Lump sum	350,000	Civil works contract
	Sub Total (G)					**350,000**	
	Total (A+B+C+D+E+F+G)				**INR**	**13,099,410**	

Contractor will revisit all sites including STP sites and ascertain the tree cutting/ utility shifting required.

X. CONCLUSION AND RECOMMENDATION

257. The process described in this document has assessed the environmental impacts of all elements of the Khetri water supply and 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.

258. Subproject components are located in Khetri 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 ROW and government-owned lands. Construction site of 1 nos of STP with SBR technology is away from city area in the available vacant land not under any productive use near Khariya Kua. The land is under the possession of Nagar Palika. Total land required for STP will be around 4800 sq mtr and sufficient land approximately 8000 m^2 is available. Nagar Palika has issued a NOC for the proposed STP. CWR and Treated Water Pumping Station will be undertaken in the unused land within existing campus of PHED. There are no protected areas, wetlands, mangroves, or estuaries in or near the project locations.

259. Water demand of Khetri town for year 2036 and 2051 are 3.78 MLD & 4.34 MLD respectively. Against demand of year 2036 & 2051 only 1.30 MLD is available with existing TWs. Balance deficit demand will be supplied by Canal Water. Additional new source of surface water from “Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II” is being executed by PHED and at commissioning stage. Water has been reached at Khetri Town from Surface source. Khetri will get deficit water (excluding GW) from this project of PHED Rajasthan source as Kumbha Ram Lift Canal”. The work of pipeline system from canal off take point to JE office has been completed. This will be a feasible source for water supply and the water allocation letter from the PHED Rajasthan is obtained. Treated water will be available from “Integrated Taranagar Jhujhunu Sikar Khetri Drinking Water Supply Project, Package II” of PHED up to Khetri Town JE Campus H/w. WTP of this scheme is at Malsisar Town around 80 Km from Khetri.

260. Presently source of water for existing water supply in Khetri town is ground water. The town is benefited from 7 no. of tube wells situated about 2.5 km from Bankoti. Water collected from 7 nos tube wells are collected at 900 kl CWR at Bankoti and from there reaches by gravity to Clear Water Reservoir at JE office and further it transferred to ESR/GLSRs in the town. At present, an intermittent water supply system is running in the town with actual service level 30-35LPCD (frequency once in a week) at consumers end, which is less than standard of 135 LPCD. The supply duration is about 1 to 1.5 hours with low pressure. This is due to heavy losses in the existing distribution network of about 40-45%. Presently about 70-80% area of municipality limit is covered under the drinking water supply scheme by PHED. Remaining areas which are newly developed and newly added to the municipality area are not connected with piped scheme.

261. Khetri does not have any organized sewerage system. Presently the wastewater from kitchens & bathrooms is discharged into storm water drains culminating finally to the Nallah or on ground, which pollutes the environment and contaminates the ground water. Open

defecation is not uncommon. Most of the residential and commercial buildings and educational institutions have on-site septic tanks and soak pits. Though septic tanks is an accepted onsite treatment, as the septic tanks are not designed and maintained properly, the effluent does not confirm to the standards. The effluent from the septic tanks is directly let into the open drains. In the absence of safe disposal system of sewage as mentioned above, the people of Khetri are facing unhealthy and unhygienic environment therefore public representatives are also demanding facilities of sewerage system on priority basis. The town requires sound drainage and sewerage system.

262. Few habitations exists near to proposed STP site (50 to 100 mtr distance) and meaningful consultation conducted with nearby sensitive receptors. Some trees and shrubs are present at these sites. Nearest sensitive receptor in the form of house is located at a distance of 50m from the proposed STP site No wild fauna is found in these locations. STP will be constructed on available vacant Govt. Land. Vacant and encumbrance free Land will be made available by Nagar palika, Khetri for the construction of STP. There is natural drain flowing beside the proposed STP site at a distance of 80 mtr.

263. It is proposed to reuse the treated effluent for use of agriculture, horticulture, development of urban forestry etc. and remaining treated effluent is proposed to be discharged into a nearby rivers/drains. In order to safeguard the interest of downstream users it is proposed to apply technology/process to achieve very low BOD (BOD 10) and suspended solids in the treated effluent. Sequential batch reactor (SBR) technology has been adopted in RUDSICO-EAP, Phase-IV Treated effluent shall be mostly reused for beneficial purposes for which proposal of construction of Treated Effluent Elevated Reservoir (TEER), Treated Effluent Storage Reservoir (TESR) and Effluent Pumping Station (EPS) has been taken. Contractor will propose the best methods of reuse of treated effluent and sludge as per guidelines of CPHEEO and best international practices in consultation with RUDSICO and Nagar Palika and submit a plan in RUDSICO for approval

264. Except water lines and 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. Water pipes and sewer line works 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 will be adopted for sewers deeper than 3.5 m and also at main road crossings in traffic areas.

265. Land for construction of one CWR is available in PHED A.En. campus where there is existing office of PHED and 3-4 staff quarters exist in which 3 families are residing. There are few trees of Neem, Pipal, Bargad and Bel exist. which need to be cut for site clearance. Measures should be taken for safety during demolitions works and safe disposal of demolished muck. Mitigation measures will be required during construction so that no impact may be on habitants. 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 as per RUDSICO-EAP policy.

266. At STP, incoming sewage will be treated to meet standards and reused for agriculture, plantation and other gainful purposes by Nagar Palika, Khetri otherwise disposed into nearby drain. Anticipated impacts during operation of STP will be related to drop in treatment efficiency. This may result from - change in incoming sewage quality, power supply outage or malfunction of units. These are, however, likely to be minimal, as sewer system will receive only domestic wastewater, there will be a backup power facility, and maintenance will be as per the standard procedures.

267. At the STP sewage sludge will be removed continuously from reactors, and solidified using decanter, and stored in sludge drying beds for a period of seven days. The treatment and drying processes kill enteric bacteria and pathogens. Because of its high content of nitrates, phosphates and other plant nutrients the sludge can be used as organic fertilizer.

268. Contractor will propose the plan with best methods for reuse of treated effluent and sludge as per guidelines of CPHEEO and best international practices in consultation with RUDSICO-EAP and Nagar Palika and submit it in RUDSICO-EAP for approval. In order to aid preparation of a viable treated wastewater reuse and sludge reuse plan, an institutional and capacity building component shall be incorporated in the Project to enable the ULB staff to develop an understanding of the relevant issues.

269. 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.

270. Khetri is a heritage town and has several state-protected monuments. Except pipelines, no other components are located nearby protected monuments. Distribution line works will be location with regulated area around the monument. Given the minimal excavation, there will be nor risk to any structure. Nevertheless, the works will be implemented only after due consideration and construction methodology with the Department of Archaeology. For chance finds, works will be observed by a person with archaeological background. Migitation measures for construction near monuments shall be implemented and made part of the EMP.

271. AC pipe as such in not hazardous as it is in the cement bonded form, however, working with or handling AC pipes in manner that produces dust, fibers, air borne particles etc., is very harmful and hazardous to the workers and general public around the work sites. The condition of existing underground AC pipes is not known, however, as these are old, pipes may be in deteriorated conditions. Various measures are suggested including development and implementation of Asbestos Management Plan (AMP)

272. 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.

273. 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 raw and treated water quality, treatment efficiency of STP (raw and treated sewage quality), sludge at STP. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

274. 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

275. 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.

276. 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.

277. The citizens of Khetri will be the major beneficiaries of the improved water supply and sewerage systems. The subproject is primarily designed to improve environmental quality and living conditions of Khetri Town through provision of water supply and sewerage. The benefits arising from this subproject include: (i) increased availability of potable water at appropriate pressure to all households including urban poor; (ii) reduced time and costs in accessing alternative sources of water. (iii) better public health particularly reduction in waterborne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards.

278. 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 STP requires consent to establish (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.

279. Quarterly report shall be prepared by CAPC and PIU and submitted to PMU for review and further actions. ADB will review project performance against the RUDSICO-EAP 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.

280. 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) Update the asbestos management plan per site-specific conditions;
(iv) Update and implement the recommendations from the Heritage Impact Assessment, including the harmonization of architecture and design to the town's physical cultural resources' identity;
(v) Update/revise this IEE based on detailed design and/or if there are unanticipated impacts, change in scope, alignment, or location;
(vi) Conduct safeguards induction to the contractor upon award of contract;
(vii) Strictly supervise EMP implementation;
(viii) Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2000 and amendment) and solid waste
(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.

281. 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.

REA Check list

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/Water supply and Sewerage Project in Khetri Town, Distt.Jhunjhunu
Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
Sewerage			
A. Project Siting Is the project area…			
Densely populated?	√		Subproject activities extend to the entire town including the densely populated areas. Old areas of city are densely populated while outskirt of old city is comparatively less dense. Pipe line works will be conducted throughout the entire municipal area. Proposed site of construction of STP with SBR technology is away from city area in the available vacant land not under any productive use near Khariya Kua. There are residential buildings exists near to proposed STP site (50 to 100 mtr distance).
Heavy with development activities?	√		Khetri is a developing town; urban expansion is considerable

SCREENING QUESTIONS	Yes	No	REMARKS
Adjacent to or within any environmentally sensitive areas?		√	Subproject sites are within 50 km of identified "likely critical areas" per results of the IBAT screening. Biodiversity and critical habitat assessments were conducted for the sample subprojects. Khetri town is within 1.2 km of the Khetri-Bansiyal Conservation Area. The biodiversity studies indicated that subproject sites are not qualified as critical habitat assessment per the IFC guidelines. The EARF includes IBAT results of towns being considered in the project and requires field level verification during detailed design phase. The project will not consider works that are located 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.
Cultural heritage site	√		Khetri is one of the heritage towns in RSTDSP. Heritage impact assessment (HIA) was conducted as part of the preparation of the IEE for sample subprojects. The HIA is included in the IEE and the recommendations are included in the preliminary design and EMP. The HIA will be updated during detailed design stage. The EARF and sample IEEs include chance find protocol. Statutory clearance from Archaeological Survey of India and/or Rajasthan Department of Archaeology and Museums shall be obtained prior to start of works. For physical cultural resources (PCRs) that are not legally protected, the EARF includes requirements and measures to be considered in the detailed design.
Protected Area		√	See response to adjacent to or within any environmentally sensitive area.
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	

SCREENING QUESTIONS	Yes	No	REMARKS
Special area for protecting biodiversity		√	See response to adjacent to or within any environmentally sensitive area.
Bay		√	
Potential Environmental Impacts Will the Project cause…			
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	**Not anticipated.** No above-ground infrastructures will be built within or adjacent physical cultural resources (PCRs). Only pipe laying will be done outside and around physical cultural sites. Heritage impact assessments specify the requirements before and during construction to ensure that no loss or damage will be done on these PCRs.
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.
Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		√	**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.
Overflows and flooding of neighboring properties with raw sewage?		√	**Not anticipated.** Treated effluents from the STP will be utilized in agriculture or similar uses and comply with the State's Reuse policy.
Environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		√	**Not anticipated.** Risks, climate change factors and forecasted demands are considered in the design and capacity of the sewerage systems.

SCREENING QUESTIONS	Yes	No	REMARKS
Noise and vibration due to blasting and other civil works?		√	**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.
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.** 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.
Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		√	**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.
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	√		**Not anticipated.** Sewerage system only caters to domestic waters, no industrial wastewater is allowed into the system.
Road blocking and temporary flooding due to land excavation during the rainy season?		√	**Not anticipated.** STPs will be isolated through boundary walls and dense plantations to avoid/minimize nuisance.
Noise and dust from construction activities?	√		**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.

SCREENING QUESTIONS	Yes	No	REMARKS
traffic disturbances due to construction material transport and wastes?	√		**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.
temporary silt runoff due to construction?	√		**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.
hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	√		**Anticipated during construction but temporary, site-specific and can be mitigated.** EMPs and contract provisions include requirement for contractors to provide silt control measures.
deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	√		**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.

SCREENING QUESTIONS	Yes	No	REMARKS
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.
Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in sewage flow and exposure to pathogens in sewage and sludge?	√		**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.
large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		√	**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.
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?		√	**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.
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?	√		**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.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: India/Rajasthan Secondary Towns Development Sector Project (RSTDSP), Khetri , Rajasthan

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

Screening Questions		Score	Remarks[35]
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.
	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	
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	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)	0	

[35] 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.

	?		
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 Risk

Other Comments: None

WATER SUPPLY

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) 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.
(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) 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/Rajasthan Secondary Towns Development Sector Project (RSTDSP)- Water Supply and Sewerage Project, Khetri, Jhunjhunu, 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 within ROW alongside the existing roads and can be constructed without causing any permanent impact to houses, and commercial establishments. STP site is sufficient away from habitations.
Heavy with development activities?	√		Khetri is a developing town; urban expansion is considerable
Adjacent to or within any environmentally sensitive areas ?		√	Subproject sites are within 50 km of identified "likely critical areas" per results of the IBAT screening. Biodiversity and critical habitat assessments were

Screening Questions	Yes	No	Remarks
			conducted for the sample subprojects. Khetri town is within 1.2 km of the Khetri-Bansiyal Conservation Area. The biodiversity studies indicated that subproject sites are not qualified as critical habitat assessment per the IFC guidelines. The EARF includes IBAT results of towns being considered in the project and requires field level verification during detailed design phase. The project will not consider works that are located 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.
Cultural heritage site		√	Khetri is one of the heritage towns in RSTDSP. Heritage impact assessment (HIA) was conducted as part of the preparation of the IEE for sample subprojects. The HIA is included in the IEE and the recommendations are included in the preliminary design and EMP. The HIA will be updated during detailed design stage. The EARF and sample IEEs include chance find protocol. Statutory clearance from Archaeological Survey of India and/or Rajasthan Department of Archaeology and Museums shall be obtained prior to start of works. For physical cultural resources (PCRs) that are not legally protected, the EARF includes requirements and measures to be considered in the detailed design.
Protected area		√	See response to adjacent to or within any environmentally sensitive area.
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	See response to adjacent to or within any environmentally sensitive area.
Bay		√	

Screening Questions	Yes	No	Remarks
Potential Environmental Impacts Will the Project cause…			
Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff ?		√	**Not anticipated**. There is no wastewater or effluent discharge into the upstream sources and are thus not expected to induce pollution of raw water supply.
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	**Not anticipated.** No above-ground infrastructures will be built within or adjacent to PCRs. Only pipe laying will be done outside and around PCRs. The HIA specify the requirements before and during construction to ensure that no loss or damage will be done on these PCRs.
Hazard of land subsidence caused by excessive ground water pumping?		√	**Not anticipated.** Any groundwater source (e.g. tube wells), will require permission from Rajasthan Ground Water Board and conduct of feasibility/source sustainability studies prior to consideration as a source.
Social conflicts arising from displacement of communities?		√	**Not anticipated.** Project does not involve any land acquisition. A Resettlement Plan will be prepared if there are any involuntary resettlement.
Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	**Not anticipated.** Water allocation letters from the Public Health Engineering Department (PHED) and Rajasthan Groundwater Department are required, and only allocated water shall be used for the water supply subprojects.
Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		√	**Not anticipated.** Efficient treatment technology and water quality laboratories are included in scope of water supply subprojects.
Delivery of unsafe water to distribution system?	√		**Not anticipated**.
Inadequate protection of intake works or wells, leading to pollution of water supply?		√	**Not anticipated.** Design specifications include protection of intake works.
Over pumping of ground water, leading to salinization and ground subsidence?		√	**Not anticipated.** Groundwater extraction shall be limited to the sustainable levels as indicated in the permits provided by the Groundwater Department.
Excessive algal growth in storage reservoir?	√		**Not anticipated.** Design specifications confirm maintenance requirements to ensure no algal growth in tanks and reservoir.

Screening Questions	Yes	No	Remarks
Increase in production of sewage beyond capabilities of community facilities?	√		**Not anticipated.** Sewerage systems and demand requirements are accounted for. The project will include improvement of sewerage and sanitation systems.
Inadequate disposal of sludge from water treatment plants?		√	**Not anticipated.** Facilities to manage sludge and solid wastes (grit) are included in the design. The IEEs and Operations and Maintenance (O&M) manuals will include handling and disposal procedures.
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?	√		**Not anticipated.** Low noise pumps and machineries will be used in pumping stations to alleviate noise to nearby areas.
Impairments associated with transmission lines and access roads?	√		**Anticipated during construction only.** Complete road closures are not expected, and traffic may be diverted with access ensured for pedestrians. Contractors are required to incorporate in the Traffic Management Plan as part of the site-specific EMP (SEMP).
Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	√		**Anticipated but can be mitigated.** Potential hazards during O&M phase are identified and mitigation measures in place. Chlorine will be handled by qualified personnel with the proper handling techniques and proper PPE. No other hazardous chemical will be maintained.
health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?	√		**Anticipated but can be mitigated.** Potential hazards during O&M phase are identified and mitigation measures in place. Chlorine will be handled by qualified personnel with the proper handling techniques and proper PPE. No other hazardous chemical will be maintained.
Dislocation or involuntary resettlement of people		√	**Anticipated but can be mitigated.** Any involuntary resettlement is addressed by the resettlement framework.
disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	**Not anticipated.** Contractor is encouraged to hire workers from the local labor force.
Noise and dust from construction activities?	√		**Anticipated but temporary, site-specific and can be mitigated.** No blasting activities envisaged. Nuisance or

Screening Questions	Yes	No	Remarks
			disturbance due to elevated noise may be experienced during construction. All the machineries employed will comply with the noise emission standards of the Central Pollution Control Board. Dust suppression measures such as water sprinkling will be employed. These requirements and monitoring of effectivity should be included in the site-specific EMP.
Increased road traffic due to interference of construction activities?	√		**Anticipated but temporary, site-specific and can be mitigated.** Complete road closures are not expected, and traffic may be diverted with access ensured for pedestrians. Contractors are required to incorporate in the Traffic Management Plan as part of the site-specific EMP (SEMP).
Continuing soil erosion/silt runoff from construction operations?	√		**Anticipated but temporary, site-specific and can be mitigated.** Construction work during monsoon shall be carried out such that silt run off is prevented. SEMPs include requirement for contractors to provide silt control measures.
Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		√	**Not anticipated.** Water treatment plans are designed with on-site and timely monitoring to ensure the quality of treated water prior delivery to the households. The drinking water quality parameters and acceptable levels are included in the contract.
Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	**Not anticipated.** Treated water will be tested prior distribution.
Accidental leakage of chlorine gas?	√		**Not anticipated.** Proper Occupational Health and Safety (OHS) handling and storage of chlorine is included in the requirements
Excessive abstraction of water affecting downstream water users?		√	**Not anticipated.** Only water allocated by the Government will be used for the water supply services.
Competing uses of water?		√	**Not anticipated.** Water used for the project are specifically allocated by the Government for the project's purpose.

Screening Questions	Yes	No	Remarks
			Only the water allocated will be used.
Increased sewage flow due to increased water supply	√		**Not anticipated.** Sewerage systems and demand requirements are accounted for in the analysis. The project will include improvement of sewerage and sanitation systems.
Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant			**Not anticipated.** Sewerage systems and demand requirements are accounted for in the analysis. Some subprojects also include new sewerage systems.
large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	**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.
social conflicts if workers from other regions or countries are hired?		√	**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.
risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		√	**Anticipated but temporary, site-specific and can be mitigated.** Construction does not involve use of explosives. EMPs include measures and monitoring requirements on occupational health and safety for chemical hazards.
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. Asbestos-containing materials are observed in project sites and are known to be in-situ underground. Such asbestos materials will be handled in accordance to the Asbestos Management Plan including reporting and documentations.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: India/Rajasthan Secondary Towns Development Sector Project (RSTDSP), Water Supply and Sewerage Subproject, Khetri, Distt. Jhunjhunu, Rajasthan
Sector : Urban Development
Subsector: Water Supply
Division/Department: SARD/SAUW

Screening Questions		Score	Remarks[36]
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.
	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	
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	0	

[36] 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.

	inputs over the life of project outputs (e.g. construction material)?		
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	
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 risk

Other Comments: None

Drinking water 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)

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]		
	Iron	mg/l	0.3	-	0.3
	Manganese	mg/l	0.1 (0.3)	-	0.1 (0.3)
	Arsenic	mg/l	0.01 (0.05)	0.01	0.01
	Cadmium	mg/l	0.003	0.003	0.003
	Chromium	mg/l	0.05	0.05	0.05
	Cyanide	mg/l	0.05	none	0.05
	Fluoride	mg/l	1 (1.5)	1.5	1 (1.5)
	Lead	mg/l	0.01	0.01	0.01
	Ammonia	mg/l	0.5	none established	0.5
Chemical	Chloride	mg/l	250 (1,000)	none established	250 (1,000)
	Sulphate	mg/l	200 (400)	none	200 (400)
	Nitrate	mg/l	45	50	45
	Copper	mg/l	0.05 (1.5)	2	0.05 (1.5)
	Total Hardness	mg/l	200 (600)	-	200 (600)
	Calcium	mg/l	75 (200)	-	75 (200)
	Zinc	mg/l	5 (15)	none established	5 (15)
	Mercury	mg/l	0.001	0.006	0.001
	Aluminum	mg/l	0.1 (0.3)	none established	0.1 (0.3)
	Residual Chlorine	mg/l	0.2	5	0.2
Micro Germs	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml			

[a] Bureau of India Standard 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.

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[1]		Being complied
	Reflect inputs from public consultations	Refer to ADB SPS requirements on meaning consultations[2]	Being complied
Location	Avoid involuntary resettlement by prioritizing rehabilitation over new construction using vacant government land where possible, and taking all	If cannot be avoided, prepare Resettlement Plan.	Being complied

[1]ADB SPS Appendix 5

[2]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 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"

	possible measures in design and selection of site or alignment to avoid resettlement impacts		
	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)[3] such as archaeological monuments; heritage sites and movable or	If location is within 300 m of notified protected monuments/ sites and there is no alternative, permissions from the ASI or State Department of	Being complied

[3] 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."

	immovable objects, sites, structures, group of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance.	Archaeology to be obtained prior to finalization of detailed engineering design. If 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[4]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[5]	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 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		Being complied

[4] ADB SPS Appendix 4 para 12 on Existing Facilities
[5] 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"

	any ACM.		
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 is a significant proportion of their total land holding (>10%).		Being complied
Water Supply			
Sustainability	Utilize water sources at sustainable levels of abstraction only (i.e. without significant reductions in the quantity or quality of the source overall)	Water source sustainability or the relevant clearance from PHED should be provided in the subproject's IEE.	Being complied
Quality (raw water, treated water)	Ensure that water supply to consumers comply with the national drinking water standards at all times and confirm this by regular monitoring at WTPs and in domestic premises.		Being complied
	Avoid using water sources that may be polluted by upstream users	Baseline raw water quality to be included in the IEE.	Being complied
	Avoid water-use conflicts by not abstracting water that is used for other purposes (e.g. irrigation)	If there are other users, permits or clearance for the allocation should be provided in the IEE.	Being complied
Location	Locate all new facilities – Water Treatment Plants (WTP), Tube Wells (TW), etc. within 100m from houses, shops or any other premises used by people, thus establishing a buffer to reduce the effects of noise, dust and the visual appearance of the site.		Being complied
	Locate WTP at sites where there is no risk of flooding or other hazards that might impair functioning of the WTP or present a risk if damage to the WTP or the surrounding area		Being complied
Design	Ensure that the water supply system improvements are combined with improvements in sewerage to deal with the increased discharge of domestic wastewater.		Being complied

Sewage System			
Location	Locate new Sewage Treatment Plants (STP) as far as should be at least 500m away 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 IEE; (iii) develop layout plan with maximum buffer to nearby houses; (iv) provide a peripheral green buffer (at least 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	Being complied
	Locate Sewage Pumping Stations (SPS) and wet wells should be located as far as at least 100m 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 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	Being complied

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

Ambient Air Quality, Vehicle, Diesel Generator Emissions Standards

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)
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,	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)

Parameter	Location [a]	India Ambient Air Quality	WHO Air Quality Guidelines (µg/m^3)		Applicable Per ADB
	Rural and Other Areas				
	Sensitive Area	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
Lead (Pb)	Industrial, Residential, Rural and Other Areas	0.5 (Annual) 1.0 (24-hr)		0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
	Sensitive Area	0.5 (Annual) 1.0 (24-hr)		0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
Ammonia (NH_3)	Industrial Residential, Rural and Other Areas	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
	Sensitive Area	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
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 Monixide; 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]

Effluent Discharge Standards for STPs order by NGT Dated 30.04.2019

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

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.

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 1: Salient Features of Major Laws Applicable to Establishments Engaged in Construction of Civil Works

(i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.

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

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

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

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

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

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking

wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

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

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

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

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

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

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

Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities

Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains.

Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or 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 2:Heritage Impact Assessment for Khetri

Heritage Impact Assessment

A process of identifying, predicting, evaluating and communicating the probable effects of a current or proposed development policy or action on the cultural life, institutions and resources of communities, then integrating the findings and conclusions into the planning and decision-making process, to mitigate adverse impacts and enhance positive outcomes.[42]

Approved by ADB's Board of Directors in July 2009, the Safeguard Policy Statement (SPS) builds upon the three previous safeguard policies on the environment, involuntary resettlement, and indigenous peoples, and brings them into a consolidated policy framework that enhances effectiveness and relevance. The SPS applies to all ADB-supported projects reviewed by ADB's management after 20 January 2010. ADB works with borrowers to put policy principles and requirements into practice through project review and supervision, and capacity development support. The SPS also provides a platform for participation by affected people and other stakeholders in project design and implementation.[43]

The SPS aims to promote sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts by avoiding adverse impacts of projects on the environment and affected people, where possible; minimizing, mitigating, and/or compensating for adverse project impacts on the environment and affected people when avoidance is not possible; and helping borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

Section 11 defines PCR 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 underwater. Their cultural interest may be at the local, provincial, national, or international

[42] International Association of Impact Assessment IAIA
[43] https://www.adb.org/site/safeguards/policy-statement

level". This section details out the importance of protecting PCRs against any possible impact of infrastructure work undertaken on site. [44]

9.1. Executive Summary

Physical Cultural Resources increasingly face several challenges due to either neglect or new development to their management and conservation process. Heritage Impact Assessment especially focusses on protecting the values and effectively identify the threats posed by some of the developmental challenges. Cultural resources may be private or public and this sets their relation with various stakeholders and create an impact on the place. **It is important, therefore, that informed decisions be made during the process which may impact the cultural resources. It also explains the significance of each baseline component and how proposed development may alter/impact that resource.**

Heritage Impact Assessment (**HIA**) is required to determine the impacts to cultural resources in Khetri in response to the work to be undertaken within the proposed water and sewerage infrastructure. The process includes **identification** of all resources, providing an **evaluation** of the significance and outlining the **impact** and make recommendations through **mitigation** measures that would minimize the impact on the resources. The entire process helps in making informed decisions related to the identified Physical Cultural Resources. **A property doesn't have to be nationally or state-protected to be a subject of Heritage Impact Assessment.** Any resource that exhibits heritage value is subject to an appropriate level of conscientiousness and will be part of the HIA. This would assist developers and consultants and ensure that all the information is complete and comprehensive with regards to the heritage value of the place. **HIA, as a process is important because the PCRs in Khetri, maybe largely unstudied and undocumented holding a significant intangible potential in as a heritage town.**

9.1.1. Introduction to the region

The region has witnessed a momentous history ranging from early civilizations to post Independence. Culturally rich towns and cities of the Shekhawati region, as this is popularly

[44] https://www.adb.org/documents/safeguard-policy-statement?ref=site/safeguards/main

referred to, are a living example of this significant history. Physical Cultural Resources encompass both tangible and intangible assets rooted in the physical, social and economic context of the region. The distinct architectural style and living traditions are a significant attraction and define the essence of the region to the visitor. Archaeological sites, historic landscapes, monumental forts, *chattris*, historic living habitats, residential mansions known as '*haveli'*, step-wells and tanks, known as *bawdis*, temples, and variety of crafts, arts, festivals, dance forms and music, form the Physical Cultural Resource.

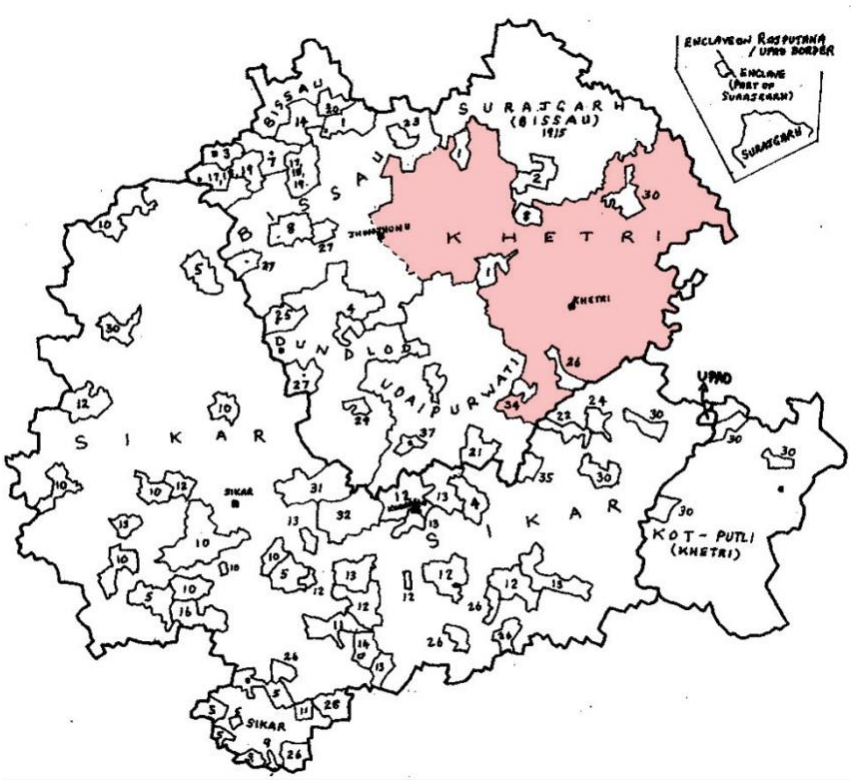
The natural environment, represented in the geological and physiographical formations, the habitat of native flora and fauna, water sources and the adaptation of the hydrological cycle for water harvesting and distribution for a part of the unique cultural landscape of this town and are an important part of the PCRs.

Khetri is part of the Shekhawati region of Rajasthan and is geographically located in the Northern part of the State of Rajasthan. The region was established by Shekhawat Rajputs and was ruled by Songara Rajputs until India got Independence. The Shekhawati Rajputs ruled over the Shekhawati region for over 500 years and were the most prominent among all the sub-clans of the Kachwaha Dynasty of Jaipur and built various forts, *havelis* and other architectural marvels in their respective provinces (*thikana*). They also introduced 'frescoes' in the region through these forts and palaces. The towns in Shekhawati is also known for their grand painted mansions and are recognized as the "Open Art Gallery of Rajasthan" having a significant number of fresco paintings.

The princely States of the Shekhawat region were Shahpura (Head Seat of Shekhawats), Khetri, Dundlod, Nawalgarh, Mukandgarh, Mandawa, Mehansar, Bissau, Alsisar, Malsisar, Mandrella, Chowkari, Heerwa & Sigra, Surajgarh, Udaipurwati, Parsurampura, Taen, Sikar, Kasli, Shyamgarh, Jahota, Khandela-Bara Pana and Chhota Pana, Danta, Khood, Khachariawas, Khatu, Pachar, Mundru, Sainswas, Chirana.[45]

Map 1 showing Shekhawati States

[45] http://www.indianrajputs.com/history/shekhawat.php



9.1.2. About Khetri

Khetri is located at 27.98 N, 75.8 E and is a small town in the Jhunjhunu district of Rajasthan. Surrounded by hills on all sides this area is renowned for its rich copper mines. The princely state of Khetri *(thikana)* was founded by Thakur Kishan Singh in 1742 and was cnosidered the second-largest *thikana* of Shekhawat.[46] Initially, it was under the control of Nirban Rajputs but was later usurped by the Shekhawat Rajputs. In 1745, the 2nd Thakur of Khetri, Thakur Bhopal Singh commenced work on the Bhopalgarh Fort which was completed in 1770 and in 177. The 3rd Raja of Khetri, Raja Bagh Singh, was granted the title of Raja by Madhoji Scindia.

The state of Khetri and its amicable ruler were highly respected in the Rajputana region. Despite its limited extents, the state showcased a splendid fort, mansions, palaces, interesting architectural structures and various other natural features adding to its perception of one of the most advanced and progressive states of Rajasthan at the time.[47]

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[46] http://www.indianrajputs.com/view/khetri
[47] https://www.asianage.com/india/all-india/270819/vivekanandas-special-friendship-with-the-maharaja-of-khetri.html

In 1905, Raja Shri Jai Singh Bahadur, dedicated one of the palaces to the Ajit Singh hospital in the name of his father. He bequeathed Rs. 50,000 to charity which enabled the expansion of Jai Singh High School in Khetri.[48] Raja Ajit Singh Bahadur shared a close relationship with the nationally revered spiritual leader, Swami Vivekananda. In honour of this bond, Maharaja Ajit Singh's grandson, Raja Bahadur Sardar Singh subsequently donated this palace to Ramakrishna Mission, a spiritual organisation promoting the *Ramakrishna Movement* or the *Vedanta Movement*, named after and inspired by the Indian saint Ramakrishna Paramahamsa and founded by Ramakrishna's chief disciple Swami Vivekananda on 1 May 1897.[49]

The town of Khetri is part of a medieval historic landscape, retaining its authenticity as a heritage town as well as its functionality as a hub of urban life and activity. The residential quarters, streetscapes, water harvesting structures, temples contribute to its unique identity. When studied from the lens of the Historic Urban Landscape (HUL) approach[50] sees the city as a multilayered structure in time and space. This layering addresses topography, geomorphology, hydrology, built environment, infrastructure above and below the ground, open spaces and gardens, their spatial organization and interrelationships.

9.1.3. *Demography*

As a Municipality in the district of Jhunjhunu, Khetri is divided into 20 wards. It has a population of 18,209 of which 9,451 are males while 8,758 are females as per Census India 2011.

Khetri Municipality administers over 3,149 houses to which it supplies basic amenities like water and sewerage. It is also authorized to build roads within Municipality limits and impose taxes on properties under its jurisdiction.

Table 3 showing Religious Demography of Khetri as per Census of India 2011

Town	**Population**	**Hindu**	**Muslim**	**Christian**	**Sikh**	**Buddhist**	**Jain**	**Others**	**Not Stated**
Khetri	18209	89.68%	10.09%	0.08%	0.04 %	0.00%	0.08 %	0.01%	0.02%

[48] http://www.indianrajputs.com/view/khetri
[49] https://en.wikipedia.org/wiki/Ramakrishna_Mission
[50] https://whc.unesco.org/en/hul/

Out of the total population, 4,966 are engaged in work or business activity. Of this 4,313 are male and 653 female.

Table 4 shows the Demographics of Khetri[51]as per Census of India 2011

Description	**Census 2011 Data**
Town Name	Khetri
Civic Type	Municipality
Tehsil Name	Khetri
District Name	Jhunjhunu
State Name	Rajasthan
Total Population	18209
Total Area	11.31 (Ha)
Total No of House Holds	3149
Total Male Population	9451
Total Female Population	8758
0-6 Age group Total Population	2347
0-6 Age group Male Population	1271
0-6 Age group Female Population	1076
Total Person Literates	12792 (80.65%)
Total Male Literates	7544 (92.22%)
Total Female Literates	5248 (68.32%)
Total Person Illiterates	5417
Total Male Illiterates	1907
Total Female Illiterates	3510
Scheduled Cast Persons	2765 (15.18%)

[51] https://etrace.in/census/town/khetri-rajasthan-800482/

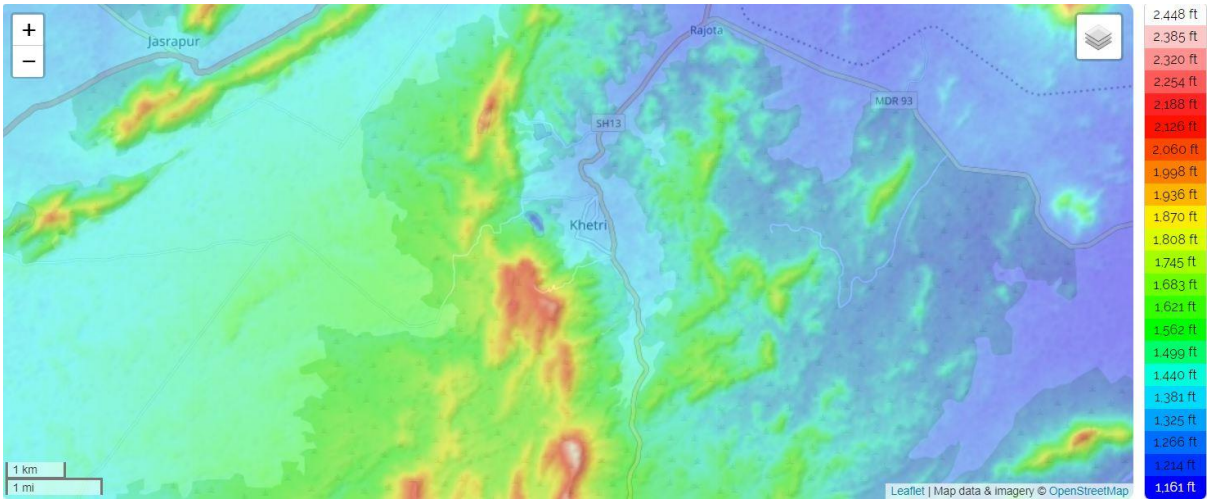
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Scheduled Cast Males	1413
Scheduled Cast Females	1352
Scheduled Tribe Persons	56 (0.70%)
Scheduled Tribe Males	72
Scheduled Tribe Females	56

9.1.4. Topography

Khetri has an average elevation of 484 metres (1587 feet) above mean sea level. It is surrounded by hills on all four sides and the area is covered mostly by sand and boulders. The sub-surface rocks belong to Ajabgarh and Alwar groups of the Delhi Supergroup with underlying acquifers that form the main source to the groundwater. Explorations in the Gothra (South west of Khetri town and within Khetri tehsil) and Banwas villages (north of Khetri tehsil, within Buhana Tensil) have established the presence of copper in the area. Red sandy clay loam, red sandy loam and loam (alluvial types) soils are available in the North-Eastern part of Rajasthan. Loam (alluvial type) is significant for cultivation and is found in rural settlements such as Neem-ka-thana and Khetri town. The soil cover is very thin and only a few low, medium sized trees can be observed thriving in the landscape. Large areas are covered with thorny scrubs with stunted growth. Brinjal, Bottle gourd, Ladyfinger, Ridged gourd, Daikan, Pepper, Spinach and Guar are locally available in the markets of Khetri. It is also commonly accepted that they may contain high traces of copper and iron ore.

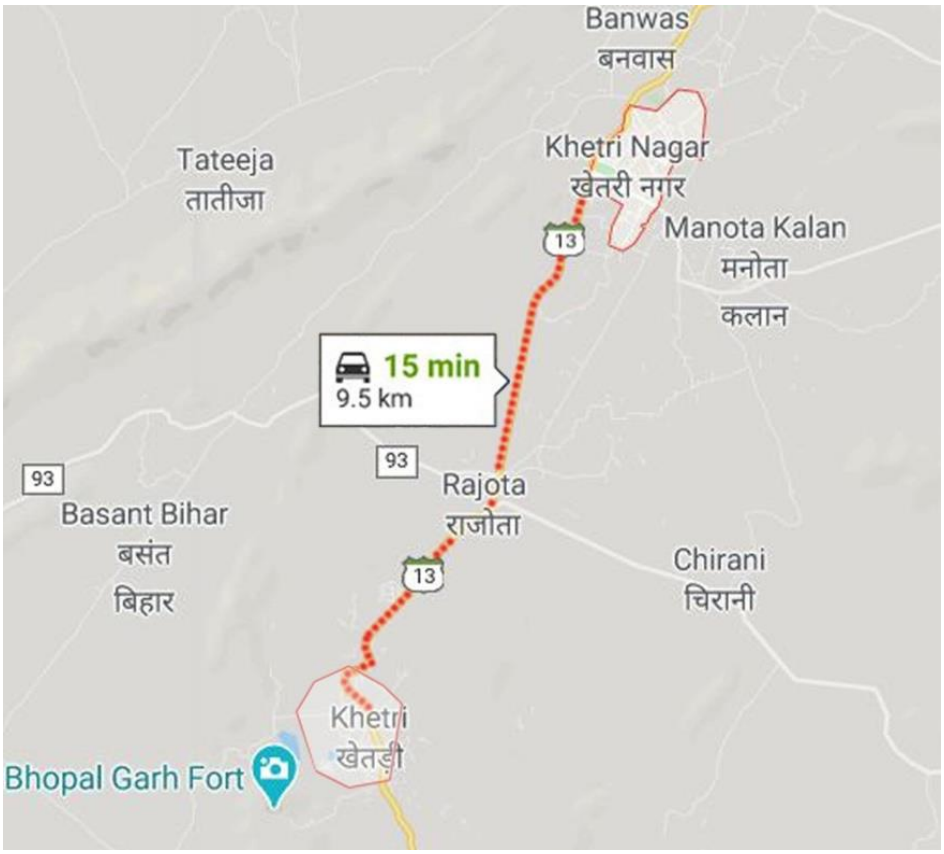
Map 2 showing terrain of Khetri



9.1.5. Distance Charts

Two predominant towns located in Khetri are “Khetri Nagar” and the “Khetri Town” which are 10 km apart, connected via National Highway 13.

Map 3 showing distance between Khetri Town and Khetri Nagar



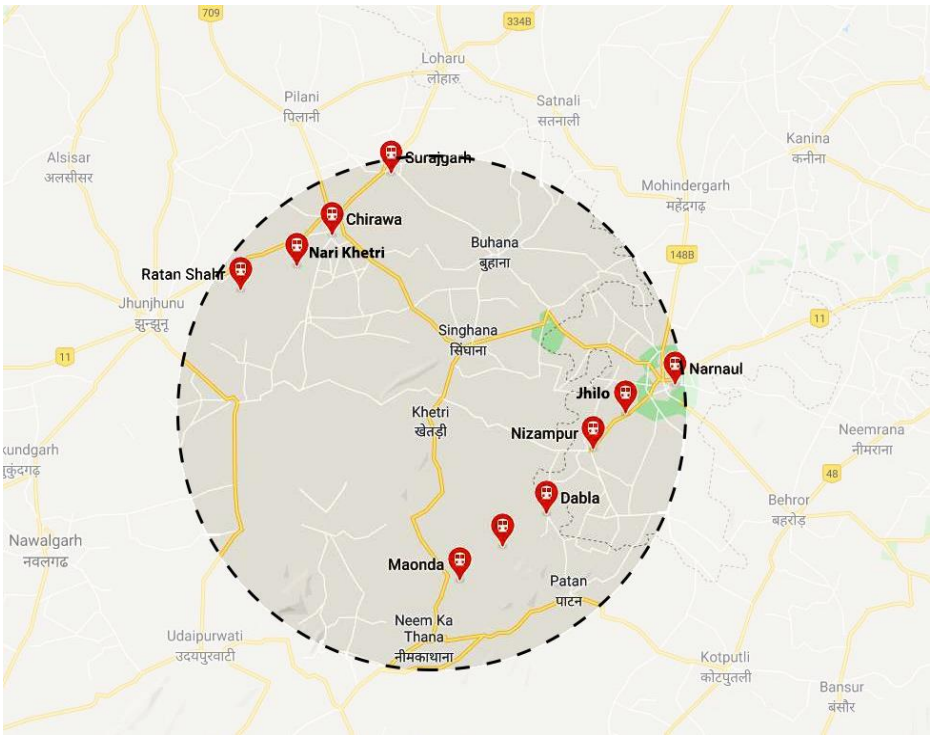
Map 4 showing major roads of Jhunjhunu District

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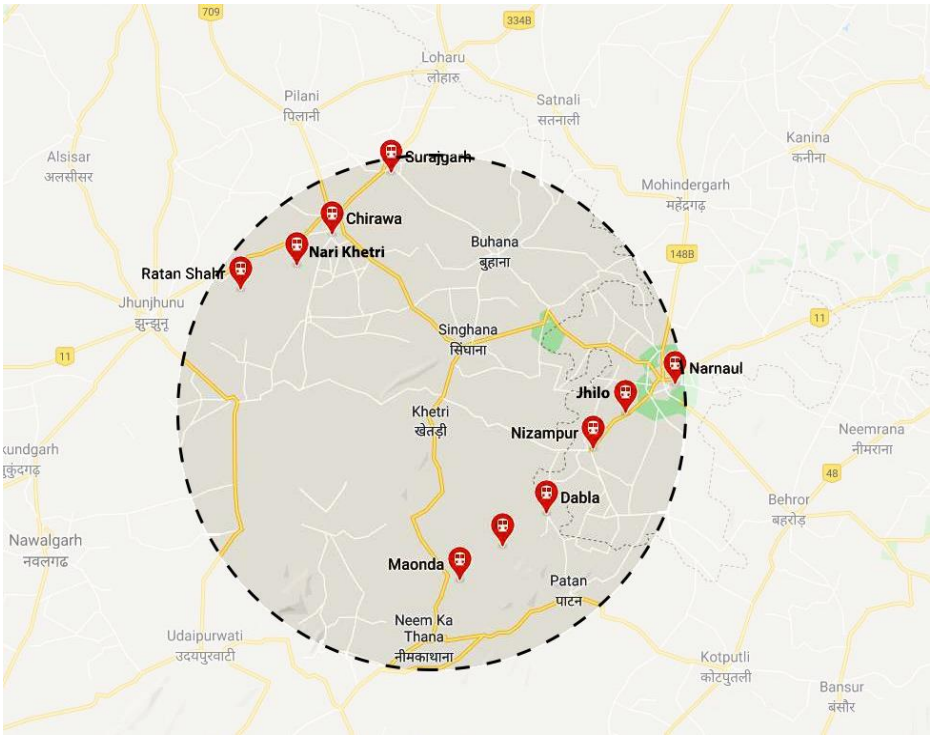
The town of Khetri is connected to 10 railway stations within a 35 km radius, the closest being Maonda 27km away. Nizampur, Jhilo and Narnaul stations are located in the state of Haryana.

Map 5 showing railway stations in a 35km radius



Within a 40 km distance is located the one airport available in Jhunjhunu district. Besides this there are heliports for private air travel.

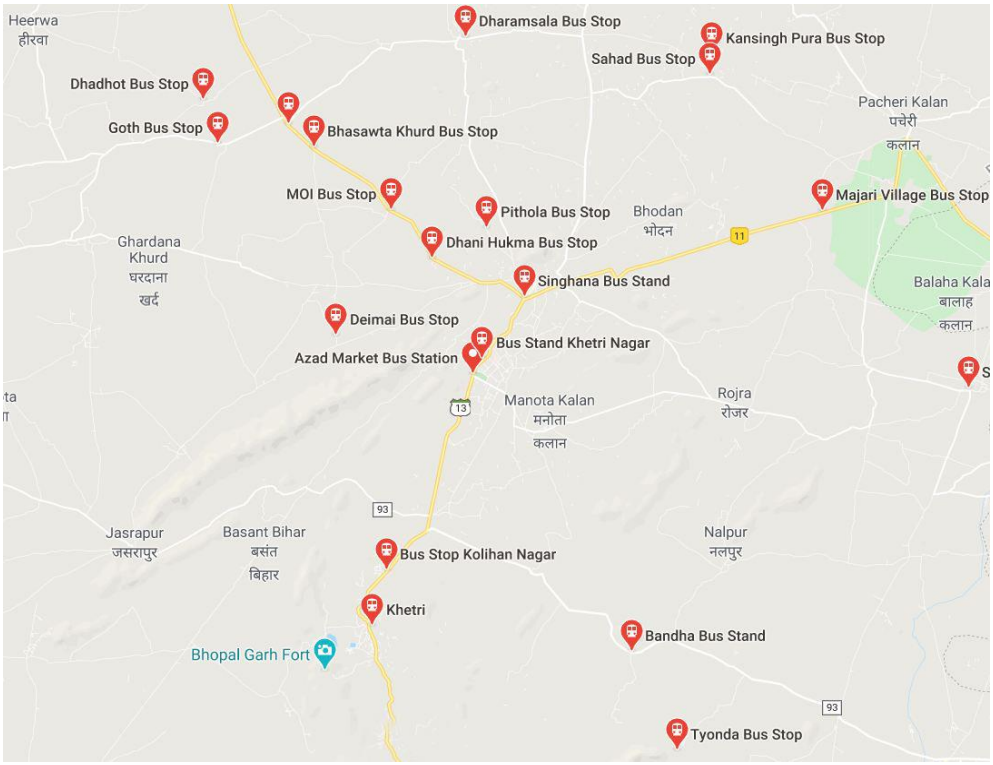
Map 6 showing airports in a 40 km radius



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There are multiple bus stands ensuring good connectivity with the region in and around the Khetri town.

Map 7 showing bus stands in and around Khetri



9.2. Project Details and Description

The aim of the project is to conduct a study related to the impact of the current infrastructure scheme being proposed for the Khetri heritage town and work directly with clients and other consultants, with supervision for critical tasks as an outcome of the Heritage Impact Assessment. This effort is in keeping with the Asian Development Bank Safeguards and the work of the project management unit to manage heritage resources and conservation under the SAUW Division projects. ADB has undertaken to provide loans for the heritage town of Khetri to aid in improved services covering water and sewerage infrastructure with joint efforts from the Government of Rajasthan. Khetri is the first of 14 secondary towns selected for the project. Beyond the HIA study, the project also aims to conduct training for executing agencies, consultants, contractors and other stakeholders to understand heritage management processes in designing, implementing and monitoring projects. Preparing a Terms of Reference to ensure

engagement of heritage expertise during all the project conceptualisation to implementation stages by the implementing agency is another outcome of the project.

9.2.1. Physical Cultural Resources

Physical Cultural Resources, as defined by ADB are movable, immovable objects, sites, structures, group 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. As regards Khetri, two site visits were undertaken as a result of which the following PCRs were identified. Seeing the richness of the town with regards to cultural and natural heritage, this list covers some significant structures and includes a representative sample of the lesser known assets of the town's heritage. A detailed list and documentation is recommended to be undertaken through nomination of heritage experts and team by the government agency undertaking work in the area.

(a) Archaeological Sites – Ganeshwar, a small settlement located south of Khetri town within approximately 45-kilometres, in the proximity of Neem ka Thana town, has revealed ancient sites that probably have a 4000 year old history. This site is located at the source of river Kantali, which is known to have earlier joined river Drishadvati, near Soni-Bhadra in the north.[52] Other excavations in the Sikar-Jhunjhunu area of the Khetri copper belt suggest the supply of copper objects to Harappa. Various storage jars, vases, basins, bowls, lids and miniature pots have been discovered near the site.

(b) Mansions (Haveli) – The tangible heritage in the Shekhawati region of Rajasthan are large residential mansions which are owned by business families. The mansions may be deserted and/or in poor condition due to lack of or inappropriate maintenance. These mansions have a potential of serving as open art galleries and can be used for economic generation and protection of local craft while serving as live examples ofsound conservation practice.

[52] https://www.rajras.in/index.php/ganeshwar-archaeological-site-rajasthan/

(c) **Forts** – Each townscape in the region usually showcases a fort on the high point on the terrain to mark the presence of an erstwhile royal family or its descendants. In some areas, a few of these forts have been converted into hotels or visitor accommodation but most lie deserted usually in a dilapidated state. In Khetri, the Bhopalgarh fort belonged to the royal family of Khetri. Today, this magnificent piece of architecture lies deserted and vandalized.

(d) **Historic core -** The historic core breathes life into towns since residential and religious architecture such as *havelis* and temples are concentrated in the culturally rich core while it continues to live, breather and operate as a regular town centre operating markets, place of work, schools within its boundaries. However, the historic cores often lack basic infrastructure and services due to various reasons.

(e) **Historic Landscapes–** The region is rich in historic landscapes which can be categorized under royal residential complexes, religious sites, educational cultural institutions and recreational areas and water harvesting and conservation systems within the larger cultural landscape.

(f) **Stepwells (*Baori*), Tanks (*Kund, Johad*) and Lakes and Water Bodies with Stepped Edges (*Ghat*) –** Architectural typology which was historically used in storing water was an inherent part of the water management system of the historic settlement. This traditional system with a high social, associational and cultural value lies defunct and dilapidated while the town looks away from self-sustaining/decentralised traditional water conservation and supply towards a centralised system of government led infrastructure for water supply.

(g) **Religious Sites** – These are strategically located, aesthetically evolved structures linked to the religious beliefs of the local people that strengthen social and religious links within the settlement. Each community group usually takes care of their religious sites and performs activities associated with them.

(h) **Commemorative structures** – These structures evoke a sense of pride, memory, and are symbols of traditional practices that contribute towards the collective memory of the place.

(i) **Traditional markets and streets -** Almost every historic town in the region has a traditional market area, which in most cases offers a vibrant epicentre of daily community

life. Intangible heritage within traditional markets is represented through production units of various arts, crafts and culinary delicacies. Making of lac bangles, pickle home industry, sweatmeat shops with traditional sweets such as carrot pak, traditional footwear craft and making of flags or Nishan for the local yatras are some of the activities uniquely seen in the market town of Khetri. These streets are also part of various cultural routes reiterating the sociocultural and religious identity of the local population.

(j) **Festivals and related cultural routes**:

1. **Gangaur Festival -** Gangaur is probably the most celebrated and colourful festival in the region and celebrated with great fervour and devotion especially by womenfolk to worship Goddess *Gauri*, the consort of Lord Shiva. This represents the celebration of spring, harvest and marital fidelity.[53] It is especially meant for the women both married and unmarried. The word Gangaur is derived from two words. Gan meaning Shiva and Gauri meaning Parwati. The festival starts day after Holi, the festival of colours (around the month of March) and is celebrated for two weeks.

   Rites and Rituals[54] **-** The Gangaur festival commences with the custom of gathering ashes from the Holi Fire and burying the seeds of 'Barley' in it. The seeds are then watered everyday awaiting the germination. The ceremony takes place with the praiseful songs for Shiva and Gauri. The women decorate their hands with mehndi since it is considered auspicious. They carry painted earthen pots on their heads. They also make images of Gauri and Shiva with clay.

   On the seventh evening after Holi, unmarried girls assemble and take out a procession with 'Ghudlia' (an earthen pot with holes around and a lamp inside) on their heads. This practice is repeated for ten days. Celebrated by women this involves fasting for 18 days partaking only one meal a day.

   A large number of fairs are organized during this time. Women make images of Isar and Gauri in clay for the festival. In some Rajput families, permanent wooden images are used after painting them every year carried out by traditional painters called

[53] https://www.festivalsdatetime.co.in/2016/05/2018-gangaur-hindu-festival-date-time-in-india.html#axzz57fcGnpvP
[54] http://www.dsource.in/resource/gangaur-festival/traditional-attire-rituals

Matherans. The event culminates with the immersion of the idols in *baoris* or *johads* (wells or water reservoirs), marking farewell to Goddess Gauri.

2. **Khatu Shyam[55] - Celebrated in Rajasthan**, Khatushyam is the name and manifestation of **Barbareek**—according to some texts, the grandson of Bhimsen and Hidimba . Commonly referred to as Shyam Baba, he is considered a popular supernatural power and either referred to by his original Sanskrit name *Barbarīka* or the hindi name *Barbarīk*, or *Barbareek*. According to Hindu mythology, before the battle of Mahabharata began, the prowess of Barbarika was said to be unmatched. Bound by his principle to always favour the weaker side in order to remain just, this decision would have resulted in the complete annihilation of both sides, leaving only Barbarika as the sole survivor. It is said that Lord Krishna, to avoid this devastation, asked Barbarika for his head (sheesh daan), to which he readily agreed. Shree Krishna was extremely happy with the devotion shown to him, and by the great sacrifice of Barbarika that he granted him a boon, according to which Barbarika would be known by Krishna's name, Shyam Ji in *kaliyug* (present times) and would be worshipped in his form.

   Nishan Yatra Journey of Khatu Shyam - Nishan Yatra is one of the famous cultural routes in the region. Holding a procession on foot, the believers carry a *kesariya* (saffron coloured) flag referred to as Nishan. After they perform *aarti* of Khatu Shyam, pilgrims proceed towards the local Khatu Shyam Temple. After completing the Nishan[56] yatra journey, an offering is made to commemorate *sheesh ka daani* in context of his head sacrifice.

3. **Varahi Devi Rally -** Goddess Varahi Devi is a Hindu deity representing the feminine aspect of the all-pervading power of creation, believed to be inherent in all animate and inanimate beings. She is one of the *Matrikas*, a group of seven Mother Goddesses who represent 'Shakti', or power. Varahi Devi is the female counterpart of Varaha, the boar form of *Avatar of Lord Vishnu*. The goddess is responsible for maintaining

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[55] http://www.tourism.rajasthan.gov.in/khatu-shyam-temple.html

[56] Nishan - This is holy flag, Kesariya in colour. It has Krishna and Shyam baba Pictures and chants. Coconut and feathers of peacock are also tied to it.

law and order in the universe.[57] Varahi is a night goddess and is worshipped after sunset and before sunrise. A rally is organized in the region by the devotees in the honour of the Goddess. The main market in Khetri has a Varahi devi temple.

4. **Hanuman Jayanti** - Hanuman Jayanti is a Hindu religious festival that celebrates the birth of Lord Sri Hanuman, a significant character popularly referred to as the monkey god in the epic Ramayana. On this auspicious day, devotees of Lord Hanuman seek his protection and blessings. As part of this festival, a grand *Kalash Yatra* heads out from the temple premises.
5. **Ram Navami** - Rama Navami is a spring season Hindu festival that celebrates the birth of Lord Rama. He is particularly important to the Vaishnavism tradition of Hinduism, as the seventh *avatar* of Vishnu. The festival is a part of the spring Navratri, and falls on the ninth day of the bright half (*Shukla Paksha*) according to the Hindu calendar month of *Chaitra*. Some devotees mark the event by taking miniature statues of the infant Rama, bathing and clothing it, then placing it in a cradle. Charitable events and community meals are also organized. The festival is an occasion for moral reflection for many Hindus and thus marked by vrata (fasting).

9.2.2. Baseline conditions

Within the above classification of tangible and intangible heritage, the authorities undertaking construction and operational work within Khetri town, need to take cognizance of the wide range of PCRS on site.

Cultural significance is the importance of a property to the history, architecture, archaeology, engineering or culture of a community, region or nation. In selecting a building as a heritage structure, particular attention should be paid to the following:

- Association with events, activities or patterns (like **Ajit-Vivek Museum**)
- Association with important persons or representing the work of a master (**Havelis**)
- Distinctive physical characteristics of architectural style, design, construction or form (like forts & palaces)

[57] https://poojabell.com/varahi-devi/

- Potential to yield important information, such as illustrating architectural, social or economic history. E.g. Havelis, Royal stables converted to the bus station, town halls, goshala, clubs, markets, waterworks etc.
- Technological innovations in construction or building typologies viz. dams, bridges, etc.
- Town planning features like gateways, squares, streets, avenues. Khetri streetscape continues to showcase facades (complete or in a state of disrepair) of houses, shops, temples and structures that may have retained their original use or adopted another function.
- All structures related to water such as wells, stepwells, baoris or kunds, natural drainage systems, water harvesting systems and any other traditional water collecting, disseminating structure is to be considered as a Physical Cultural resource.
- Art and fresco work which this region is famous for.

Table 5 showing baseline condition of built heritage

Baseline feature no.	**Name**	**Description**	**Location**
1.	The Bhopalgarh Fort Refer to Appendix 2 Figure 4 showing ruins of Bhopalgarh Fort	Khetri Mahal was constructed by Raja Bhopal Singh around 1770. It is primarily known for its fine paintings and murals mainly supporting the Raghunath temple and Bhopalgarh fort. It is also known as Wind Palace of Khetri. Oriented along East-West and facing East, it represents the Shekhawati Architecture style. Built atop a hill it can be accessed on foot via a 4 km trail from th town centre. The palace is connected via a series of ramps with open rooms, colonnaded connected through arched portals. Built using an Indo-Persian structural system the building showcases arcuate construction techniques. The historic structure is made of brick and stone with exposed bricks. The palace is remarkable among buildings of its region because of the flow of wind through its open portals.	It is built on the Bhopalgarh mountain and is approachable via a 4 Km long trek from the base. 26.6548° N, 73.4916° E

2.	Ajit-Vivek Museum Refer to Appendix 2 Figure 5 showing Ajit-Vivek Museum	A Museum, now known as Ajit-Vivek Museum is related to Raja Ajit Singh and Swami Vivekananda. It was inaugurates on 31st March 2019 in the restored building, the earstwhile Diwan-khana Mahal. The four-storied structure follows the Shekhawati style of architecture with a double storied main hall, an open terrace on the third level with a view of the entire town and hills in the background. The fourth level consists of a meditation room for men and women. The restored structure has a pink paint coating with white paint trimmings on its elevation. This museum houses multiple cultural programs. It is an important commemorative space that interprets the relationship between Raja Ajit Singh and Swami Vivekananda in the context of Khetri's rich history.	Beside State Transport, State Highway 13, Khetri, 28.0053° N, 75.7870° E
3.	Sukh Mahal Refer to Appendix 2 Figure 6 View of Sukh Mahal from Jai Niwas	It was constructed in the 19th century A.D. and used as a guest house for Raja Ajit Singh and Swami Vivekananda's guests. The Mahal is situated near Ram Krishan Mission and 500 m from town Bus Stand. It is a masterpiece of art, culture and architecture with an Indo-Persian structural system and arcuate building techniques.	It is built on a hilltop and can be spotted from a distance. 28.0075° N, 75.7860° E
4.	Amar Mahal Refer to Appendix 2 Figure 7 showing Amar Mahal	It is a three-story structure right next to the Ajit Vivek Museum. It has eaves holding the balcony on the first level. The building is in a dilapidated condition.	It is located adjacent to the Ajit-Vivek museum 28°00'19.5"N 75°47'14.4"E

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5.	Jai Nivas Refer to Appendix 2 Figure 8 showing Jai Niwas	It was constructed in 19th century A.D. and was traditionally used as a residence but is now left only as a tourist attraction. It is a huge palatial building with a lofty staircase. The building stands on high terrain and has a boundary wall in dilapidated condition. It has an arch opening in the exterior which gives an uninterrupted view of the Sukh Mahal. The boundary wall is beautifully designed but is falling apart due to lack of maintenance. The structure has vegetation growing all around it. The poor condition of the building ahs exposed parts of the masonry.	It can be seen clearly from Sukh Mahal. 28°00'23.0"N 75°47'07.7"E
6.	Sanskrit Vidhyalaya Refer to Appendix 2 Figure 9 showing Sanskrit Vidhyalaya	It is a brick masonry structure painted in yellow colour. It is a four-storied structure which can be accessed staircases that open up to the central courtyard where in the middle lies a small temple. It has arched balconies and *chattris* on top of the structure.	Opposite to Ganga Mata Ji Mandir 28°00'05.4"N, 75°47'06.1"E
7.	Shremati Laxmi Shah Hospital Refer to Appendix 2 Figure 10 showing fresco on entry of Shremati Laxmi Shah Hospital	It is a two-storied building with fresco work on the entry gate along with arches. It has *chattris* which have been blackened because of the poor maintenance.	28°00'04.4"N 75°47'07.8"E
8.	Dewan Brij Lal Singh Ji Shah ka Kund Refer to Appendix 2 Figure 11 showing Dewan Brij Lal Singh Ji	It is a brick and stone masonry step-well that has been left unused. It is situated in the same complex as the Laxmi Shah Hospital. It has fresco work on the *chattris* in the corner and on the *chattris* within. There is vegetation growing on the upper story and stagnant and polluted water within the *baori*.	28°00'03.9"N 75°47'10.2"E

	Shah ka Kund		
9.	Jai Singh High School Refer to Appendix 2 Figure 12 showing panorama of Jai Singh High School	Founded in 1885[58], the masonry structure with an indo Islamic style has *chhatris* on the terrace have a cusped arch opening. The complex has a large open space. The *chhajjas* are supported by stone brackets.	28°00'07.1"N 75°47'10.6"E
10.	Khetri Trust Kariyalay/ Office Refer to Appendix 2 Figure 13 showing condition of Khetri Trust Building Facade	It is a 3 storied structure painted yellow and has vegetation growing on it. The rear elevation has staircases on either side leading to alternate entries. It has a minaret like structure on its edges with arches and *chattris* on top.	28°00'22.6"N 75°47'10.5"E
11.	Bawri Refer to Appendix 2 Figure 14 showing Bowri beside open sewer	The water body is situated on the main axis of the settlement. It has been recently painted which has hidden the authentic fabric of the structure. The chattris are placed on the platform of the *Bawri*. At present, a natural drainage channel that is highly passes along the structure.	

[58] https://www.icbse.com/schools/g-jai-singh-sr-sec-s-khetri-5e93z

12.	Panna Sagar Talab Refer to Appendix 2 Figure 15 showing panoramic view of Paana Sagar Talab	Panna Sagar Talab is an man made collection tank in the heart of Khetri town designed to collect rainwater. The Talab/tank is situated adjacent to the Nagar Palika Campus approximately a km. from the Bus Stand. It was constructed in the 18th century A.D. [59] and is decorated with remains of exquisite sculptures of Hindu deities. The central pond is approached by a series of the step leading to the water. The rear area of this large structure shows a well worked out water collection and conveyance system which is a usual feature in the dry water parched towns of this part of Rajasthan.	27°59'57.6"N 75°46'52.3"E
13.	Ganga Ji Mandir Refer to Appendix 2 Figure 16 showing *Ganga ji Mandir*	Built-in the 19th Century, the structure has a multi-foliated arch at the entrance. It is part of the residential unit and is still in use.	
14.	Raghunath Gaushala Refer to Appendix 2 Figure 17 showing Raghunath Gaushala	The Gaushala is situated near Cinema Hall Khetri and is 1 km from Bus Stand Khetri. It was conceived in the 20th century A.D. [60] as a beautiful building adorned with colourful paintings at the entrance. The multi-foliated arch at the entrance has also beautiful Rajasthani frescos possibly with little of the original material. The interior has a courtyard for cattle.	

[59] http://ignca.gov.in/asi_reports/rjjjn_1558.pdf
[60] http://ignca.gov.in/asi_reports/rjjjn_1585.pdf

15.	Mandir Shri Gopal ji Refer to Appendix 2 Figure 18 showing Gopal Ji Mandir	The Temple is situated near Thakur Hari Singh Temple and was built in 18th century A.D.[61] It is an old temple and can be approached by a series of steps. It has turrets on either side of the temple. The top of the temple has chattris. It has a foliated arch at the entrance with the walls adorned with rich Rajasthani frescos. The temple has intricate carving and delicate designs.
16.	Bhatiayani Mandir or Saraswati School Refer to Appendix 2 Figure 19 showing Saraswati School	The structure is painted yellow on the outside. It has multi-foliated arches at the entrance gate. It is a three-storied structure with chattris on top of the roof and open classes on the remaining two stories.
17.	Radha Krishan Refer to Appendix 2 Figure 20 showing Radha Krishan Mandir	The temple has a foliated arch at the entrance with a chhatri on one side of the temple.
18.	Shree Varahi Devi Temple Refer to Appendix 2 Figure 21 showing Varahi Devi Temple	A beautifully painted exterior the frescos and statues on the entry steps may be recent additions.

[61] http://ignca.gov.in/asi_reports/rjjjn_1583.pdf

19.	Ganpat Ram ki Haveli Refer to Appendix 2 Figure 22 showing Ganpat Ram ki Haveli	The Haveli is situated near Sabzi Mandi adjacent to the Main Bazaar in Khetri.[62] The haveli has a long arcaded façade faving the main road with intricately carved work on the arches and door lintel. The veranda like projection is embellished with ornamental iron-work.

Note: This is a sample set of PCRs and more information is to be collected at the stage of DPR preparation. For other projects, this process of documenting PCRs will be undertaken before the design stage. The town, as per locals consists of around 120 temples and it is important to document them so that the infrastructure work respects the spiritual landscape of the heritage town.

[62] http://ignca.gov.in/asi_reports/rjjjn_1553.pdf

9.3. Methodology [63]

Development or other physical changes in the environment may have adverse or beneficial impacts on cultural heritage attributes. It is necessary to identify all possible changes/works as well as the range of impacts on each attribute. It is also important to identify the scale or severity of a specific change or impact on a specific attribute – as this combination is what defines the significance of the impact (significance of effect).

Impacts may range from direct or indirect; cumulative, temporary or permanent, reversible or irreversible, visual, physical, social and cultural, and/or economic. Activities undertaken as part of the proposed infrastructure development in Khetri need to be considered for their wide range and possibilities of impact on the heritage fabric and cultural values within the HIA.

Direct impacts are those that arise as a primary consequence of the proposed development or change of use. Direct impacts can result in the physical loss of part or all of an attribute, and/or changes to its setting - the surroundings in which a place is experienced, its local context, embracing the present and past relationships to the adjacent landscape. In the process of identifying direct impacts, care must be taken of regarding gaining/granting approvals to build in mechanisms to avoid direct impact – development needs to address the physical resources in entriiety as well as the impact on each resource, the pattern, ensemble, setting, spirit of place etc.

Direct impacts resulting in physical loss are usually permanent and irreversible. These normally occur as a consequence of construction and are usually confined within the development footprint. The scale or magnitude of these impacts will depend on the scale and intensity of activity and proportion of the attribute affected.

Direct impacts that affect the setting of an attribute may occur as a consequence of construction or operation of the development scheme. Assessment of impacts on setting refers to perceptible visual and aural (noise) effects that can be measured at a given time. Such

[63] ICOMOS. (2011, January). Guidance on Heritage Impact Assessments for Cultural World Heritage Properties.

impacts may be temporary or permanent, reversible or irreversible depending on the extent to which the cause of the impact continues. Impacts may also be transient where the occurrence is sporadic or of limited duration, for example, related to hours of operation or the frequency of passage of vehicles.

Indirect impacts occur as a secondary consequence of construction or operation of the development and can result in physical loss or changes to the setting of an asset beyond the development footprint.

Scale or severity of impacts or changes can be judged taking into account their direct and indirect effects and whether they are temporary or permanent, reversible or irreversible. The cumulative effect of separate impacts should also be considered as these may together be be destructive. The scale or severity of the impact can be ranked without regard to the value of the asset, as:

- No change
- Negligible change
- Minor change
- Moderate change
- Major change

The significance of the effect of change – i.e. the overall impact - on an attribute is a function of the importance of the attribute and the scale of change. This can be summarized for each attribute described using the following descriptors. As change or impacts may be adverse or beneficial, there is a nine-point scale with “neutral” as its centre point:

- Major beneficial
- Moderate beneficial
- Minor beneficial
- Negligible beneficial
- Neutral
- Negligible adverse
- Minor adverse
- Moderate adverse

- Major adverse

Table 6 shows the Value of Heritage Asset

VALUE OF HERITAGE ASSET	SCALE & SEVERITY OF CHANGE/IMPACT No Change	Negligible change	Minor change	Moderate change	Major change
	SIGNIFICANCE OF EFFECT OR OVERALL IMPACT (EITHER ADVERSE OR BENEFICIAL)				
Very High	Neutral	Slight	Moderate/ Large	Large/very Large	Very Large
High	Neutral	Slight	Moderate/Slight	Moderate/Large	Large/Very Large
Medium	Neutral	Neutral/Slight	Moderate/Slight	Moderate	Moderate/Large
Low	Neutral	Neutral/Slight	Neutral Slight	Slight	Slight/Moderate
Negligible	Neutral	Neutral	Neutral/Slight	Neutral/Slight	Slight

All proposals should be tested against existing policy frameworks and the management plan for the property and surrounding area. The compatibility of the scale, pattern, use, etc. should be tested according to the attributes of the property.

9.4. Planning and Legislative Background

9.4.1. Existing Framework

Table 7 shows Acts and Byelaws

Acts and Byelaws	**Key Points**
Ancient Monuments and Archaeological Sites and Remains Act, 1958 (Central Act No. 24 of 1958	Applies to the monuments and sites deemed to be of national importance.
Antiquities and Art Treasure Act, 1972 (Central Act No. 52 of 1972)	Applies to any antiquities or art treasures which need acquisition or protection.

The Rajasthan Monuments Archaeological Sites And Antiquities Rules, 1968	As per **Chapter 2, Point No. 8** Prohibition of certain acts within protected monument – No person shall within a protected monument – (a) do any act which causes or is likely to cause damage or injury to say part of the monument; (f) Violate any practice, usage or custom applicable to or observed in the monument; or (g) Bring, for any purpose other than the maintenance of the monument – (i) any animal, or (ii) any vehicle except in the areas reserved for the parking thereof As per the above, the contractors working on-site need to ensure that heritage sites/precincts should not be used for storage of material, parking (temporary or permanent) or be used to undertake any disruptive activity related to the construction of the RUDSICO-EAP projects in keeping with the spirit of the Rules listed above. **As Per Rule No. 10** Conditions for copying other monuments – (1) Any person may copy a protected monument other than such monuments in respect of which an order has been made under rule 9. (2) Nothing in sub-rule (1) shall be construed as authorizing any person other than an Archeological Officer or an officer authorized by him on this behalf while copying any such monuments, (b) erect any scaffolding within such precincts, or (c) use within such precincts any artificial light…., or (d) apply any extraneous matter, such as water, oil, grease or any moulding material on such monument or part thereof, (10) Nothing shall be done to violate the customary rules prevailing at the monument or to use it for any purpose that may be inconsistent with its character. (11) Nothing likely to offend public sentiment shall be done. As per the above sub-rules, heritage is considered as the monument as well as the rules, and local values related to the cultural practices. While we get further information of the controlled area, construction being undertaken in the town should follow the spirit of the historic character of the monuments in its vicinity. Keeping in mind the proximity of the Ajit Vivek museum and Khetri Trust buidlings the new AEN structure and office buildings being built should incorporate the following Rules in the structures and office buildings in their final designs:

18. Particulars of buildings, structures and other works controlled under section 19 – Within the controlled area of a protected monument, the position, height, size, design, material, color and screening etc. of the building, structures and other works above the ground shall be regulated by the following conditions:-

(a) the new construction or structure shall not be in such a place and of such a height as might obstruct the external view of the protected monument;

(b) the size of the new building or structure or works shall not be greater than that of the monument;

(c) the design of the new construction or structure or works shall not allow any incongruities to be a patchwork in the vicinity when compared with the style used in the monument;

(d) the materials used in the new construction shall not be different in quality from those used in the old building, structure or work;

(e) the color of the new construction, structure or works shall conform with the one used in the monument;

(f) the style of screens used, if any, in the new construction or structure or works would confirm to the type used in the monument;

(g) the internal appearance of the building, structures and other works above ground within the controlled area of the monument shall fall in line with the external appearance of the protected monument, in the regulated area of which the alteration or extension of any buildings or structures or works take place.

19. Application for permission for construction or excavation etc. in protected areas – Every application for permission for –

i. Construction of any building;
ii. Carrying out any mining, quarrying, blasting; or
iii. excavating for archaeological or historical purposes; or
iv. undertaking any other operation of the like nature, under section 22, in any protected area, shall be made in Form II at least three months before the date of commencement of the proposed construction, operation excavation, etc. as aforesaid.

<u>The final detail design from the contractor should be cognizant of:</u>

i. <u>The location of the trench on the side of the right of way which least interrupts the physical fabric of the monument as well as any related</u>

	pedestrian or vehicular circulation related to the cultural activities associated with the structure. ii. Excavation/digging depths and methodology so least damage is caused due to the construction activities to the structures in the vicinity. iii. Take care that concrete plaster or other inappropriate building or finishing materials do not come in contact with the buildings or historic boundary walls of the structures. The services of an architect specialising in traditional architectural forms and landscape architect specialing in open space design should be engaged for all new buildings, spaces, interventions being planned in the heritage towns.
Municipalities Act, 2009 amended in 2010	An act to consolidate and amend the laws relating to the State of Rajasthan and to provide for matters connected therewith and incidental thereto (Rajasthan Municipalities Act, 2009). The act describes the conservation of monuments and places of historic importance as core municipal duties along with provision for preparing Master Development Plan, Municipal Action Plan, Execution Plan, keeping in consideration conservation of natural and built heritage assets. Though the detailed analysis for the same shows that provisions for management, financial assistance, land acquisition, urban mobility and outreach are not provided specific to the conservation of heritage assets, it can be seen as a point of initiation formulating a framework for inclusive revitalization in historic towns of Rajasthan.
Shekhawati Heritage Council Rules amended to Rajasthan State Heritage Council Rules[64]	The Government of Rajasthan formulated the Rajasthan State Heritage Council Rules as a statutory document in the exercise of the powers conferred by sub-clause (iii) of clause (g) of Section 46 and Section 337 of the Rajasthan Municipalities Act, 2009. The document applies to all the municipal areas in Rajasthan and proposes the protection of a dense ensemble of unprotected heritage through identification, documentation, conservation and regulation of

[64] Bank, N. a. (2018). *Inclusive Revitalisation of Historic Towns and Cities : Strategic Framework for Rajasthan State Heritage Programme.* New Delhi: NATIONAL INSTITUTE OF URBAN AFFAIRS, NEW DELHI.

these assets.

9.5. Assessment and Evaluation of Overall Impact

The process focuses on evaluation and impact assessment as discussed in the methodology on protecting and conserving cultural and natural resources alongside development of essential infrastructure in heritage towns. This is a step towards a long-term vision which mutually benefits local community in maintaining and conserving their heritage while also being served by essential water and sewerage networks.

9.5.1. Key conflicts/issues

- Damage to the **physical fabric** of PCRs to undertake infrastructure work
- Emissions of **noise** resulting from the Project adversely affecting the amenity of residences or sensitive areas.
- Generation of ground-borne **vibrations**, which could adversely affect the PCRs.
- The issues associated post installation during operation and maintenance of pipes are **leakage, cracks, corrosion, poor quality, poor installation** and many others.
- **Access** to the PCRs during the construction process in conflict with the calendar of festivals
- **Loss of visual** integrity and a coherent urban character of townscape
- **Loss/disruption of traditional water harvesting system** that includes tanks, channels, natural waterways and gradient

9.5.2. Impact due to Water Distribution Network

Water distribution and sewerage collection networks are linear interventions undertaken primarily along roads. We need to keep in mind that they do not disrupt the historic landscape as a whole including identified and unidentified Physical Cultural Resources. The pipelines which may not be following existing roads may transverse the historic landscape and archaeological sites and chance find protocols need to be adopted in case of any finds.

The water distribution and sewerage network may impact heritage structures or underground archaeological evidence via noise, vibration and leakages. The water supply and drainage system may have a direct impact on historic structures in the vicinity of the existing road

network. The areas where the distribution network does not follow an existing road may also have a bearing on historic landscape fabric and integrity.

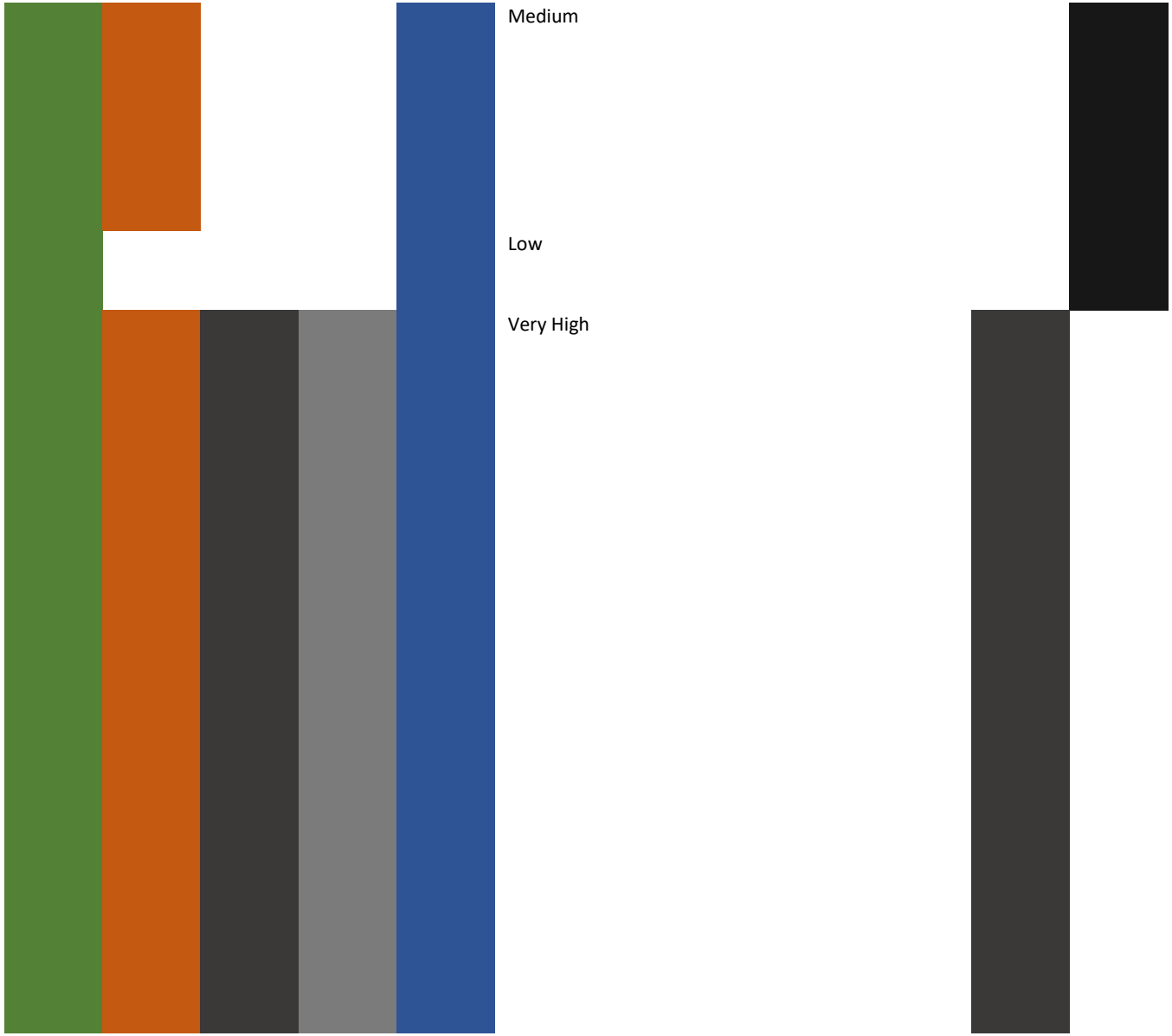
9.5.3. Impact on Physical Cultural Resources

Table 8 shows the impact on Physical Cultural Resources

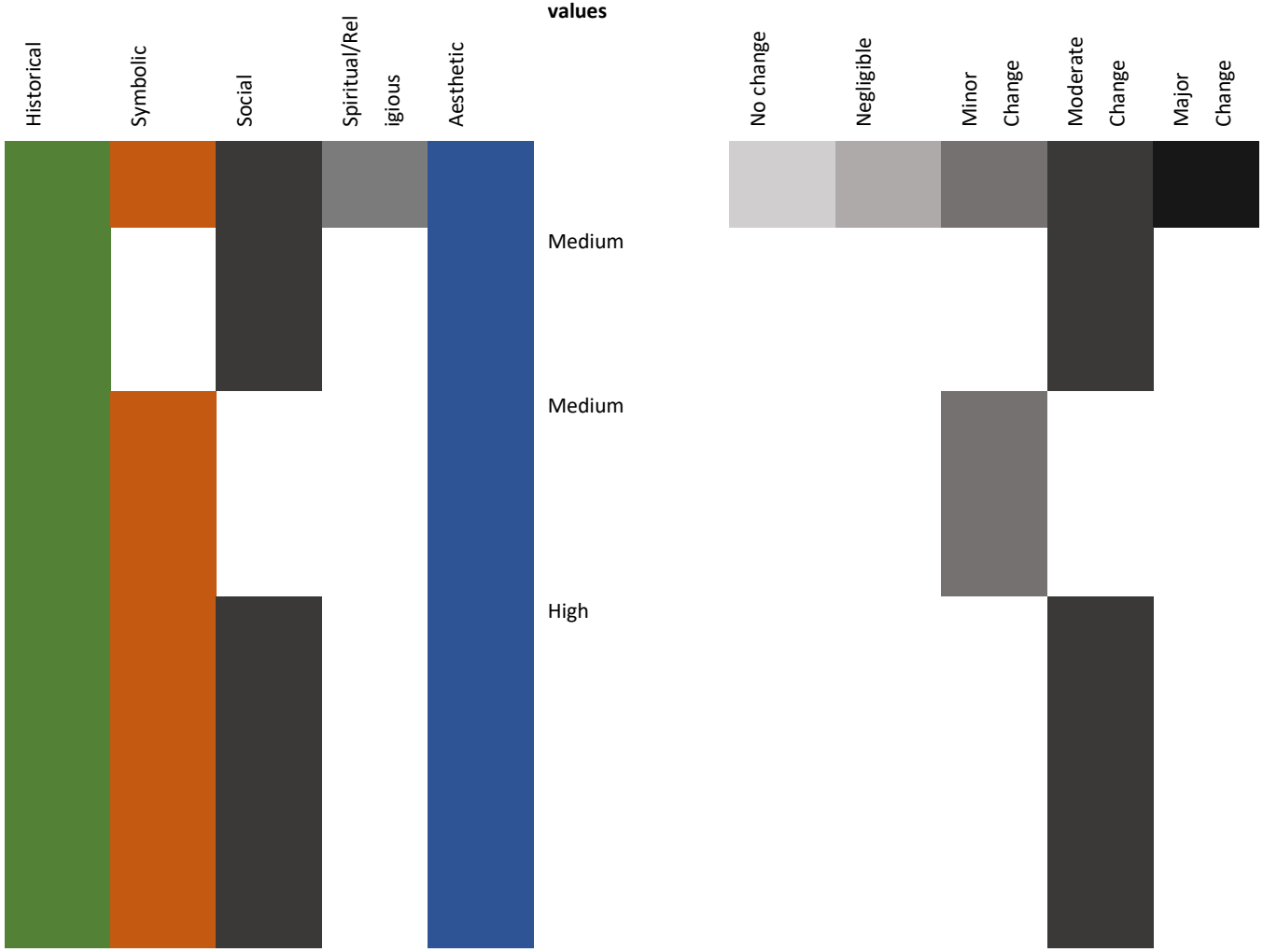
Baseline Feature No.	Name	Protection Status	Value Assessment					Contributions to values	Scale of Change/ * left to decay, dilapidation, vandalism					
			Historical	Symbolic	Social	Spiritual/Religious	Aesthetic		No change	Negligible	Minor Change	Moderate Change	Major Change	
1.	*The Bhopalgarh Fort**	State protected						Medium						
2.	*Ajit-Vivek Museum/ Fateh Vilas Mahal*	State protected						Very High		Studies to be undertaken as to the authenticity of the work				
3.	*Sukh Mahal**	Unprotected						Medium						

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4.	*Amar Mahal* (Within Khetri Trust precinct)*	Unprotected (possibly under litigation)	Medium
5.	*Jai Nivas**	Unprotected	Low
6.	*Sanskrit Vidhyalaya (also referred to as Temple of Gopinath ji Ranawat & referred to as Temple of Madan Mohan ji in the State Archaeology list of protected monuments)*	Unprotected	Very High



Baseline Feature No.	Name	Protection Status	Value Assessment	Contributions to values	Scale of Change
7.	*Shremati Laxmi Shah Hospital*	Unprotected		Medium	
8.	*Dewan Brij Lal Singh Ji Shah ka Kund**	Unprotected		Medium	
9.	*Jai Singh High School*	Unprotected		High	



Baseline	Name	Protection	Value Assessment	Contributions to	Scale of Change

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Feature No.		Status	Historical	Symbolic	Social	Spiritual/Religious	Aesthetic	values	No change	Negligible	Minor Change	Moderate Change	Major Change
10.	*Bawdi*	Unprotected				To check on site		Medium					
11.	*Khetri Trust Kariyalay/ Office*	Unprotected											
12.	Panna Lal Shah Talab	State protected						Very High				Taking into account its water quality, repair history and status of water harvesting network	
13.	Ganga Ji Mandir	Unprotected											
14.	Raghunath Gowshala	Unprotected						We do not know the historic use					
15.	Mandir Shri Gopal ji	Unprotected						Medium					

16.	Bhatiayani Mandir or Saraswati School	Unprotected	High
17.	Radha Krishan	Unprotected	Medium
18.	Ambe market Shree Varahi Devi Temple	Unprotected	High
19.	Ganpath Ram ki Haveli*	Unprotected	High
20.	Temple of Madan Mohan ji	State protected as per list but temple was not identified by experts or locals on site	
21.	Temple of Raghunath ji	State protected	



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Table 9 Shows mitigation measures the type and nature of the impact

Baseline Feature No.	Name	Type of Impact	Nature of Impact
1.	*The Bhopalgarh Fort*	**No impact by current infrastructure scheme** but PCR in condition of extreme dilapidation suffering from neglect and vandalism	Accepted /Beneficial/ Acceptable with mitigation measures/ unacceptable Remarks: No impact. But need for urgent repairs, conservation and maintenance required in the absence of which the PCR will be irreversibly damaged/lost.
2.	*Ajit-Vivek Museum*	Direct/ **Indirect**/ Cumulative/ Residual	Accepted/Beneficial/**Acceptable with mitigation measures/**unacceptable
3.	*Sukh Mahal*	**No impact by current infrastructure scheme** but PCR in condition of extreme dilapidation suffering from neglect and vandalism	Accepted/Beneficial/Acceptable with mitigation measures/unacceptable Remarks: No impact. But need for urgent repairs, conservation and maintenance required in the absence of which the PCR will be irreversibly damaged/lost.
4.	*Amar Mahal*	Direct/ **Indirect**/ Cumulative/ **Residual** PCR in condition of extreme dilapidation suffering from neglect and vandalism	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: As this is located across from the AEN campus with pipelines running along its façade care will need to be taken that the vibrations and excavations do not harm the building but also that the new buildings set up are visually coherent/in line with the traditional façade and streetscape of the area.

			Further, need for urgent repairs, conservation and maintenance required in the absence of which the PCR will be irreversibly damaged/lost.
5.	*Jai Nivas*	Direct/ **Indirect**/ Cumulative/ Residual **No direct impact by current infrastructure scheme** but PCR in condition of extreme dilapidation suffering from neglect and vandalism	Accepted/Beneficial/**Acceptable with mitigation measures/**unacceptable Remarks: No direct impact. But need for urgent repairs, conservation and maintenance required in the absence of which the PCR will be irreversibly damaged/lost.
6.	*Sanskrit Vidhyalaya*	Direct/ Indirect/ Cumulative/ Residual **No direct impact by current infrastructure scheme** but PCR in condition of extreme dilapidation suffering from neglect and vandalism	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: No direct impact. But need for urgent repairs, conservation and maintenance required in the absence of which the PCR will be irreversibly damaged/lost.
7.	*Shremati Laxmi Shah Hospital*	Direct/ Indirect/ Cumulative/ Residual **No direct impact by current infrastructure scheme** but PCR in condition of extreme dilapidation suffering from neglect and vandalism	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: No direct impact. But need for repairs, conservation and maintenance required.
8.	*Dewan Brij Lal Singh Ji Shah ka Kund*	Direct/ Indirect/ Cumulative/ Residual No direct impact by current infrastructure scheme but PCR in condition of dilapidation suffering from neglect	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: No direct impact. But need for urgent repairs, conservation and maintenance required in the absence of which the PCR will be irreversibly

			damaged/lost.
9.	*Jai Singh High School*	Direct/ Indirect/ Cumulative/ Residual PCR in condition of dilapidation suffering from neglect though in continued use as a school	Accepted/Beneficial/**Acceptable with mitigation measures/**unacceptable Remarks: No direct impact. But need for urgent repairs, conservation and maintenance required in the absence of which the PCR will be irreversibly damaged/lost.
10.	*Khetri Trust Kariyalay Office*	Direct/ **Indirect**/ Cumulative/ Residual	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable
11.	*Bawdi*	Direct/ **Indirect**/ Cumulative/ Residual	Accepted/Beneficial/**Acceptable with mitigation measures/**unacceptable
12.	*Panna Sagar Talab/ Panna Lal Shah Talab*	Direct/ Indirect/ **Cumulative**/Residual PCR in moderate condition suffering from poor water quality and misuse	Accepted/Beneficial/Acceptable with mitigation measures/unacceptable Remarks: No direct impact. But need for repairs, conservation and maintenance required.
13.	Ganga Ji Mandir	Direct/**Indirect**/ Cumulative/Residual No direct impact by current infrastructure scheme but PCR in condition incompatible regular use	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: No direct impact. But need for repairs, conservation and maintenance required.
14.	Raghunath Gowshala	Direct/ **Indirect**/ Cumulative/ Residual	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable
15.	Mandir Shri Gopal ji	Direct/ **Indirect**/ Cumulative/ Residual	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: No direct impact. But need for repairs, conservation and

			maintenance required.
16.	Bhatiayani Mandir or Saraswati School	Direct/ **Indirect**/ Cumulative/ Residual PCR in condition of dilapidation suffering from neglect though in continued use as a school	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: No direct impact. But need for repairs, conservation and maintenance required.
17.	Radha Krishan Temple	Direct/ **Indirect**/ Cumulative/ Residual No direct impact by current infrastructure scheme but PCR in condition incompatible regular use	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: No direct impact. But need for repairs, conservation and maintenance required.
18.	Ambe market Shree Varahi Devi Temple	Direct/ **Indirect**/ Cumulative/ Residual	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable
19.	Ganpath Ram ki Haveli	Direct/ **Indirect**/ Cumulative/ Residual **No direct impact by current infrastructure scheme** but PCR in condition of extreme dilapidation suffering from neglect	Accepted/Beneficial/**Acceptable with mitigation measures**/unacceptable Remarks: No direct impact. But need for urgent repairs, conservation and maintenance required in the absence of which the PCR will be irreversibly damaged/lost.

9.6. Mitigation Measures Proposed

These guidelines will help in the layout of sustainable water supply and drainage systems that are in keeping with the heritage character of the town. The aim is that during conception, design and execution of the projects, the Physical Cultural Resources are protected for their socio cultural significance. Therefore, any new development in a historic context needs to be carefully evaluated for potential adverse effects. The Central and State government legislation guides the kind of work that can or cannot be undertaken in the vicinity of PCRs. However, this

document attempts to address specifically the impact of infrastructure work related to water supply and sewerage networks and the measures to minimize and mitigate this impact.

9.6.1. Natural heritage: land, water and vegetation

The development being undertaken should ensure that there is

1. No disruption to traditional water harvesting systems and natural drainage systems of the town and its natural context
2. Alignment of modern drainage systems with the natural gradient and existing water systems on site
3. No negative impact on rock formations, vegetation patterns in the regional context.

9.6.2. Cultural heritage: Archaeological Sites and intangible heritage

1. The water supply and sanitation pipelines have the possibility to impact archaeological sites, burial grounds in and around town. The chance finds protocol is therefore attached if required. The ideal mitigation for all archaeological sites is preservation in situ. This is not always a practical solution when they are not exposed and a new project has to be carried out. Therefore, a series of recommendations are suggested. [65]

1. Avoidance – The first step is to mark the area which is suspected to have archaeological remains and avoid any kind of construction in that area.

2. Archaeological Test trenching – This would determine the presence or absence of archaeological features, structures, deposits, artefacts within the specified area defined under the project. The trenching is performed as per international standards. In the event of the presence of any indicator, the following actions should be taken immediately:

[65] Lee, D. S. (12-13 December 2013). *Eco-Efficient Water Infrastructure: towards Sustianble Urban Development in Asia and the Pacific.* Bangkok.

- All construction within a radius of at least 20 m should cease. This distance should be increased at the discretion of supervisory staff if heavy machinery could cause further disturbance to the suspected physical heritage resource.
- This area must be marked using visible means, such as barrier tape, and all personnel should be informed that it is a no-go area.
- A guard should be appointed to enforce this no-go area. The access should be negotiated in the immediate area.
- All concerned stakeholders should respect the potentially sensitive and confidential nature of the heritage resources, particularly human remains.

Note: Please refer to Chance find protocol (attached) for further details on handling sensitive cultural sites.

3. Scientific Excavations – This would determine the entire extent and significance of the remains, features, structures, deposits, artefacts to avoid any impact on the resources.

4. Re-routing – To avoid damage to places of cultural or archaeological importance, or particular structures, the route of the pipeline has to be designed sensitively to avoid any damage.

5. Temporary relocation – Traditional places such as mela grounds etc. may need to be temporarily relocated as needed with the permission of the concerned authority.

9.6.3. Buildings and Cultural landscape (which include Havelis, Forts, Religious Sites, Commemorative structures, markets and streets)

During the work, heritage conservation/management experts should form part of the PMU Project Management and capacity building consultants. These heritage specialists must ensure that all Physical Cultural Resources are:

1. Identified and demarcated adequately before commencement of construction activities.

2. An inventory of the PCRs to be affected by the route which should include information about each feature including:
    - Distance from the pipeline
    - Nature of predicted impact
    - Predicted impact before mitigation
    - Mitigation measures
    - Extent of impact
3. The PCRs and their importance are brought to the attention of relevant project staff, including construction workers through on-site training workshops.
4. The inspection should be continued monthly even during the process of construction to avoid/minimise any residual effect.
5. Design permanent and temporary works to avoid or minimise impacts on PCRs. The detailed design of these should be discussed and approved before the execution of the project.
6. A vibration and noise impact assessment is essential to understand the impact of heavy machinery and digging of pipelines. It gives a clear understanding of the initial and residual risk. The purpose is to design in a manner that the impact is minimal and risks do not significantly alter the character of the PCRs.
7. The measures devised have to ensure that the impact due to construction and operation works can be managed and mitigated. For operational noise, vibration control systems have to be adopted to control vibration and ground-borne noise emissions from construction work. E.g. Demolition of the old office complex in the vicinity of the Khetri trust-building and Amar Vilas needs to be undertaken with utmost care to ensure minimum impact to the foundation and super structure of historic buildings due to noise

and vibrations. It is important to ensure listing out appropriate tools and methodologies for this purpose in the construction specifications.

8. The key issues identified with a water supply and sewerage network have to be addressed during the operational phase as this may result in moisture related damage to the PCRs which may be of various degrees. This is the most commonly occurring damage in historic structures.

9. The construction of the water storage facility and new office block needs to minimize any negative impact on the nearby PCRs from the visual perspective as well.

10. The conservation and heritage management plan should incorporate a section on the repair and corrective action to the resources that have been impacted due to moisture. Some of the key recommendations are as follows:

    - Urgent repair of water supply and drainage pipelines and faucets that have been leaking or damaged.
    - Control excessive ground moisture with the use of damp proof treatments.
    - It is critical to monitor areas vulnerable to moisture damage.
    - Moisture management built into a O&M schedule
    - Training local community members to identify and take immediate steps to minimise leakage as soon as it becomes evident

11. Mapping of festival routes and rituals - Construction activity must not create conflict or onsite disturbance during the festival calendars. Each temple, within each ward, will have its *prabandhak* committee and festival calendar and dates. The construction team needs to have a stakeholder meeting with the committee when its construction planning and management plan is being prepared. Construction activity should be cognizant of the traditional as well as tourism calendar to minimize disruption of local life and livelihood.

12. To ensure that areas like the Ajit-Vivek museum with tourist populations have a short construction span to minimize disruption from parking and drop off to the museum.

Specific Recommendations

New developments in historic towns have a direct impact on the visual and physical integrity in the immediate as well as a broader setting. It is important that new development harmoniously integrates with the existing Physical Cultural Resources that include the cultural and natural habitat. Methods and tools should be designed to ensure new development should respect and is sympathetic to the local character or appearance of the existing historic landscape. PMU's Project Management and Capacity Building consultants must comprise of a Heritage Expert with the following suggested (not exhaustive) key responsibilities:

(i) Facilitate detailing out and finalization of the Heritage Impact Assessment

(ii) Coordinate between PMU and implementing agencies for implementation of the project

(iii) Facilitate coordination for smooth implementation of project among all stakeholders and executing agencies

(iv) Ensure implementation of different components and Quality assurance and checking and making sure that the work on-site follows drawings and design layouts provided as a part of the Detailed Project Report with regards to protection of PCRs

(v) Coordination with local committees and communities as well as take advice and suggestions

(vi) Ensure timely implementation and review of the progress of projects

During Planning and Designing

The planning should include research which targets the complex layering of the settlement, to identify values, understand their meaning for the communities. Other academic and research centres should be involved in the process. It is essential to communicate and share the proposal for new development with local stakeholders to get their opinions and incorporate changes if

required. The design of any new construction should be such that respects important views as well as the scale of the neighbouring buildings/streetscape.[66]

The PMU should refer to existing acts, policies and rules before undertaking design in a historic environment. Local communities have to be consulted to understand the usage of space, streets where the new construction is proposed. It will help PMU understand and plan the span of construction as well as ensure least delays during construction. Alternate routes have to be designed and approved before the construction phase with local administration in case of conflicts.

The excavations and vibrations due to laying of pipes should not impact the historic landscape, strcutures and archaeological remains in the area but as it is not always possible to avoid/anticipate, therefore, chance finds protocols are to be designed and adopted prior to the construction phase.

Chance finds protocols process: Planning

The objective of the Chance finds Protocol is to:

(i) Define the processes which must be followed to ensure the management of Physical Cultural Resources and preservation and appropriate treatment of chance finds while also minimizing disruption to the construction schedule.

(ii) Enable compliance with all relevant national laws and regulations and other requirements.

Project Management Unit shall consult all relevant parties including local stakeholders to agree to Chance Finds Protocol. The arrangements have to be made for a suitable laboratory and other necessary facilities. PMU shall develop and issue to Contractor a PCR Training and Awareness manual. The PCR Training and Awareness manual will include basic training in the identification of archaeological materials relevant to the area, including

[66] Yan, F. G. (2018). Historic Urban Landscape in Beijing The Gulou Project and Its Contested Memories. In M. S. Christina Maags, *Chinese Heritage in the Making* (pp. 93-117). Amsterdam University Press.

human skeletal remains. Contractor shall deliver the Cultural Heritage Training and Awareness manual to all relevant Contractor personnel before they commence work.

During Construction

The construction of infrastructure and facilities have the potential of disturbing or altering the known and unknown, recorded or unrecorded Physical Cultural Resources. It is recommended that before any intervention the existing conditions in the area should be thoroughly documented with the support of the residents of the town.

Chance finds protocols process: Implementation and Management

The contractor shall monitor ground disturbance works using trained personnel. In case of an event where a site of potentially high significance is discovered, immediately stop works within an approximate distance of five metres of the site and contractor shall demarcate and secure the area. The evaluation will be carried out by trained archaeologists. The management options are listed below:

(i) **Avoidance** - This option minimises the impact to the site through partial or complete project redesign or relocation. This is the preferred option from a physical cultural resource management perspective.

(ii) **Salvage Excavation** - This data recovery option is site destructive and can delay construction. If required, salvage excavation shall be conducted following national and international standards.

(iii) **In-situ Management** - This option includes the application of site protection measures, such as fencing or barricades, or capping the site area with fill. Appropriate protection measures will be identified and agreed between Contractor, Heritage Management Consultant and PMU.

(iv) **Surface Collection** - If a site is assessed as having limited salvage excavation potential but contains significant surface archaeological items, those surface finds may be individually mapped and collected by the team of Cultural Heritage experts.

Chance Finds Report Form[67]

Chance Finds Report Form		
Initial Detail		
Location of Find:	Date of Find:	The person who identified find:
Description of Initial Find:		
Was work stopped near the find?		☐ Yes ☐ No
Was an archaeologist contacted?		☐ Yes ☐ No
Archaeological Detail:		
Date of inspection:		Reporting Archaeologist:
GPS coordinates:		Photo Record: ☐ Yes ☐ No
Description of Find (fill in applicable information) (use additional pages if required):		
Artefact type:		
Max artefact length (in mm):	Max artefact width (in mm):	
Max artefact thickness (in mm):	Max artefact platform width (in mm):	
Approximate number of artefacts at site: ☐ 1 ☐ 2 to 10 ☐ > 10 ☐ >50 Other:		Approximate size of site: Site area: _____ m2 Site length: _____ m Site height (max) (for rock shelters/caves): _____ m

[67] PAPUA NEW GUINEA Cultural Heritage Chance Finds Protocol LNG Project

Brief description of site and vegetation (e.g., surface sediment type, ground surface visibility, distance to nearest freshwater source, attach site sketch if necessary):
Statement of Significance (scientific, spiritual, historic, aesthetic and emotive and any evidence of stratification):

The new design and infrastructure should be compatible with the character of the historic town and the unique identity of the town should not get compromised. Each festival route has to be considered so that the construction activity doesn't impact the cultural routes. When it is necessary to build new structures, the existing spatial layout should be respected, especially in terms of scale, size and integrity. Traffic should also be controlled and planned for new infrastructure work.

The natural drainage and traditional water management systems must not be disrupted at any means and the landscape should be protected against disasters and nuisances such as pollution and vibration to safeguard the heritage and for the security and well-being of the residents.

Mitigation Strategy

Providing a water supply system should reduce the bore well dependency and allow the groundwater recharge and aid long term aquifer conservation. While the benefits of provision of a sewage system for a town is understood to have long term direct benefits to the people, we also need to highlight the benefits of this to rejuvenating the local water harvesting systems.

Therefore, the priority should be given to laying out the sewage system for areas that are responsible for polluting the surface water and groundwater resources.

The purpose is also to protect Physical Cultural Resources and develop mitigation and management measures. Any construction or development should include these measures and tactical routing to avoid adverse impact on the resources. Infrastructure development in a historic landscape should not conflict with Physical Cultural Resources rather be

complementary and be designed in a manner that their long term success is dependent on being linked with each other.

The **Historic Urban Landscape**[68] approach sees and interprets the historic town as a continuum in time and space. There is a need for balance between preservation and protection of urban heritage, economic development, functionality and livability of a city. Development in a historic town may demand prudence. A **flexible approach**[69] should be built in since individual cases may present specific problems. The infrastructure plan must address all relevant factors including archaeology, history, architecture, techniques, sociology and economics. Mitigation measures are listed as follows:

The mitigation measures are discussed as follow:

7.1. Site Recording and Mapping - Systematic documentation and mapping of Physical Cultural Resources within the area of laying out the infrastructural works as part of preconstruction surveys. It involves collecting and collating data required for a comprehensive understanding of the current or baseline situation; the typology, number and distribution of Physical Cultural Resources. The list mentioned in the earlier sections is only an indicative legend. During surveys and stakeholder meetings many more structures and intangible systems may become evident. A clear understanding of terrain and PCR should be built into the work schedule to prevent delays when the actual work is undertaken. For this, a Heritage Impact Assessment advisor is to be engaged before the commencement of infrastructure design works[70]. The mapping should include information in this particular form.

(i) HEADING - This section is very important; it contains the all-important ID number and the name of the field worker who collected the data

(ii) LOCATION - Critical data goes here concerning the exact and relative location of the resource

(iii) SITE DESCRIPTION - This provides general information about the type of resource

(iv) LANDSCAPE - General data concerning the setting of the resource

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[68] Sonkoly, G. (n.d.). The significance of Historic Urban Landscape in the protection of World Heritage Sites. The 1st Heritage Forum of Central Europe.

[69] UNESCO. (2011, November 10). Recommendation on the Historic Urban Landscape. Paris.

[70] ICOMOS. (2011, January). Guidance on Heritage Impact Assessments for Cultural World Heritage Properties.

(v) PCR – description on the features
(vi) LOCALHAZARD - This section highlights any major risks facing the cultural resource
(vii) LANGUAGE / ETHNICITY The language(s) spoken and ethnic groups of the community are recorded here, if applicable
(viii) CUSTOMS AND TRADITIONS associated
(ix) NOTE This final section of the form can be used to record additional documentation of the resource and/or other points the field recorder would like to note.

7.2. Additional data acquisition – This stage is one step further to documentation. It requires archaeological investigations, built heritage surveys (other than PCRs), oral histories of each typology, cultural mapping of skills and intangible assets. Areas where natural water bodies and drains are being used for dumping sewage need to be addressed first. Therefore, an assessment needs to be carried out to see which wards are negatively impacting the natural water systems.

7.3. Stakeholder Consultation – The consultation will involve local communities regarding the protection of Physical Cultural Resources. The process will consider the opinions and recommendations to involve communities in cultural awareness activities. It is important to reach on consensus on what values to protect for transmission to future generations. *Therefore, a series of stakeholder workshops are advised to be undertaken* both at the city level and also at the neighbourhood levels. The consultant should engage with relevant academicians, experts and practitioners.[71]

Interviewing well and structured meaningful discussions is not always as easy as it seems. The expert must consider issues like gender and other in built societal biases. Many people, especially elders, may have a wealth of historic facts and traditional knowledge that is yet unrecorded. Oral history is recording and sharing interviews with

[71] ICOMOS. (1987, October). Charter for the Conservation of Historic Towns and Urban Areas. *Adopted by ICOMOS General Assembly*. Washington DC, USA: ICOMOS.

such people about their past memories. It allows people who cannot write to become a part of history.

7.4. Protecting the integrity and attributes of Physical Cultural Resources by removing and locating the toilet blocks from historic precincts. Limiting the height of new construction to avoid visual impact. Allowing only compatible additions to Physical Cultural Resources. Integrating and harmonizing mass, setback, setting and materials.

7.5. Rerouting and access plan – It focuses on managing the potential impact of new development on existing routes such as festival routes and installation of operational controls. This would include limiting the period of construction in the festival period.

7.6. Guidelines for PCRs –

(i) Historic facades of listed buildings should be retained as far as possible

(ii) Where damage is due to human intervention and weathering has occurred, restoration work should be undertaken to return the façade to its original condition

(iii) Colours, materials and textures should be compatible with original. Where evidence is available, the façade should be returned to its original condition. Where evidence is not available, the Palette should be used to guide the façade upgradation

(iv) Structural changes that are irreversible may be retained, though no further changes to historic structure are permissible

(v) Rooftop material such as water tanks on top of PCRs should be appropriately located to avoid any visual access from the street or public views. If visible, they need to be appropriately camouflaged with a designed wall/ *jaali* etc. that blends in colour and patterns with the existing structure.

(vi) Khetri falls in a unique climatic zone with primarily 4 types of landform: Hilly upland, midland on foothills, undulating long continuous slope and low flood plains. A reference list has to be developed for use of local trees and shrubs that should be retained in this region to ensure ecological balance in its biodiversity.

a. Summary and Conclusion

For undertaking this study and conducting the Heritage Impact Assessment involved site visits to understand PCRs to identify the surveys and documentation that need to be conducted before commencement of such projects. This also includes an in-depth community consultation to evaluate and prepare the value assessment and impact assessment as per international standards for the proposed infrastructure project. This should address all sub-projects as well. A template can be developed to monitor the overlap of schedule of work that is being executed on the ground.

The main objective is to develop mitigation measures for sustainable management of Physical Cultural Resources to avoid/mitigate any direct or indirect impact on these due to the infrastructure scheme. As part of the process it is aimed that in the long term these studies and on-site measures will include efforts for heritage assessment, management and conservation of the heritage towns of Rajasthan.

b. Acknowledgements

This Report was made possible thanks to the support and advice of many individuals and organizations. The team would like to thank everyone who contributed to this endeavor.

The ADB team played a key role in providing guidance and support at all stages of the Report's cycle. We would like to thank each of its members for their time, energy and enthusiasm. Particular thanks go to the Ms. Vivian Castro -Wooldridge, Ms. Ninette R. Pajarillaga, Richard C. De Guzman and Govind Rathore for their guidance and assistance through these six weeks.

Sincere gratitude goes to Ms. Richa Pandey Dwivedii and Mr.Bakshishraj Singh for their hard work and assistance in meeting tight deadlines.

We are also grateful to the team at Beyond Built Private Limited for their help with logistics and for their support in the smooth running of the project.

Special thanks to the local people of Khetri especially Shri Umrao ji Tomar, Chairman Nagar Palika and Mr. Khan for sharing their in-depth knowledge and passion for their town to ensure that the town receives the much needed water supply and sewerage while understanding the need for their heritage and culture to be protected.

10.Appendix 2: Images of PCRs



Source 1 Author
Figure 23 showing Paana Sagar Talab



Source 2 Author
Figure 24 showing panoramic view of Panna Sagar Talab



Source 3 Author

Figure 25 showing Reservoir at Paana Sagar Talab



Source 4 Author

Figure 26 showing entrance to Mandir Shree Ramchandra ji Chudawat ji

hhh



Source 5 Author

Figure 27 showing internal view of Mandir Shree Ramchandra ji Chudawat ji



Source 6 Author

Figure 28 showing Khetri Bus Stand



Source 7 Author
Figure 29 showing Ajit-Vivek Museum



Source 8 Author
Figure 30 showing a side view to Ajit Vivek Museum

hhh



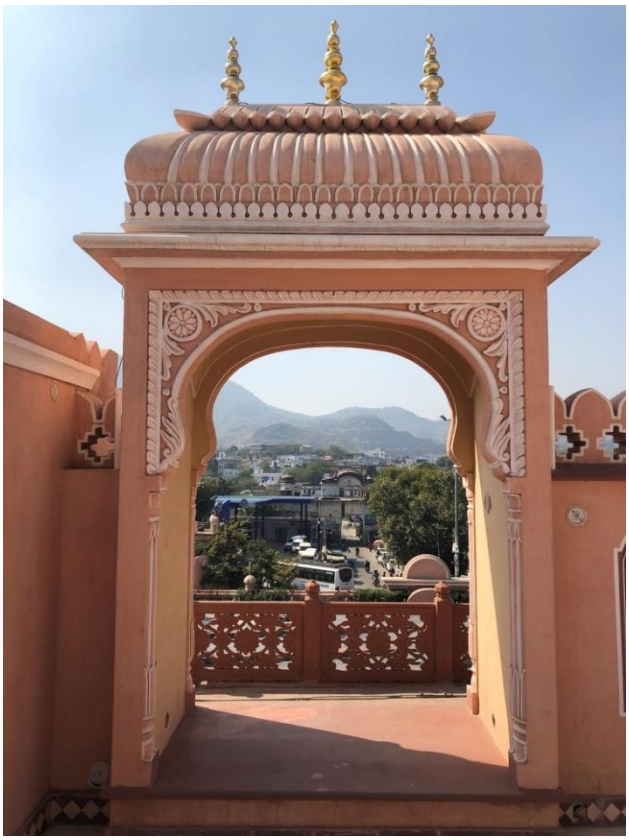
Source 9 Author

Figure 31 showing Ajit Vivek Museum



Source 10 Author

Figure 32 showing interior of Ajit Vivek museum



Source 11 Author
Figure 33 showing view of town from Ajit Vivek Museum



Source 12 Author
Figure 34 showing Jai Niwas

hhh



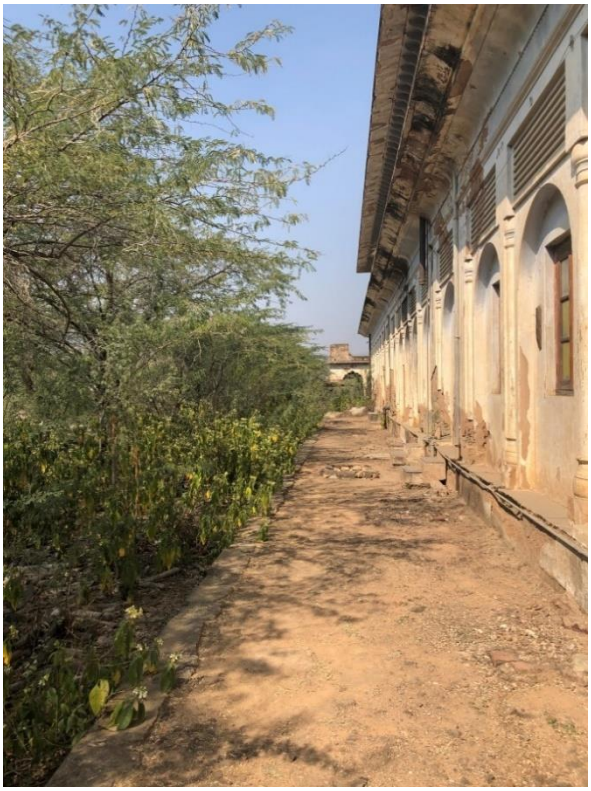
Source 13 Author

Figure 35 showing moisture damage at Jai Niwas



Source 14 Author

Figure 36 showing deteriorating condition of Jai Niwas



Source 15 Author
Figure 37 showing vegetation growth at Jai Niwas



Source 16 Author
Figure 38 View of Sukh Mahal from Jai Niwas

hhh



Source 17 Author

Figure 39 showing Sanskrit Vidhyalaya



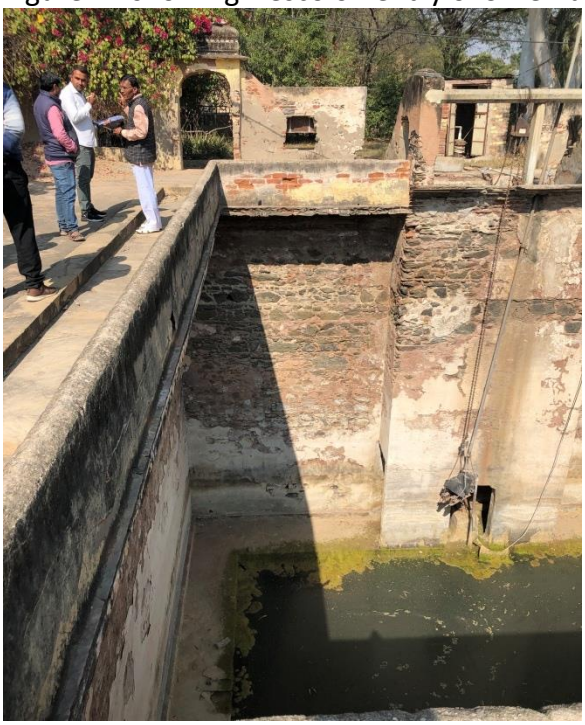
Source 18 Author

Figure 40 showing Mandir inside Sanskrit Vidhyalaya



Source 19 Author

Figure 41 showing fresco on entry of Shremati Laxmi Shah Hospital



Source 20 Author

Figure 42 showing Dewan Brij Lal Singh Ji Shah ka Kund

hhh



Source 21 Author

Figure 43 showing Dewan Brij Lal Singh Ji Shah ka Kund



Source 22 Author

Figure 44 showing panorama of Jai Singh High School



Source 23 Author
Figure 45 showing Jai Singh High School



Source 24 Author
Figure 46 showing Jai Singh High School complex

hhh



Source 25 Author
Figure 47 showing Bawri beside open sewer



Source 26 Author
Figure 48 showing existing overhead tank

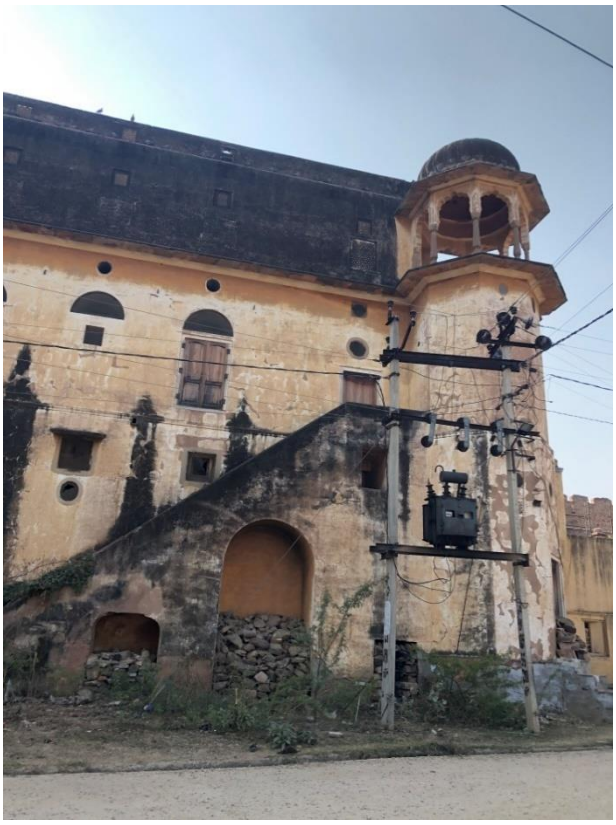


Source 27 Author
Figure 49 showing rear elevation of building (Amar Mahal) adjacent to Khetri Trust



Source 28 Author
Figure 50 showing rear elevation of building (Amar Mahal) adjacent to Khetri Trust

hhh



Source 29 Author

Figure 51 showing rear elevation of building (Amar Mahal) adjacent to Khetri Trust



Source 30 Author

Figure 52 showing entry gate of Sukh Mahal



Source 31 Author
Figure 53 showing entry to Bhopalgarh Fort



Source 32 Author
Figure 54 showing Entry Gate at Bhopalgarh Fort

hhh



Source 33 Author
Figure 55 showing ruins of Bhopalgarh Fort



Source 34 Author
Figure 56 showing ruins at Bhopalgarh Fort



Source 35 Author

Figure 57 showing boundary wall at Bhopalgarh Fort



Source 36 Author

Figure 58 showing view of Khetri Town from Bhopalgarh Fort wall

hhh



Source 37 Author

Figure 59 showing condition of the Darbar Hall in Bhopalgarh Fort



Source 38 Author

Figure 60 showing internal courtyard At Bhopalgarh Fort



Source 39 Author

Figure 61 showing a view of the Darbar Hall at Bhopalgarh Fort



Source 40 Author

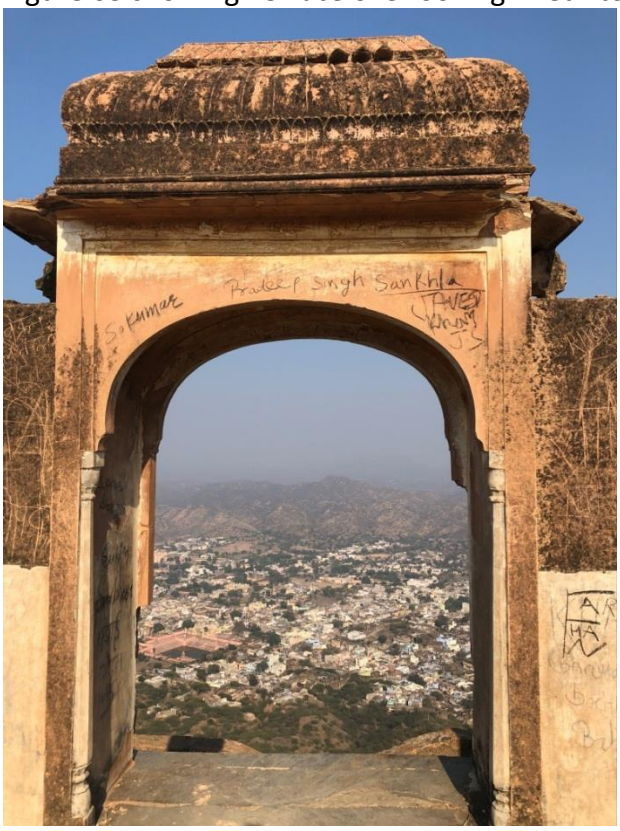
Figure 62 showing fresco on walls inside Bhopalgarh Fort

hhh



Source 41 Author

Figure 63 showing Terrace overlooking Khetri town at Bhopalgarh Fort



Source 42 Author

Figure 64 showing view of Khetri Town from the top of Bhopalgarh Fort



Source 43 Author
Figure 65 showing inside of a Temple at Bhopalgarh Fort



Source 44 Author
Figure 66 showing Bawri at Bhoalgarh Fort

hhh



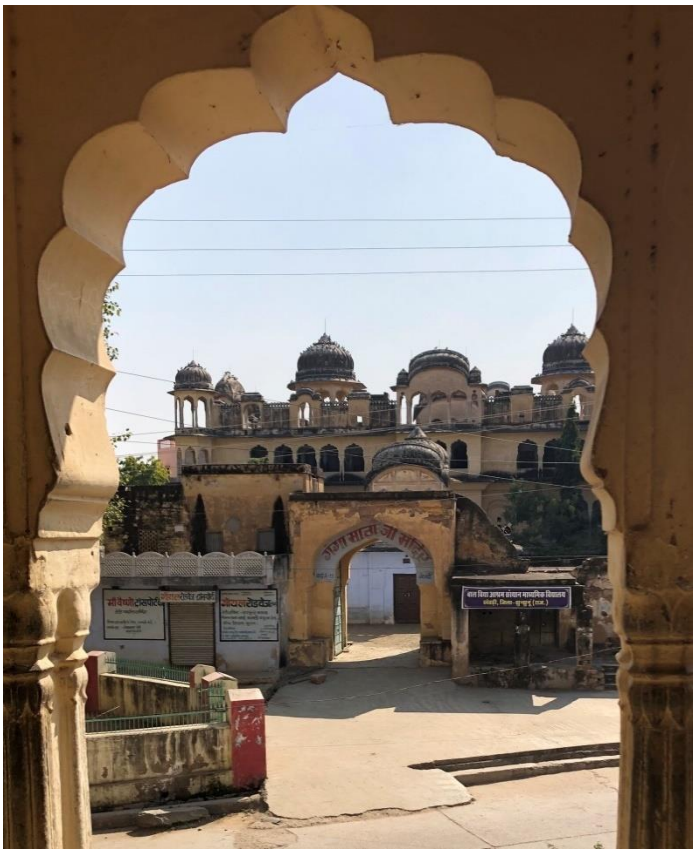
Source 45 Author

Figure 67 showing Raghunath Gaushala

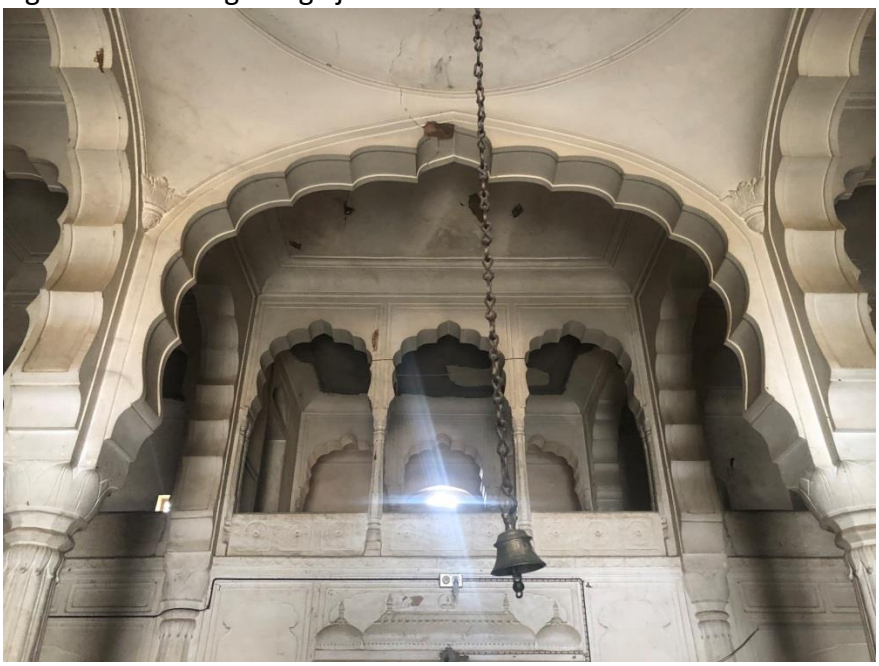


Source 46 Author

Figure 68 showing Gopal Ji Mandir



Source 47 Author
Figure 69 showing Ganga ji Mandir



Source 48 Author
Figure 70 showing interior of Ganga ji Mandir

hhh



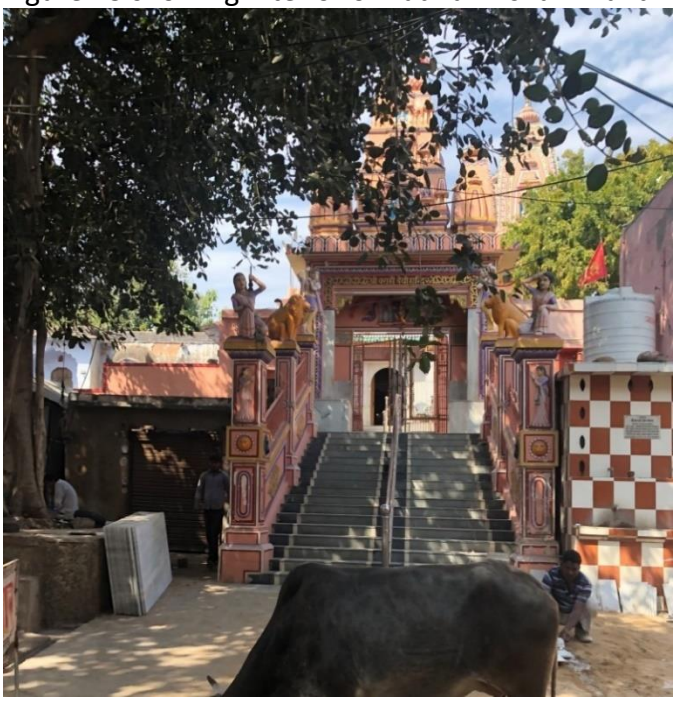
Source 49 Author
Figure 71 showing Saraswati School



Source 50 Author
Figure 72 showing Radha Krishan Mandir



Source 51 Author
Figure 73 showing interior of Radha Krishan Mandir



Source 52 Author
Figure 74 showing Varahi Devi Temple

hhh



Source 53 Author

Figure 75 showing Ganpat Ram ki Haveli



Source 54 Author

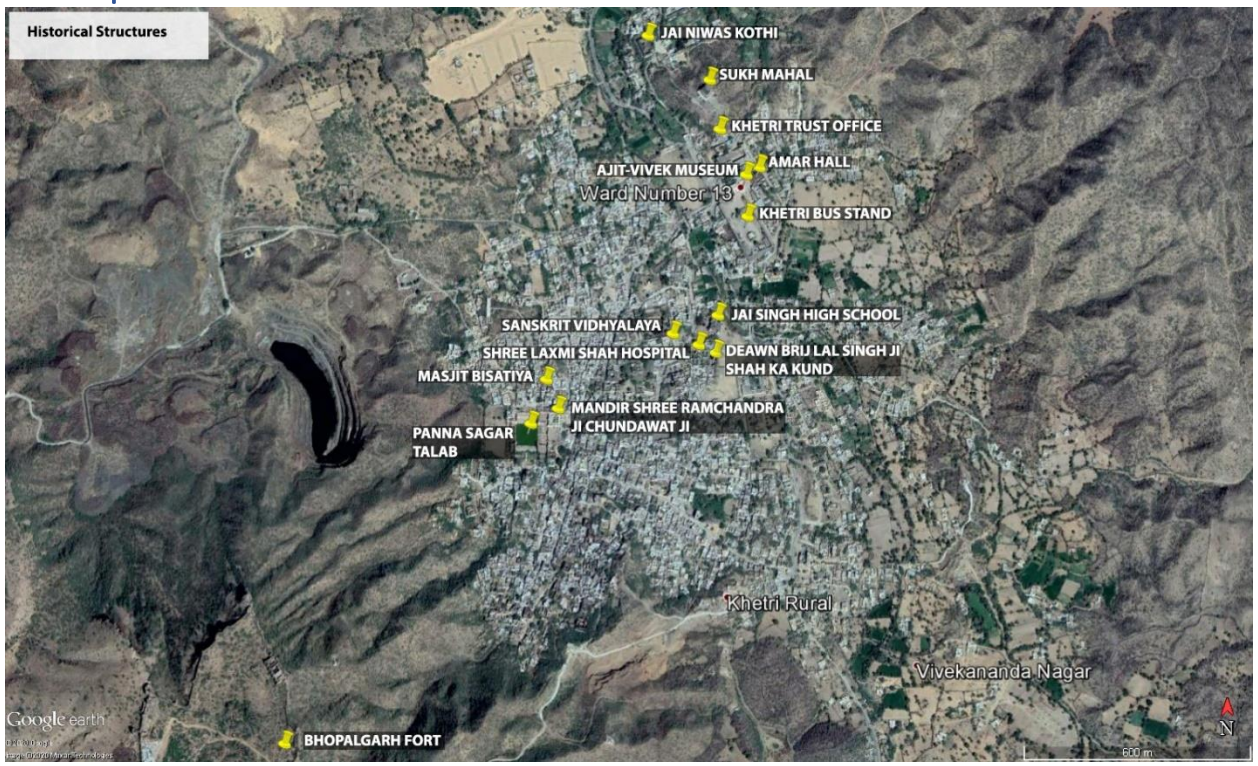
Figure 76 showing Ganpath Ram ki Haveli



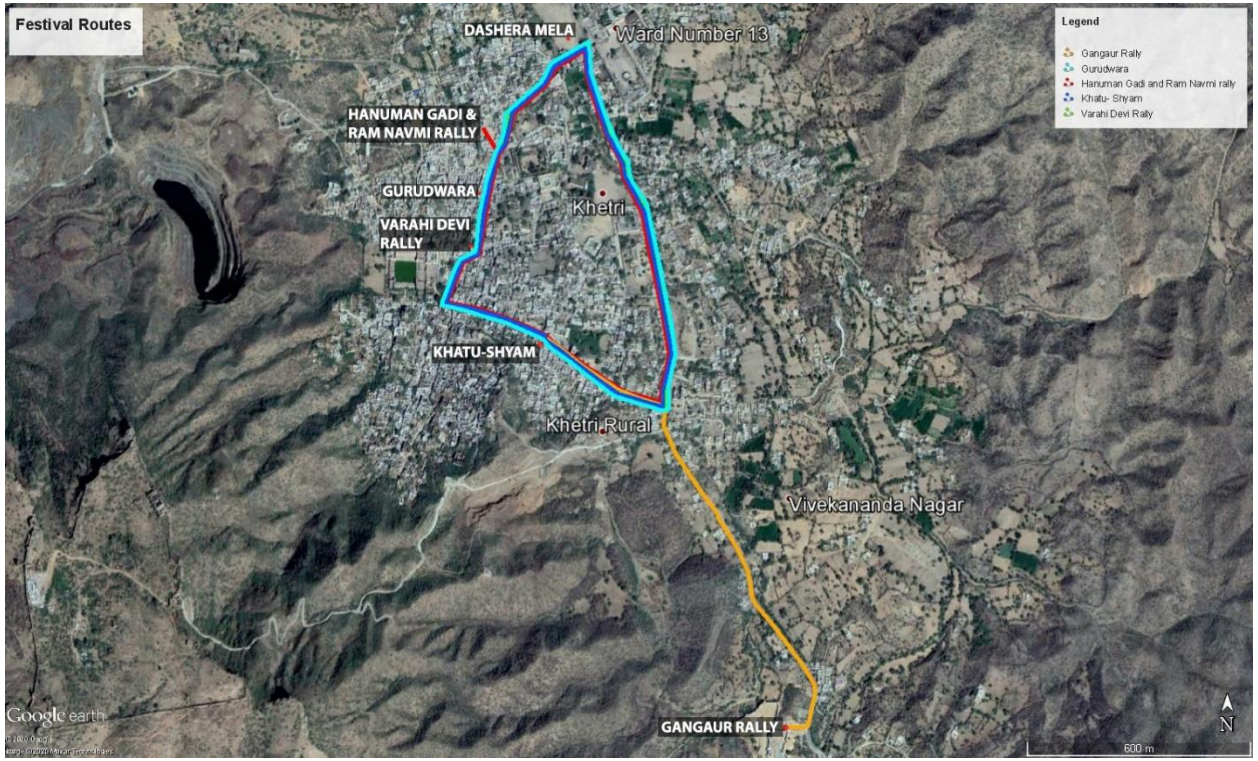
Source 55 Author
Figure 77 showing Amar Mahal

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Maps of Khetri



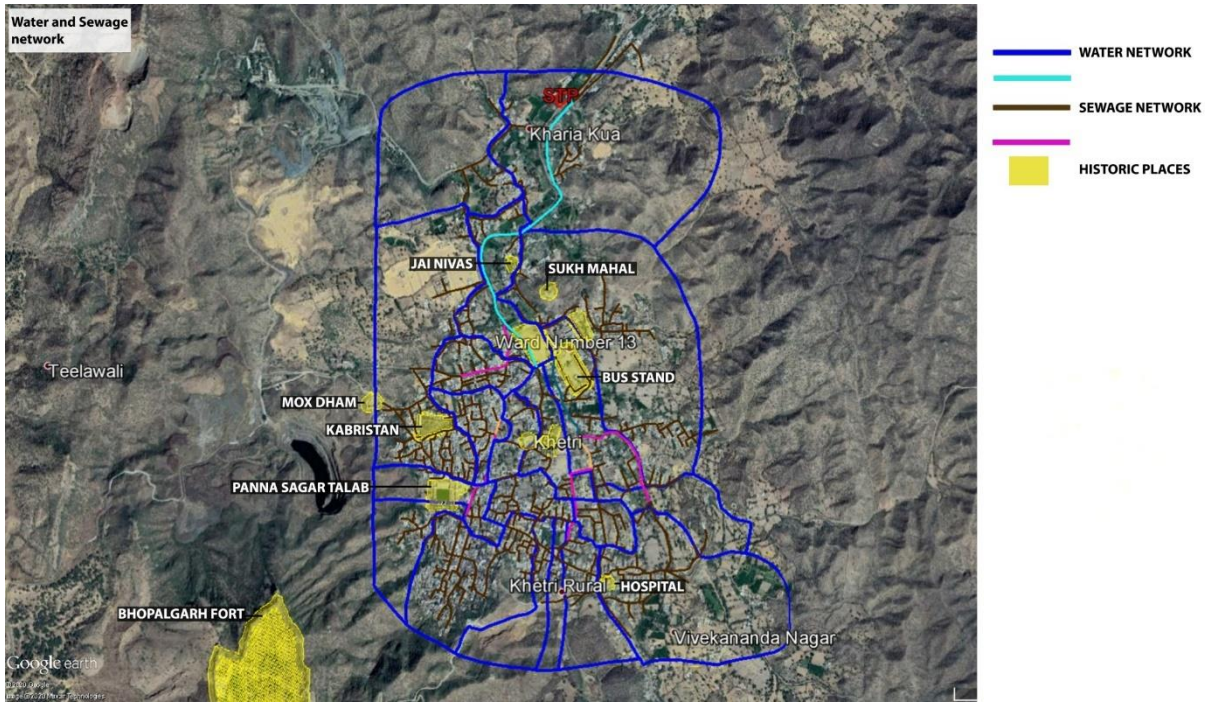
Source 56 Google Earth
Map 8 showing historical buildings in Khetri



Source 57 Google Earth

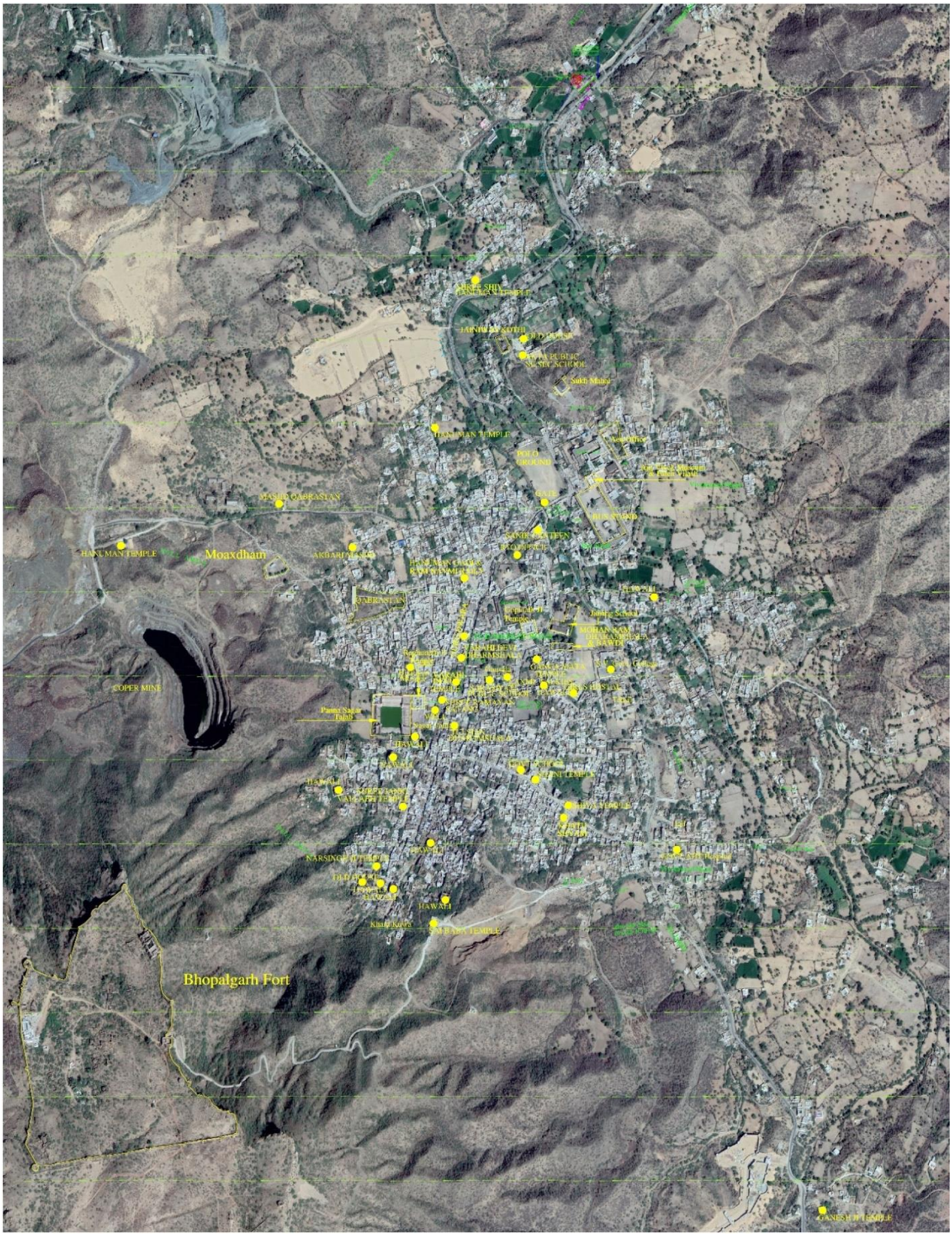
Map 9 showing Festival Routes in Khetri

hhh



Source 58 Google Earth

Map 10 showing Proposed Water and Sewage network



Source 59 Creative Technocrate Services Pvt. Ltd.
Map 11 showing updated survey map of Khetri

Appendix 3: Integrated Biodiversity Assessment Tool - Khetri

Integrated Biodiversity Assessment Tool

WORLD BANK GROUP BIODIVERSITY RISK SCREEN

Article I. Reportgeneratedon10/02/2020byNinettePajarillagaunderthelicensenumber954-6717held by ADB.www.ibat-alliance.org

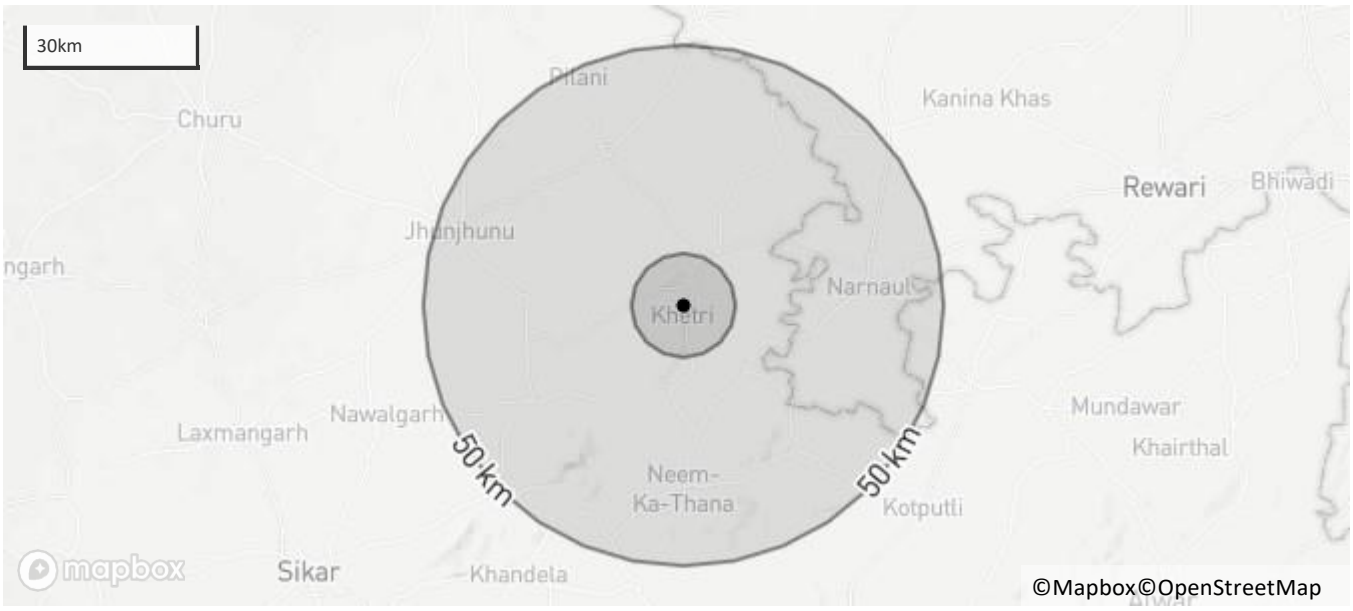
Project Name: IND RSTDSP - Khetri STP

Country: India

Location: [28, 75.8]

Article II. Overlaps with:

Protected Areas	0
Key Biodiversity Areas	0
IUCN Red List	14
Critical Habitat	Unclassified



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)

Article III. About this report

IBATprovidesinitialscreeningforcriticalhabitatvalues.PerformanceStandard6(PS6)definesthesevaluesforcritical habitat(PS6:para.16)andlegallyprotectedandinternationallyrecognizedareas(PS6:para.20).PS6 willbetriggered whenIFCclientactivitiesarelocatedinmodifiedhabitatscontaining“significantbiodiversityvalue,”naturalhabitats, criticalhabitats,legallyprotectedareas,orareasthatareinternationallyrecognizedforbiodiversity.ReferencestoPS6 andGuidanceNote6(GN6)areprovidedtoguidefurtherassessmentanddetaileddefinitionswherenecessary.Please seehttps://www.ifc.org/ps6forfulldetailsonPS6andGN6.

Thereportscreensforknownriskswithinastandard50kmbufferofthecoordinatesusedforanalysis.Thisbufferisnot intendedtoindicatetheareaofimpact.Thereportcanbeusedto:

- Scoperiskstoincludewithinanassessmentofrisksandimpacts
- Identifygapswithinanexistingassessmentofrisksandimpacts
- Prioritizebetweensitesinaportfolioforfurtherassessmentofrisksandimpacts
- Inform apreliminarydeterminationofcriticalhabitat
- Assess the need for engaging a biodiversity specialist
- Identify additional conservation experts or organizations to inform further assessment or planning

WARNING:IBATaimstoprovidethemostup-to-dateandaccurateinformationavailableatthetimeofanalysis.Thereis howeverapossibilityofincomplete,incorrectorout-of-dateinformation.Allfindingsinthisreportmustbesupportedby furtherdesktopreview,consultationwithexpertsand/oron-the-groundfieldassessmentasdescribedinPS6andGN6. PleaseconsultIBATforanyadditionaldisclaimersorrecommendationsapplicabletotheinformationusedtogenerate thisreport.

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ceofthePublisher,TheWorldBank,1818HStreetN.W.,Washington,D.C.20433;Email:pubrights@worldbank.org

Article V. Priority Species

Habitatofsignificantimportancetoprioryspecieswilltriggercriticalhabitatstatus(SeePS6:para16). IBATprovidesa preliminarylistofprioryspeciesthatcouldoccurwithinthe50kmbuffer.ThislistisdrawnfromtheIUCN RedListof ThreatenedSpecies(IUCNRL).Thislistshouldbeusedtoguideanyfurtherassessment,withtheaim ofconfirming knownor likely occurrence of these species within the project area. It is also possible that further assessment may confirm occurrence of additional priority species not listed here. It is strongly encouraged that any new species informationcollectedbytheprojectbesharedwithspeciesexpertsand/orIUCNwhereverpossiblein ordertoimprove IUCNdatasets.

Article VI. IUCN Red List of Threatened Species - CR & EN

Thefollowingspeciesarepotentiallyfoundwithin50kmoftheareaofi nterest. ForthefullIUCNRedListpleaserefertotheassociatedcsvintherepo rtfolder.

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

Sypheotides indicus	Lesser Florican	EN	AVES
Sterna acuticauda	Black-bellied Tern	EN	AVES
Haliaeetus leucoryphus	Pallas's Fish-eagle	EN	AVES
Neophron percnopterus	Egyptian Vulture	EN	AVES

Species name	Common name	IUCN Category	Group
Aquila nipalensis	Steppe Eagle	EN	AVES
Falco cherrug	Saker Falcon	EN	AVES
Leptoptilos dubius	Greater Adjutant	EN	AVES

Article VII. Restricted Range Species

There are no restricted range species to show for this report.

Article VIII. Biodiversity features which are likely to trigger Critical Habitat

Protected Areas

Thefollowingprotectedareasarefoundwithin10.0kmand50.0kmofthe areaofinterest.
Forfurtherdetailspleaserefertotheassociatedcsvfileinthereportfolder.

Area name	Distance	Recommendation

Article IX. Key Biodiversity Areas

Thefollowingkeybiodiversityareasarefoundwithin10.0kmand50.0kmofthearea ofinterest.
Forfurtherdetailspleaserefertotheassociatedcsvfileinthereportfolder.

Area name	Distance	Recommendation

Article X. Species with potential to occur

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
AVES	325	25	5	8	12	20	280	0
MAMMALIA	62	6	0	1	5	3	53	0
REPTILIA	11	1	0	0	1	0	9	1
ACTINOPTERYGII	34	1	0	0	1	2	30	1
MAGNOLIOPSIDA	38	1	0	0	1	0	36	1

LILIOPSIDA	50	1	0	0	1	0	47	2
AGARICOMYCETES	2	0	0	0	0	1	1	0

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
AMPHIBIA	10	0	0	0	0	0	10	0
INSECTA	37	0	0	0	0	0	36	1
GASTROPODA	20	0	0	0	0	0	20	0
POLYPODIOPSIDA	2	0	0	0	0	0	2	0
BIVALVIA	6	0	0	0	0	0	6	0
MALACOSTRACA	4	0	0	0	0	0	4	0
ARACHNIDA	1	0	0	0	0	0	1	0

Country-level summary

Coming soon

Article XI. Recommended Experts and Organizations

Forprojectslocatedincriticalhabitat,clientsmustensurethatexternalexpertswithregionalexpertiseareinvolvedin further assessment (GN6: GN22). Clients are encouraged to develop partnerships with recognized and credible conservationorganizationsand/oracademicinstitutes,especiallywithrespecttopotentialdevelopmentsinnaturalor critical habitat (GN6: GN23). Where critical habitats are triggered by priority species, species specialists must be involved.IBATprovidesdataoriginallycollectedbyalargenetworkofnationalpartners,whilespeciesinformationis sourcedviatheIUCNRedListandaffiliatedSpeciesSpecialistGroups.Theseexpertsandorganizationsarelisted below.Pleasenotethatthisisnotintendedasacomprehensivelistoforganizationsandexperts.Theseorganizations andexpertsareundernoobligationtosupportanyfurtherassessmentanddosoentirelyattheirdiscretionandunder theirterms.AnyviewsexpressedorrecommendationsmadebythesestakeholdersshouldnotbeattributedtotheIFC or IBAT for IFCpartners.

Article XII. Relevant national or regionalorganizations

IBAT integrates information developed by a global network of conservation agencies, organizations and experts. These efforts are coordinated by the IBAT Alliance (BirdLife International, Conservation International, IUCN and UNEP-WCMC) who compile and maintain this information as globally standardized databases. The local partners most relevant to the area of analysis are:

Wild Bird Society of Japan Address: Maruwa Building, 3-9-23 Nishi-Gotanda, Shinagawa-ku, Tokyo 141-0031, JapanWeb: http://www.wbsj.org/

BirdLifeAsiaRegionalOffice Address:354TanglinRoad,#01-16/17,TanglinInternationalCentre,Singapore247672 Email:singapore.office@birdlife.orgWeb:http://www.birdlife.org/asia

Article XIII. DirectoryforSpeciesSurvivalCommission(SSC)SpecialistGroupsandRedListAuthorities

URL:
http://www.iucn.org/about/work/programmes/species/who_we_are/ssc_specialist_groups_and_red_list_authorities_directory/

Integrated Biodiversity Assessment Tool

WORLD BANK GROUP BIODIVERSITY RISK SCREEN

Reportgeneratedon10/02/2020byNinettePajarillagaunderthelicensenumber954-6718held by ADB.www.ibat-alliance.org

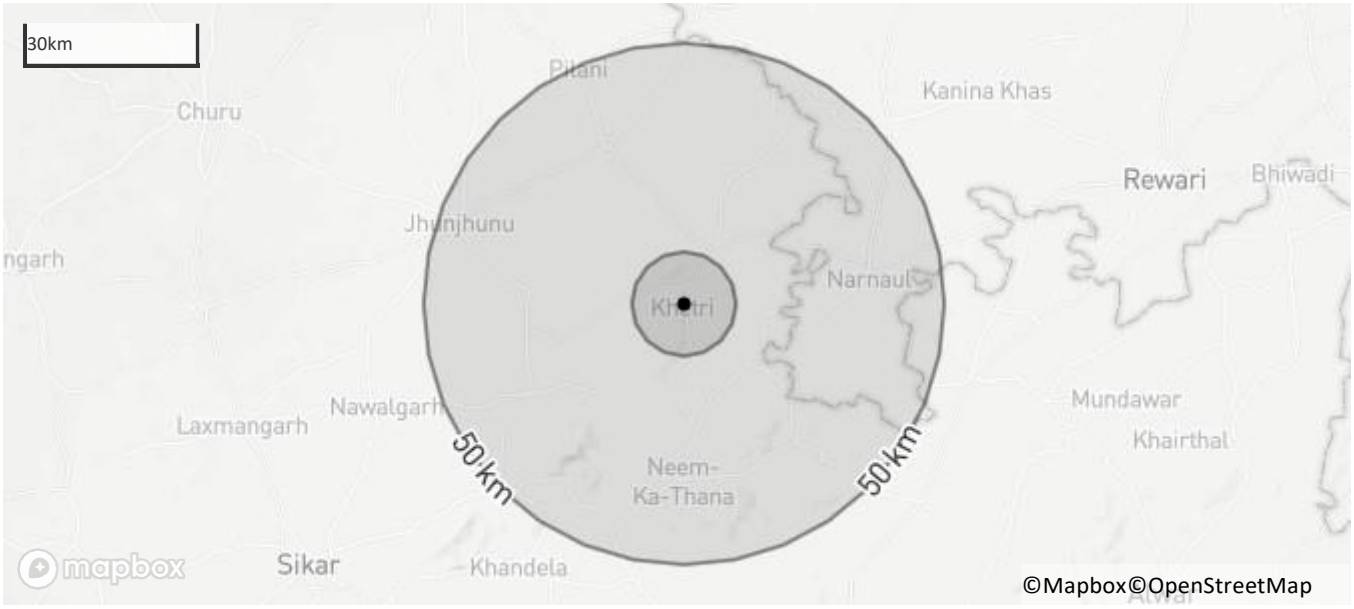
Project Name: IND RSTDSP = Khetri CW Pumphouse

Country: India

Location: [28, 75.8]

Overlaps with:

Protected Areas	0
Key Biodiversity Areas	0
IUCN Red List	14
Critical Habitat	Unclassified



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WORLD BANK GROUP

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About this report

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Thereportscreensforknownriskswithinastandard50kmbufferofthecoordinatesusedforanalysis.Thisbufferisnot intendedtoindicatetheareaofimpact.Thereportcanbeusedto:

- Scoperiskstoincludewithinanassessmentofrisksandimpacts
- Identifygapswithinanexistingassessmentofrisksandimpacts
- Prioritizebetweensitesinaportfolioforfurtherassessmentofrisksandimpacts Inform
- apreliminarydeterminationofcriticalhabitat
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Priority Species

Habitatofsignificantimportancetoprioryspecieswilltriggercriticalhabitatstatus(SeePS6:para16).IBATprovidesa preliminarylistofprioryspeciesthatcouldoccurwithinthe50kmbuffer.ThislistisdrawnfromtheIUCNRedListof ThreatenedSpecies(IUCNRL).Thislistshouldbeusedtoguideanyfurtherassessment,withtheaimofconfirming knownor likely occurrence of these species within the project area. It is also possible that further assessment may confirm occurrence of additional priority species not listed here. It is strongly encouraged that any new species informationcollectedbytheprojectbesharedwithspeciesexpertsand/orIUCNwhereverpossibleinordertoimprove IUCNdatasets.

IUCN Red List of Threatened Species - CR & EN

Thefollowingspeciesarepotentiallyfoundwithin50kmoftheareaofinterest.
ForthefullIUCNRedListpleaserefertotheassociatedcsvinthereportfolder.

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
Sypheotides indicus	Lesser Florican	EN	AVES
Sterna acuticauda	Black-bellied Tern	EN	AVES
Haliaeetus leucoryphus	Pallas's Fish-eagle	EN	AVES
Neophron percnopterus	Egyptian Vulture	EN	AVES

Species name	Common name	IUCN Category	Group
Aquila nipalensis	Steppe Eagle	EN	AVES
Falco cherrug	Saker Falcon	EN	AVES
Leptoptilos dubius	Greater Adjutant	EN	AVES

Restricted Range Species

There are no restricted range species to show for this report.

Biodiversity features which are likely to trigger Critical Habitat

Protected Areas

Thefollowingprotectedareasarefoundwithin10.0kmand50.0kmoftheareaofinterest.
Forfurtherdetailspleaserefertotheassociatedcsvfileinthereportfolder.

Area name	Distance	Recommendation

Key Biodiversity Areas

Thefollowingkeybiodiversityareasarefoundwithin10.0kmand50.0kmoftheareaofinterest.
Forfurtherdetailspleaserefertotheassociatedcsvfileinthereportfolder.

Area name	Distance	Recommendation

Species with potential to occur

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
AVES	325	25	5	8	12	20	280	0
MAMMALIA	62	6	0	1	5	3	53	0
REPTILIA	11	1	0	0	1	0	9	1
ACTINOPTERYGII	35	1	0	0	1	2	31	1
MAGNOLIOPSIDA	38	1	0	0	1	0	36	1
LILIOPSIDA	50	1	0	0	1	0	47	2
AGARICOMYCETES	2	0	0	0	0	1	1	0

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
AMPHIBIA	10	0	0	0	0	0	10	0
INSECTA	37	0	0	0	0	0	36	1
GASTROPODA	20	0	0	0	0	0	20	0
POLYPODIOPSIDA	2	0	0	0	0	0	2	0
BIVALVIA	6	0	0	0	0	0	6	0
MALACOSTRACA	4	0	0	0	0	0	4	0
ARACHNIDA	1	0	0	0	0	0	1	0

Country-level summary

Coming soon

Recommended Experts and Organizations

Forprojectslocatedincriticalhabitat,clientsmustensurethatexternalexpertswithregionalexpertiseareinvolved in further assessment (GN6: GN22). Clients are encouraged to develop partnerships with recognized and credible conservationorganizationsand/oracademicinstitutes,especiallywithrespecttopotentialdevelopmentsinnatural or critical habitat (GN6: GN23). Where critical habitats are triggered by priority species, species specialists must be involved.IBATprovidesdataoriginallycollectedbyalargenetworkofnationalpartners,whilespeciesinformationis sourcedviatheIUCNRedListandaffiliatedSpeciesSpecialistGroups.Theseexpertsandorganizationsarelisted below.Pleasenotethatthisisnotintendedasacomprehensivelistoforganizationsandexperts.Theseorganizations andexpertsareundernoobligationtosupportanyfurtherassessmentanddosoentirelyattheirdiscretionandunder theirterms.AnyviewsexpressedorrecommendationsmadebythesestakeholdersshouldnotbeattributedtotheIFC or IBAT for IFCpartners.

Relevant national or regionalorganizations

IBAT integrates information developed by a global network of conservation agencies, organizations and experts. These efforts are coordinated by the IBAT Alliance (BirdLife International, Conservation International, IUCN and UNEP-WCMC) who compile and maintain this information as globally standardized databases. The local partners most relevant to the area of analysis are:

Wild Bird Society of Japan Address: Maruwa Building, 3-9-23 Nishi-Gotanda, Shinagawa-ku, Tokyo 141-0031, JapanWeb: http://www.wbsj.org/

BirdLifeAsiaRegionalOffice Address:354TanglinRoad,#01-16/17,TanglinInternationalCentre,Singapore247672 Email:singapore.office@birdlife.orgWeb:http://www.birdlife.org/asia

DirectoryforSpeciesSurvivalCommission(SSC)SpecialistGroupsandRedListAuthorities

URL: http://www.iucn.org/about/work/programmes/species/who_we_are/ssc_specialist_groups_and_red_list_authorities_directory/

Appendix 4: Geographical position coordinates of subproject components

COMPONENTS	Latitude	Longitude
Clear water pump house and clear water reservoir	28° 0'22.18"N	75°47'13.67"E
Clear water pumping system in the existing clear water pump house (booster pump)	28° 0'43.43"N	75°47'10.44"E
STP 1 (3.15MLD) – Near Khariya Kua	28° 0'54.32"N	75°47'11.19"E
Effluent discharge point	28° 0'52.58"N	75°47'10.89"E

Appendix 5: Sample chance find protocol

Introduction

Project town being a heritage town, there are possibility of any chance finds (artefacts) recovery during excavations. Contractors working at heritage towns must take additional care not to destroy or damage historic features during excavations. There may be many buried historic features in heritage towns such as – idols, toys, wells, ancient drains, remains of buildings, other walls, grain pits, etc. Every care must be made not to destroy these during excavations.

Excavator drivers need to be instructed to be aware of hitting buried features and that they must be investigated before continuing work. When features are encountered during mechanical excavation, work should stop and the PIU/Consultants engineers must be informed immediately so that they can be inspected at the first opportunity.

When historic features such as walls, brick constructions and other features are encountered during excavation the excavation must be stopped immediately and the PIU/Consultants must be informed immediately.

1.1 ***Contractors' instruction****:* As soon as contractor recovers any chance find during any excavation works for pipe laying, they should immediately inform PIU/Consultant present in town about the chance find recovery. Immediately stop the excavation activity near point of recovery. After PIU/consultants engineers come at site, contractor should follow cleaning and photography in supervision of PIU/Consultant engineers.

1.2 ***Cleaning*** - When a feature/chance find is discovered it must be defined by careful cleaning. Roots must be removed and dirt must be carefully cleaned away. The section or trench base should also be cleaned back for a little distance around the feature.

1.3 ***Record photography*** – When the feature is clean good photography should be taken – vertical and face-on shots and a few general shots of the feature, also showing its position in relation to surrounding features, buildings, etc. The photographed should be catalogued (date, location, direction of shot)

1.4 ***Drawn record -***When features/chance finds are revealed a drawn record should also be made.

a. General location record – measuring its position and orientation within the protected site / in relation to surrounding structures
b. Record drawings – detail drawings made in plan and section/profile. The extent (edges) of the feature should be drawn and the level of the existing ground surface and the top and base of the feature should be recorded. These levels should be marked on the drawings. The drawings should include detail of the construction of the feature. Perspective sketches could also be made if necessary. Explanatory notes can also be put on the drawings.

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

1.6 ***Discovery of historic objects -*** When clearance and excavation takes place 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).

1.7 ***PIU/Consultants responsibility-*** PIU/Consultants should inform in written to the State Archaeological Department at the earliest with photographs and request to Archaeology Department to visit the site and hand over the chance finds to them.

Appendix 6: Salient features of the IGNP canal

Indira Gandhi Nahar Project is an excellent example of courageous fight of man against oddness of nature. Aim of this ambitious project is to irrigate the thirsty desert land of Western Rajasthan with Himalaya's water and provide drinking water to crores of inhabitants of this area.

Origin of this canal is from Harike barrage situated in Punjab. From Harike, 204 Km. long Indira Gandhi Feeder off-takes, which has 170 Km. length in Punjab & Haryana and balance 34 Km. in Rajasthan. This canal enters in Rajasthan at Hanumangarh. From tail of Indira Gandhi Feeder 445 Km. long Indira Gandhi Main Canal starts which passes through Sri Ganganagar and Bikaner districts and ends at Mohangarh in Jaisalmer. The Project has been envisaged for utilization of 7.59 MAF water out of Rajasthan's share in surplus water of Ravi- Beas rivers.

Objectives of Project

- To provide irrigation facilities in desert area to meet the increasing demand of agricultural products.
- To provide water for drinking and industrial uses.
- Drought proofing of the area and improving living conditions.
- To meet the needs of drinking water, fodder etc. for the animal wealth in the region.
- To provide opportunities for employment and overall development of the area.

Status of Project

For administrative convenience, project has been divided in two stages. The 393 Km. long canal portion (Feeder 204, Main canal 189) from Harike barrage to Pugal in Bikaner distt. i.e. up to 620 RD of Main Canal, with its distribution system (excluding Sahwa lift) is called stage-I. Original work of this stage has been completed and major portion of this stage (except Kanwar Sain lift) has been transferred to Water Resources Deptt. for operation and maintenance.

At present, work of stage-II of Indira Gandhi Nahar Project is under progress. The area downstream to RD 620 of Main canal with its distribution system (including Sahwa lift) is in stage-II. Length of main canal in this stage is 256 Km., which extends from Pugal to Mohangarh. Work of Main canal was completed in 1986.

As per project estimate of year 1993 and decisions taken by State Govt. in year 1995 & 1997 total Culturable Command Area (CCA) of project was 19.63 lac hectare (5.53 lac hectare in stage-I + 14.10 lac hectare in stage-II).In view of reduced availability of water for irrigation in project , State Govt. in year 2005 took decision to complete canal construction works in 16.17 lac hectare culturable command area. This area has been opened for irrigation after completion of canal construction works. However CADWM works in lift schemes of Stage –II is remaining, where works for development of pressure irrigation system has been started.

Pressure Irrigation system in lift schemes of IGNP Stage-II

For efficient and optimum use of water available in project, it has been decided to establish sprinkler irrigation system in lift schemes of stage-II. A pilot project of sprinkler

irrigation was taken up in 27449 hectare in the year 2007-08, in which all works to be executed by department has been completed. All Water User Associations (W.U.A.) proposed in this area has been constituted and irrigation with sprinklers has been started in most of the area. To establish sprinkler irrigation system in remaining area of stage-II lift schemes, sanction has been received from Ministry of Water resources, Government of India for inclusion of project costing Rs.1658.81 crores under Command Area Development and Water Management Programme, under which 50% cost will be received as Central assistance. Pressure irrigation works under this project has been started in 3 canals of Ch. Kumbha Ram Lift Scheme and 4 other works has been in Ch. Kumbha Ram Lift, Dr.Karni Singh Lift and Pannalal Barupal lift schemes.

SCADA System

SCADA system has been installed in project for effective control on water regulation and distribution in canals through latest techniques. Quantity of water flowing in Main Canal and other important canals of-taking from main canal is available at main controlling places of project. This is also available on Internet. Extension of this system on some new locations is under process.

Benefits

With completion of most of the construction work as above, IGNP has benefited the state as under-

- Irrigation is being done every year in this area, where, earlier it was very difficult to arrange even drinking water.
- Drinking water from this canal is being supplied to various villages, towns & cities of Bikaner, Jodhpur, Sri Ganganagar, Hanumangarh, Jaisalmer, Jodhpur, Churu, Nagaur and Barmer.
- Water for Power generation is being supplied to various power projects of Suratgarh, Barsingsar, Guda, Ramgarh, Giral, Rajwest etc. and various Industries.
- Elimination of drought conditions.
- Remarkable improvement in socio-economic conditions of the people and increase in all economic activities.
- Rise in ground water table.

Source :
http://water.rajasthan.gov.in/content/water/en/indiragandhinahardepartment/AboutUs.html#

Appendix 7: Surface Water Allocation Letter from PHED

OFFICE OF THE EXECUTIVE ENGINEER, PHED, KHETRI

S.No: 519 **Dated:** 10.02.2020

Chief Engineer
RUIDP, Jaipur

Sub: Surface water allocation for Khetri town.

Sir,

In reference to the above cited subject Khetri town is covered under Integrated Taranagar-Jhunjhunu-Sikar-Khetri, Drinking Water supply Project of Khetri town and source of water is from IGNP canal. The project has been commissioned and Surface water starts getting in town. Water allocation for Khetri town for year 2047 is 5.38 MLD.

Submitted for your information.

Executive Engineer,
Project Division
PHED, Khetri (Jhunjhunu)
परियोजना खण्ड खेतड़ी

Appendix 15: 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 16: 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:

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

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

- The flors of workrooms, stairs and corridors should be cleaned at the appropriate frequency to maintain them in a clean condition
- Disinfection of relevant locations is to be carried out periodically.

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

- Examine medical history.
- Examine subjective symptoms and other objective symptoms.
- Check height, weight, vision and hearing ability.
- Chest X-ray examination.
- Blood pressure measurement.
- Check for anaemia.
- Check for liver functions.
- Check for lipids in blood.
- Check blood sugar level
- Urine analysis.
- Electrocardiogram analysis

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

- Provide immediate assistance to a beneficiary in case of an accident
- Sanction of loan and advances
- Medical expenses for treatment of major ailments
- Financial assistance for education of children
- Payment of maternity benefits
- Make provision and improvement of welfare measures and facilities as may be prescribed

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

- Change the workplace if necessary
- Change the content of the work
- Shorten the working hours
- Perform relevant measurements of the working environment
- Maintain the facility or equipment

Risks in use of treated effluent and sludge in agriculture practices

Cultivation of crops that are eaten raw should be banned. Cultivation of paddy in 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 17: Sample Asbestos containing material (ACM) Management Plan

BACKGROUND OF ASBESTOS

1. The purpose of this Asbestos Management Plan (AMP) is to identify, use appropriate methodology and scientifically handling /disposal of the Asbestos Containing Materials (ACM) in order to comply with the applicable National legislation and International standards in sync with norms of ADB's SPS 2009. ADB has mandated as per Appendix 5 - prohibit the investment activities list - production of, trade in, or use of un-bonded asbestos fibers is deliberated. As per SPS 2009 Safeguard Requirement 1, it is emphasized "that the borrower/client will provide workers with a safe and healthy working environment" in the work areas with accounted risks inherent to the work zone and defined safety instructions and standard operating procedures identifying roles and responsibilities.

2. Asbestos is a collective name given to a group of minerals that occur naturally as fiber bundles and possess high tensile strength, flexibility, heat resistance, non-biodegradability with chemical and physical durability. Asbestos is hydrated silicates with complex crystal structures. It is found in two configurations: chrysotile (derived from serpentine minerals) and amphibole is a naturally occurring mineral with long thin fibers. The most abundant asbestos used in the world is chrysotile. The use of ACM propagated due to its economic viability.

3. The purpose of this AMP is to identify, use appropriate methodology and scientifically handling /disposal of the Asbestos Containing Materials (ACM) in order to comply with the applicable National legislation and International standards in sync with norms of ADB's SPS 2009.. As per SPS 2009 Safeguard Requirement 1, it is emphasized "that the borrower/client will provide workers with a safe and healthy working environment" in the work areas with accounted risks inherent to the sector and defined safety instructions and standard operating procedures identifying roles and responsibilities.

REGULATORY FRAMEWORK, STANDARDS AND PROTOCOL
Table.1

Government of India Laws, Regulations and standards on Asbestos Applicable to the projects	**Requirements for the project**
IS 11768: 1986/2005: Recommendations for disposal of asbestos waste material	The standard emphasis that every employer who undertakes work which is liable to generates asbestos containing waste, shall undertake adequate steps to prevent and /orreduce the generation of airborne dust during handling, storing, transportation and final disposal of final disposal of asbestos and asbestos containing products. • The crux is waste avoidance: the practice inculcated should focus the on minimal waste generation.

	• Waste Collection: In the project circumstance, the waste is referred to the damaged powered asbestos which will be collected in the Permissible plastic bags to be disposed off 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.  
IS 11451: Safety and Health Requirements related to Occupational Exposure to Asbestos contaminated Products.	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.
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 that in the project case id TSDF.
Sampling of asbestos fiber (as per BIS-11450) has to be done regularly using personal sampler and determined using phase contrast microscope.	The Sampling and analysis protocol is emphasized. Details are given as above.

Further, there are several legislations that regulate the use and handling of asbestos in India as applicable, namely:

a. The Supreme Court of India – Banned ACM use in January 21 2011.
b. National Green Tribunal - In pursuant to the above order, in 2015, NGT issued an order- “that there is no asbestos mining presently operational anywhere in the country and the operations of the mines of associated minerals with asbestos has also been halted.”
c. Environmental (Protection) Act (1986)-Environmental monitoring.

RISK ASSESMENT:

4. The process of evaluation of risk at all the working sites was evaluated with the inventorization of the unscientific storage pipes-in case of worst scenario. The site identified and evaluated was Sardarshahar. Site visit was conducted to evaluate the risk associated with the ACM handling and re- handling. Working with or handling AC pipes in manner that produces dust, fibers, air borne particles etc., is very harmful and hazardous to the workers and general public in and around the work sites. The condition of existing underground AC pipes are not known, however, as these are old certain pipes will be in deteriorated conditions. So the Conditions were presumed if it is in friable form or in a condition in which it can release fibers before it is subjected any disturbance or removal, all safeguard measures needs to be adopted. There were certain areas where the AC pipes were subjected to shear and are powered, and AC Pipe ends were damaged these were the high risk zones in the campus. The probability of the air borne asbestos fibers in the areas cannot be over ruled.

5. Thus it is necessitated to draft standard operating procedure for disposal of ACM. The purpose of this standard operating procedure (SOP) is to ensure the safe handling of AMC including protection from hazards associated with uncontrolled distribution, encounter and removal of Asbestos Cement (AC) Pipes and pipe fittings. The scope of this SOP encompasses all aspects of safe AC pipe handling including identification of site, re-handling and encountering of ACM, site selection and proper identification for storage, inventorization, monitoring, final disposal, training and maintenance of records.

6. The fatal health hazard with inhalation of air borne asbestos fibers and its adverse health impact are known and needs a proper attention and planning with defined roles and responsibilities to ensure the work zone is at minimal risk and safe for the workers. It is also necessary to mandate the standard operating procedures with implementation of all requisite safety gears.

7. The assessment of the ACM disposal will be vested with theDBO Contactor. The undamaged pipe-where the pipe ends are intact that there is no damaged on the entire length of pipe-to be stored in isolated storage with secured pipe ends either by wrapping the ends with permissible plastic bags. The damaged/broken pipes/powered pipes will be disposed off, by bagging the same in permissible plastic bags. All the records pertaining to the inventorization has to be kept by theDBO Contractor. The same shall be cross verified by RUDSICO-EAP.

EMERGENCY RESPONSE PLAN & CHANCE FIND PROTOCOL

8. The emergency procedures should include managing an uncontrolled release of asbestos materials into the workplace. The onus of the same shall be ensured with immediate action of the field staff-DBO Contractor/ HSE Staff. Steps should be taken to:

- Warn anybody who may be affected.
- Exclude from the area anyone not needed to deal with the release.
- Identify the cause of the uncontrolled release.
- Regain adequate control as soon as possible.
- Make sure anyone in the work area affected, who is not wearing personal protective equipment (PPE), including respiratory protective equipment (RPE), leaves the affected area immediately.
- Minimize the spread of asbestos by ensuring they are suitably decontaminated.
- Clean up dust and debris.
- Decontaminate anyone who is contaminated with dust and debris.
- Ensure rags, clothing or PPE is decontaminated or disposed of as contaminated waste.
- Consider alone and/or remote workers to ensure they can alert someone if necessary.

Check what you're working on before you start:

- Avoid using a sweeping brush as this can spread asbestos.
- Make sure no unauthorised personnel enter the area.
- The clean-up of any accidental release of higher risk materials, eg asbestos cuttings, powered asbestos that may release the asbestos fibers, to be done by authorized person

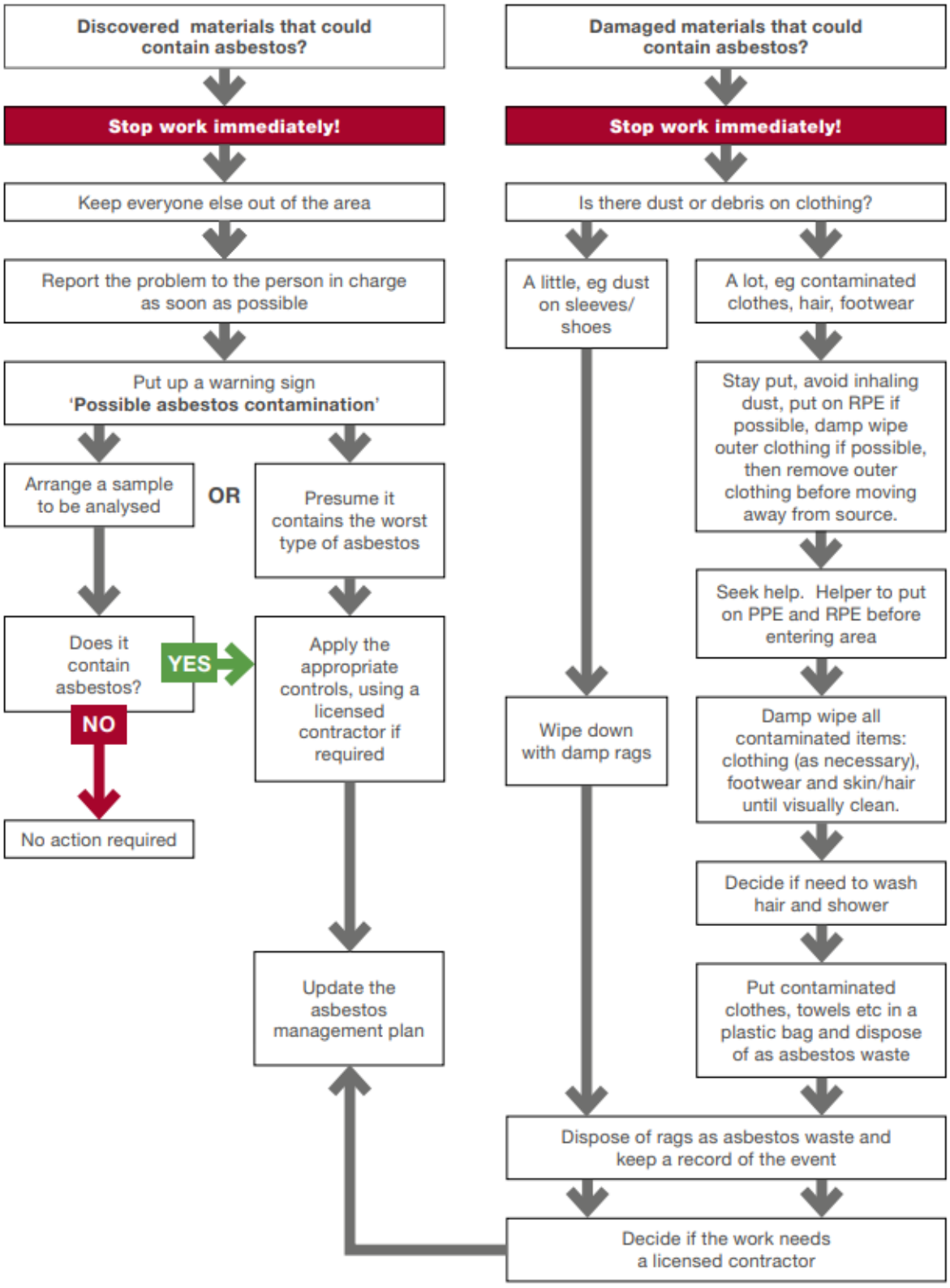


Fig.No.1-Showing Flow chart of ERP

Table.no.2-Roles and Responsibilities

PRE-CONSTRUCTION				
Activities	**Responsibilities**	**Associated Documents**	**Estimated Cost**	**Remark**
Design to encounter minimal ACM, and then Identification & Inventorization ACM - AC pipes & fittings	**RUDSICO-EAP& DBO Contractor**	Form-I	Rs.100/km	The onus of the minimal encounter of ACM is vested upon the RUDSICO-EAP and inventory will be with the DBO Contractor and has to be annually verified by RUDSICO-EAP.
Define & confine ACM storage area-in-situ			Rs.65/Sq.m	The storage area made available will be confined and fenced.
Warning signage near the ACM work site, storage and on AC pipes in local language****			Rs.500/label	The signage labels can be printed, sticker pamphlets or painted.
Training of personals handling the AC pipes and fittings	**DBO Contractor**	Form-II	Rs.1000/Person	All requisite safety gears should be made available at all sites.
Use of safety Gears			Rs.6000/Person	All the safety gears should be silicon based and suitable for Asbestos protection.
Briefing of Emergency Response Plan			Rs.500/Person	All the risk zones with respect to white card has to be briefed.
Confined storage with access control plan			Rs.5000/site	Inward and outward movement of authorized person must be allowed and has to be guarded or should be under key control.
Pre-history medical records of the ACM handling team			Rs.3000/Person	All requisite medical test, Respiratory test, lungs /Chest X-ray/CT Scan, Blood Test, Lower Abdomen examination etc
CONSTRUCTION PHASE				
Monthly Inspection & Annual Environmental Monitoring.	**DBO Contractor**	Form-III	Rs.40,000/sample	The sampling zone should be 500 m from the storage site and personal sampling has to be as per SOP-2
Reporting in SEMR	**RUDSICO-EAP/DBO Contractor**	None	Nil	As per ADB Format
Collection of Health records in compliance to the local laws	**DBO Contractor/RUDSICO-**	Form-IV	Nil	For regular evaluation & identification of any abnormality.

Ensure adoption of all standard operating procedure	**EAP/PHED/LSG**	SOP-1&2	Nil	As revision desired on basis of Site specific information may be upgraded in the SOP 1&2 if required
Collection, Segregation, Reception and Disposal as per National norms of ACM		Form-V	Nil	Standard Regulatory format has to be filled and disposed off within 90 days.
Use of safety gears prior to handling of ACM based on White Card.		White Card-Page-11	Nil	Periodic training can be site specific
Disposal of ACM to the indentified TSDF Facility to be done as per procedure within or prior to 90 days		SOP-2	1500/ton of waste plus freight as per actual.	Within 90 days from the generation of waste, in case of existing waste it has to be disposed off within 90 days from the Project Start.
To inform and fill the returns in the prescribed manifest as per HWMR.		Form-V(Form-10 of the Rule HWMR	Nil	90 days from the start of work
To facilitated a restricted confined storage space with access control with proper inventorization.		Form-II	Nil	Site Specific
In-situ storage of ACM.	**DBO Contractor**	Form-VI		The storage of existing and encountered ACM pipes (more than 4.0 ft) will be stacked end to end at 90 deg. With vertical stacks, 8 inches above the ground, covered with permissible plastic sheet. The campus custodian-viz PHED etc should also be informed about the In-situ storage of ACM and its impact.
ACM removal	**DBO Contractor**	--	--	Follow ACM Removal
Record maintenance of ACM in-situ and disposed off to TSDF	**DBO Contractor**	Form-I & Form-IV	Nil	The copies of inventory generated and collected will have to be shared with Land Custodian (LC), RUDSICO-EAP and DOB Operator. To distinguish the forms they can be numbered.

				FORM-I(LC),Form-IV(LC)
Transits ACM storage of waste to be disposed off to TSDF	**DBO Contractor**	Form-IV	50,000/room	An isolated storage room should be constructed with 10x10 with height of 3.5 ft roofed properly for transit disposal of ACM to TSDF. **DISPOSABLE ASBESTOS WASTE STORAGE ROOM HAZARDOUR WASTE CATEGORY-15.2** (as per Hazardous waste management &Handling Rules 2015).
POST CONSTRUCTION PHASE				
Compliance of AAQM, Asbestos Fiber monitoring and Soil Quality monitoring and Periodic Work zone monitoring(Asbestos fiber count) records to be maintained	DBO Contractor	SOP-2	Rs.40,000/sample	The Asbestos Fiber count monitoring has to be conducted prior to ACM handling operation and after ACM Handling operation by an Accredited Laboratory. List of accredited laboratory will be available at Rajasthan State Pollution Control Board website-rspcb.nic.in
Health records &Periodic Medical Checkup of the personals handling ACM to be maintained.	PHED/LSG/DBO Contractor	Form-II	Rs.3000/Person	All the concerned employees deputed to handle or deal with ACM has to have Pre medical history and periodic medical examination done

Permissible Levels

9. Permissible Exposure Limit (PEL) for asbestos is 0.1 fibers per cubic centimeter of air as an eight hour time weighted average (TWA), with an excursion limit (EL)of 1.0 asbestos fiber per cubic centimeter over a 30 minutes period.

ACM REMOVAL

ACM Removal has to be checked in sync with the design and emphasis has to be laid to avoid the removal of ACM, in case it is unavoidable, then all the requisite safety gears are to be

adopted:

- Inform the Asbestos Expert/HSE Expert prior to removal.
- Isolate the area with access to only trained staff/employees under supervision of Asbestos /HSE Expert.
- Exhibit all warnings



Fig.No.2 Asbestos warning signage

- Undertaken Asbestos fiber Monitoring
- The trained Employees have to be deputed for removal of ACM.
- The removal ACM material has to be check with the status and extent of damage.
- Efforts should be made to remove the ACM as minimal as possible.
- The ACM removal has to be manual; it should neither be cut nor drilled.
- All removal operation should be undertaken with ACM in wet condition.
- The removed ACM will then be labeled and placed on permissible plastic sheet. It should not be put on ground directly.
- The dimension of plastic sheet should be larger than the ACM placed.
- If the ACM pipe is not damaged as about 4.0 ft and above, the ACM will be subjected for in-situ disposal.
- If the ACM is damaged and broken then it has to be packed in permissible plastic bags and disposed off to TSDF.
- Prior to disposal it can be stored in isolated room-showing board of –Hazardous waste storage room.
- The hazardous waste to be disposed off to TSDF should not be stored over 90 days after the removal date of ACM at site.
- All the safety procedures and safety gears should be worn by all the employees engaged in the ACM Removal operation.

- The Asbestos fiber monitoring, soil monitoring has to be undertaken during the operation as well.
- The process of removal of ACM will be completed after the removed ACM and its suitably disposed off either in -situ or to the isolated room prior to disposal at TSDF.
- Post ACM Removal asbestos fiber monitoring has to be undertaken to ensure the work zone is safe to resume further operations.

Safe Practices in Handling ACM

10. Proper handling and PPE:

a. Cover up and wear PPE (Personal Protection Equipment). including respirator or dust mask

b. Make sure the mask has two straps to hold it firmly in place. Don't use masks that only have one

c. Also wear a Hard hat, gloves, disposable coveralls with a hood, and safety glasses or goggles to protect eyes

d. Do not eat, drink or smoke in the work area as you may inhale or eat dust. Wash your hands and face with soap and water before meal breaks and when finished work for the day.

e. Do not use power tools Asbestos fibers can be released if power tools are used for anything other than the removal of screws.

f. Do not water blast or scrub with a stiff broom or brush. It is illegal to water blast asbestos cement sheets. If the material has been accidentally water blasted or has suddenly deteriorated in some way, you should call a licensed asbestos removal DOB Operator

g. Wet gently with water when removing asbestos cement pipes, use a pump spray to lightly dampen the pipes and keep the dust down. Remember: Not to waterblast asbestos cement materials.

h. Avoid drilling and cutting into asbestos products.

i. Do not drill holes through and never cut Instead remove the entire product and replace it with a non-asbestos product

j. Don't drop fiber pipes remove them carefully, Lower them to the ground, don't drop them, to minimize breakage.

k. Lay plastic sheeting under the work area to prevent any dust contaminating the ground. Use 200 micron thick plastic sheeting or bags or as permissible these must not be made from recycled materials or re-used for any other purpose.

l. The work area has to be barricaded and there should be no un-authorised person allowed. Only Trained ACM expert should be allowed to handle the ACM along with EHS Expert.

m. Close windows and doors and seal vents to stop dust getting into the house; ask neighbors' to do the same.

n. Seal off other places where dust can get in.

o. Remove soft furnishings like rugs, clothes, jute bags from the work area, and seal anything with plastics if it cannot be moved.

p. All the AC broken pipes have to collected and stacked properly with 200micron plastic wrapping with winning signage.

q. Do not leave plastic sheet lying about where they may be further broken or crushed by people or traffic.

r. Remove all ACM by the trained handler.

s. Since we are amidst of dry climatic conditions due care must be taken to see that no waste broken pipes or fittings are left loose and outside the confined area and may be dampened as required.

t. Mark and add signage.

11. Due care has to be taken to collect the dampened waste in a permissible standard bags with proper warning signage's.

12. The wastages packed have to be disposed off to Treatment, Storage or Disposal Facility(TSDF).The plastic bags must have legible note:

d. Waste Type:

e. Date of packing:

f. Qty/Numbers:

g. Packed by:

h. Warning Signage:

i. Disposal



Fig.No.3- ACM: In-situ storage warning

13. The AMP procedures-**Standard Operating Procedure-01-** are as follows and are summarized as above

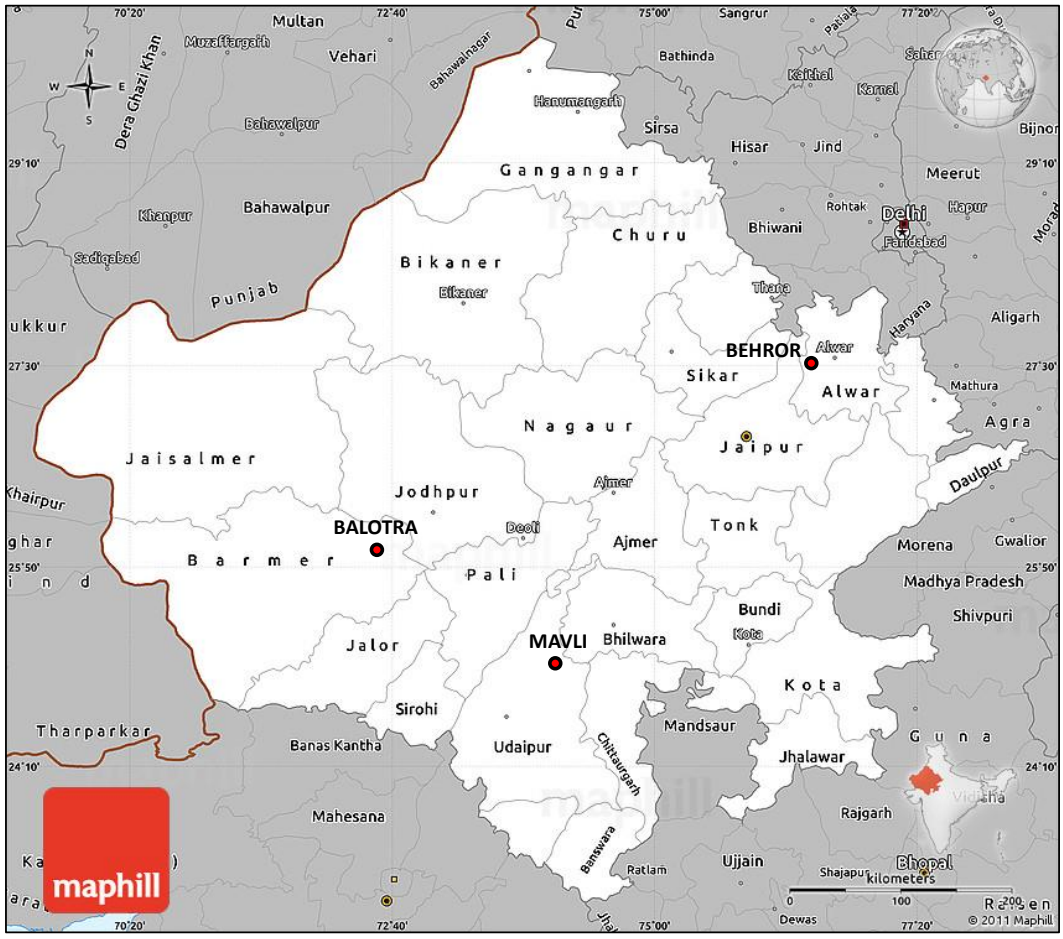
j. Objectives – to keep the work zone safe and secured.
k. Requirements – identify all the requirements needed for handling AC in the specific site and project
l. Conduct and ensure awareness and vocational training to ACM handlers
m. Conduct a comprehensive identification and risk assessment of ACMs
n. Apply restriction / re-handling of ACM on ground-use of PPE. Ensure that workers handling ACM have the right PPEs as follows:
    i. Hard helmet
    ii. Overall suit
    iii. Gloves
    iv. Mask to be strapped tight
    v. Safety goggles
    vi. Safety shoes
    vii. Ear plugs
o. Avoid underground encountering of ACM
    i. Ensure that an authorized person (HSE) are supervising the work
    ii. Barricade the area with signage
    iii. Damp ACM
    iv. Use safety gears
    v. Dismantle ACM to be labeled, kept on plastic grounding and packed in permissible bags
    vi. Label the bags properly
    vii. Ensure shipping to proper disposal sites
p. Site selection – the disposal site should be ready to handle ACM and protect the nearby people as well The site selection criteria are as follows:
    i. Away from habitation
    ii. Avoid low lying areas
    iii. Away from water storage
    iv. To be enveloped with minimum of 8-feet height enclosure
    v. Avoid high vertical stacks
    vi. Access controlled
    vii. Proper signage enclosure
q. Proper re-handling of AMC, labeling and packing
r. Control access and ensure proper monitoring of records, specifically:
    i. Environment
    ii. Health
    iii. Reporting to regulators

Dispose the ACM through qualified DOB Operators up to the Total Sanitary Disposal Facility (TSDF)

LIST OF APPROVED TSDF OPERATORS IN RAJASTHAN

S.No	Operator	Address	Remark
1.	Rajasthan Waste Management Project (M/s Ramky Enviro Engineers Ltd)	Survey 1018/13, Vill-Gudli,Tehsil-Mavli, Zinc Choraha to Debari Railway Station Road, Dist Udaipur (Rajasthan).	This TSDF is for all kind of hazardous waste as listed in the hazardous waste (Management & Handling) Rules.
2.	Ramky Enviro Engineers Ltd, Balotra	Ramky BWMP Rd, Rajasthan 344032.	This TSDF is for all kind of hazardous waste as listed in the hazardous waste (Management & Handling) Rules
3.	Continental Petroleum Ltd	Bheror, Distt- Alwar	Only for Incineration

Label/display for TSDF disposal bags has to have clear display of the content in both English and local language as displayed under:



N
NW NE
W E
SW SE
S

TSDF Facility in Rajasthan

The above map clearly depicts the location of approved TSDF in Rajasthan.

IN-SITU STORAGE ACM PIPES AREA

The removed undamaged ACM pipes have to be stacked properly as shown below to avoid any rolling of the pipes and eventual damage. The existing ACM Pipe stacking has to be re-handled to stack the ACM pipes properly. If the removed ACM Pipes is less than the full length of the ACM pipes, then separate stack of the same should be done with proper pre-caution and safety measures and gears.

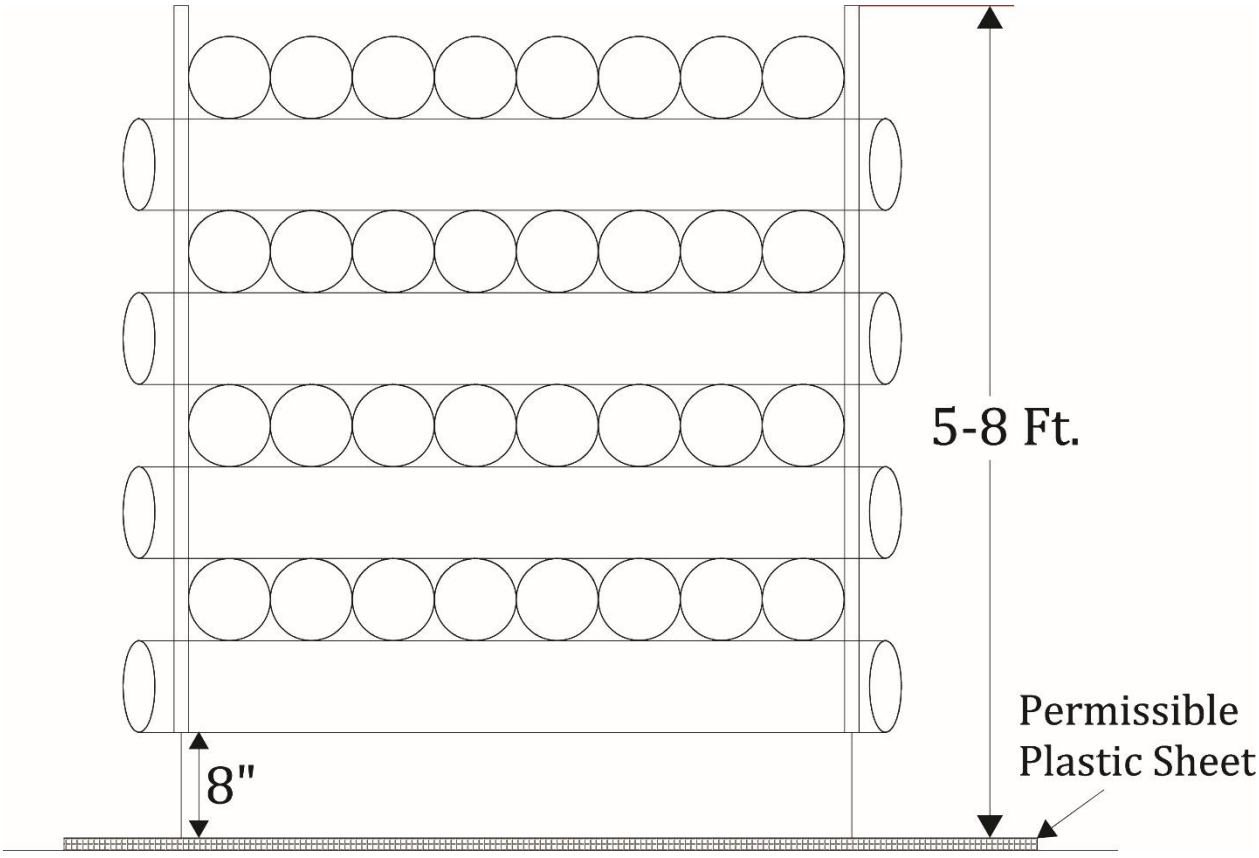


Fig.No.5: Schematic diagram showing ACM Pipes stacking

The ACM stack has to be enveloped with proper fencing showing internal movement of person with 4.0ft corridor all around the stack. The Storage area will have display of all requisite warning and access control of the authorized person's entry and exit.

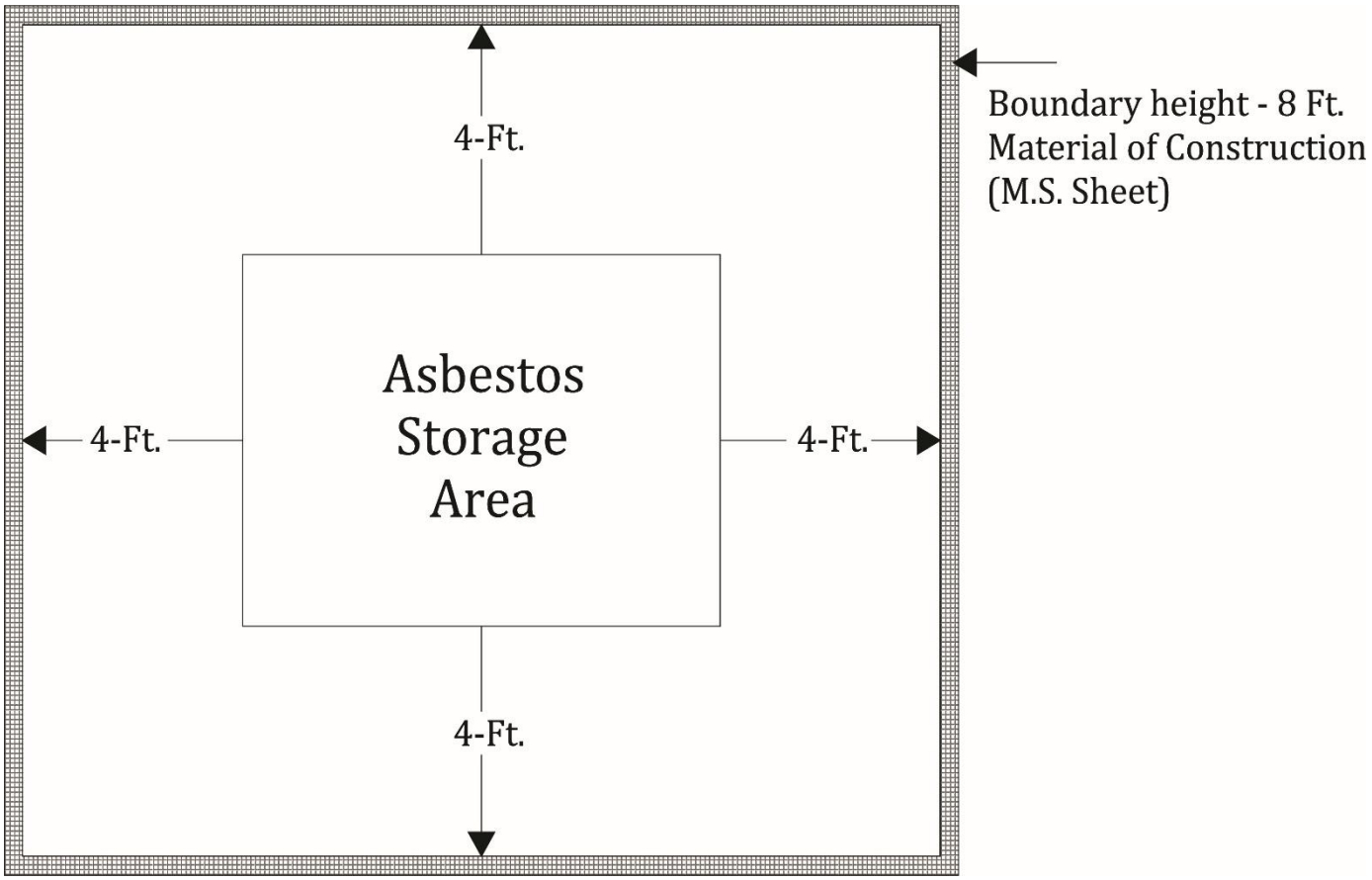


Fig.No.6: Schematic diagram showing ACM Pipes storage area

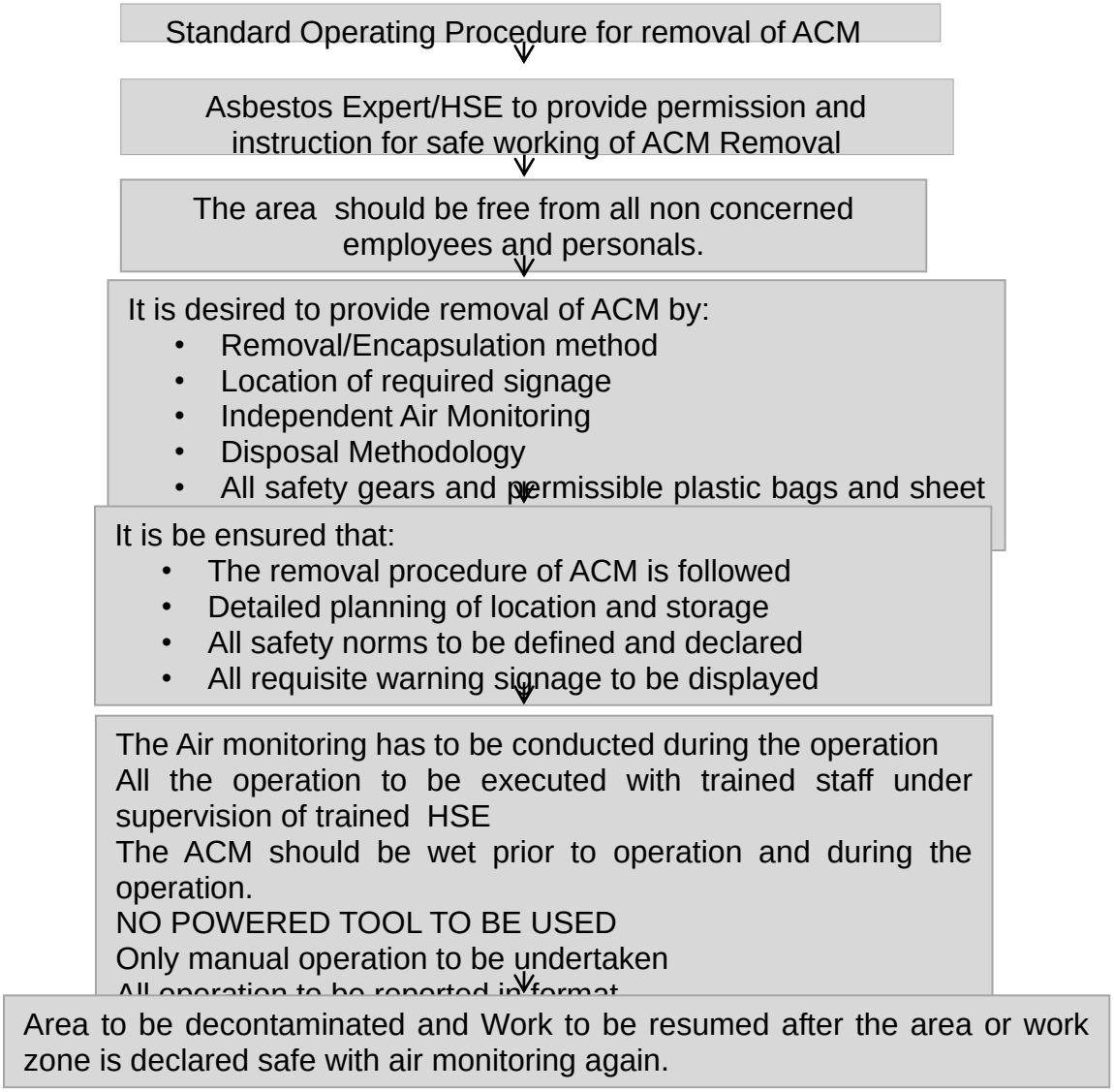


Fig.no.2-Standard Operating Procedure Flow Sheet

14. All the records in the pre-determined format are to be maintained and the disposal as stated in the applicable National legislation is to be followed. Any innovative use of the discarded ACM with the permissible law frame must be approved by respective Regulators prior to practice.

15. The format of Inventorization & records at all locations must be maintained irrespective of generation of ACM waste. The format of documentation must be uniform in order to track and trace the details as desired.

16. Based on the outcome of the workshop it was essential to enumerate the standard operating procedure & define the roles and responsibilities (already discussed as above) and the re-handling cost of the ACM as stated below:

Table.03- Suggestive Protective measures & Estimation of the cost of Re-Handling of ACM

1	Re-Handling			
	Re-handling of AC Pipes scattered/used in the premises.	• Re-Handling of the old AC Pipes in the premises needs to be quantified and a proper inventorization has to be prepared. • The isolated enveloped storage sites should be away from the habituation, the pipes used for fencing, tree guard needs to be re-handled & stored in the nearest isolated storage site and the damaged pipes/broken pipes have to be disposed off to the TSDF with all pre-cautionary measures. **NOTE:** Only powered/ grounded ACM will have to be disposed off to TSDF.	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert	The re-handling cost will be part of the laying program. The disposal cost is Rs.1500/MT plus freight as per actual
	Removal of encountered AC Pipes	• The damaged / broken AC Pipes have to be cautiously handled with prior moistening and packed in plastic bags (permissible plastic bags) and sent for re-use in road making or to TSDF with all signage and precautionary measures as suggested above.	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert	As stated above
	Storage	• The existing storage stacks have to be shielded with 8.0 ft height and above ground (min1.0 ft) The Pipes shall be stored in stacks with stoppers provided at the bottom layer to keep the pipe stack stable. The stack, particularly of smaller diameter pipes, shall be in pyramid shape. Pipes shall not be stacked more than 1.5 m high. Each stack shall have pipes of the same type and size only. Removal of	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert	As on daily wages

		pipes shall start from the top layer and by pulling from one end, if required, with all safety precautions. A pipe shall not be stored inside another pipe. The pipes may also be placed alternately length and crosswise. They shall be stored on horizontal racks supported throughout their lengths on a reasonably flat surface free from stones and sharp projections. They should not be stacked in large piles, especially under warm conditions. Open ends of pipes to be sealed with permissible polythene.		
	Transportation	• Full length pipes • Damaged/Broken Pipes	Authorised agency	As per actual.
	Disposal			
	Isolated storage	The storage area should be twice the area required for storage of ACM	Manpower engaged: Trained labor, Supervisor, HSE Experts/Asbestos Expert. Authorised vendor. Boundary, signage, safety aspects etc	As stated in Table1.1.
	Sent to TSDF	The damaged/broken pipes will be packed in permissible Poly bags and has to be stored in defined location within the isolated storage. The records pertaining to the disposal (within 90 days of generation) have to be made systematic. Possibilities of using the broken pipes in wet conditions in road making in order to bind the asbestos fibers can be explored.	Authorised agency	Freight as per actual.
Estimation of suggestive protective and preventive measures				
	Air Quality sampling & Analysis- Asbestos fiber count	Personal sampler, phase contrast microscope, In case of asbestos dust, the same shall not exceed 2 mg/Nm3. Per the OSHA standards for asbestos, exposure monitoring and medical surveillance of workers is required when the Workers are or will be exposed to airborne concentrations of fibers of asbestos at or above OSHA's exposure limits for a combined total of 30 or more	Approved/accredited laboratory	As stated above.

FORM I – ASBETOS INVENTORY, INSPECTION AND ACTION FORM **Format: RUDSICO-EAP/IIA/ LOCATION/NAME OF DBO CONTRACTOR/HSE 002/YEAR**	
Location:	
Site co-ordinates:	
Elevation:	**Team:**
Date of visit	**Sign:**

		days per year; Workers perform work that disturbs asbestos-containing material (ACM) or presumed asbestos-containing material (PACM) for a combined total of 30 or more days per year. Minimum 3 locations (@120deg from each location) at min 500 m from the isolated storage of ACM and one sampling near the encountered site. The frequency of monitoring should be bi-annually.		
	PPE's	Hard helmet, double strapped mask, safety tapes, boots(non laced), gloves, safety suits, goggles, ear plugs,	Standard make, minimum-4 sets at each site	As stated Above
	Education & Training	Awareness, New induction training and inspections	Asbestos expert/HSE Experts	As stated Above
	Medical Check up	As per norms or in consultation with Medical Practitioner.	Medical Doctor	As stated Above

Note:

Efforts should be made to minimize the existing AC water pipes. In areas where ACM are stored, it is required to have induction training of AMP, complete the formats and maintain the records.

Removals of used AC Pipes for fencing, boundary wall etc have to be carefully removed from use and stored in isolated storage.

At certain locations, it was observed that the discarded pipes was used as tree guard, when the sapling was planted as on date the tree is fully grown, in that case the removal of ACM has to be done with all precautions and use of total safety gears. Hand tools or slow-running tools producing coarse dust or chips should be used where practicable rather than high-speed machines or those which cut by abrading the material after wetting. Alternatively, the same can also be bounded properly by bitumen paint.

The coarse dust and pieces in wet conditions will have to be collected in permissible plastic bags with use of all safety gears.

The collected wastes are to be labeled as stated above and disposed off to TSDF. The records of the same will have to be kept on daily basis and summarized to monthly basis.

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**		

FORM-II – MATRIX FOR TRAINING & RECORDS

Format: RUDSICO-EAP/INSP.MATRIX/LOCATION/NAME OF DBO Contractor/HSE 001/YEAR			
S. No.	Aspects of ACM	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:			
DOCUMENTS AND RECORDS			

	Site Inventory			
	List of ACM storage and installation points			
	Structure of ACM management committee			
INVENTORY				
1.	Inventorization of ACM			
	Number of ACM/ pipes			
	Dimensions of ACM/ pipes			
	Total volume of ACM/ 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 ACM		
		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 (PEP)			
	Record of pep			
	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 HSE Signatory		

The all the data required in Form-II will be filled by the DBO Contractor (HSE-Officer), the records of this document has to be maintained for a pre-decided life. Details of training imparted have to be file with appropriate evidence like photographs, feedback form**,** videos etc. There has to be a proper documentation of the records kept with highest level of transparence to retrieve, trace and track the records as necessary. The records maintained by the DOB Operator, has to be audited regularly by the ACM-Expert.

Form-I has to be accompanied with Form-II. Defined period of Air Quality monitoring and health will have to be minimum twice a year. Where ever the fiber counts are found/ recorded beyond the permissible norms, corrective action, like:

- ❑ Cordon off the area of ACM
- ❑ HSE team with trained experts to be deputed for the task
- ❑ Moisten the ACM prior to handling
- ❑ Storage area of the ACM stacks to be covered
- ❑ The damaged/deteriorated ACM to be re-handled in presence of Asbestos Expert/ HSE (Trained) with all defined norms and safety gears.
- ❑ Disposal of damaged/deteriorated ACM to be done as per the Norms.
- ❑ Records of disposal to be maintained.
- ❑ Keep all requisite evidence in form of documentation, geo-tagged photographs etc
- ❑ Frequency of health monitoring at such locations to be increased.

Form-III-Air Quality Monitoring and Results

Format: RUDSICO-EAP/AQMR/ LOCATION/NAME OF DBO CONTRACTOR/HSE 003/YEAR			
Vendor details **Approvals**			
S.No	**Location**	**Agency**	**Results& Permissible Norms**

Conclusion/Remark **HSE Signatory**

FORM-IV-Medical History

Format: RUDSICO-EAP/MH/ LOCATION/NAME OF DBO CONTRACTOR/HSE 004/YEAR							
Employee code:							
Employer Details:							
PPE Used:							
Insurance/ESI							
S.No	**Name**	**Age/Sex/DOB**	**Address/ Contact details:**	**Period of Employment/ Job Title**	**Pre-History**	**Doctor's comments**	**HSE Remarks**
					Height **Weight/BMI** **Blood group** **X-Ray** **CT Scan** **others** **Smoker:** **Tobacco:** **Alcohol Consumption:** **Family History:** **Medication if any:** **Eye sight:** **Hearing:** **Others:**		

FORM -V
[FORM-10- as per rule 19 (1) of Hazardous waste Handling & Management Rules-2016]
MANIFEST FOR HAZARDOUS AND OTHER WASTE

1.	Sender's name and mailing address (including Phone No. and e-mail) :		
2.	Sender's authorisation No.	•	
3.	Manifest Document No.	•	
4.	Transporter's name and address: (including Phone No. and e-mail)		
5.	Type of vehicle	•	(Truck/Tanker/Special Vehicle)
6.	Transporter's registration No.	•	
7.	Vehicle registration No.	•	
8.	Receiver's name and mailing address (including Phone No. and e-mail) :		
9.	Receiver's Authorisation No.		
10.	Waste description	•	

11.	Total quantity No. ofContainers	•	……..m^3 or MT ……..Nos.
12.	Physical form		(Solid/Semi-Solid/Sludge/Oily/Tarry/Slurry/Liquid)
13.	Special handling instructions and additional information		
14.	Sender's Certificate		I hereby declare that the contents of the consignment are fully and accurately described above by proper shipping name and are categorised, packed, marked, and labeled, and are in all respects in proper conditions for transport by road according to applicableNational Government regulations.
	Name and stamp:	Signature:	Month / Day / Year
15.	Transporter acknowledgement of receipt of Wastes		
	Name and stamp:	Signature:	Month / Day / Year
16.	Receiver's certification for receipt of hazardous and other waste		
	Name and stamp:	Signature:	Month / Day / Year

FORM –VI
In-situ Storage of ACM

S.No	Activity	Number of Stacks	Area occupied	Details of ACM 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 ACM 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 ACM
- Labels to be displayed in legible format
- Specific training of ACM to be inducted in the ACM storage area for residing population in the campus.

Details of transit storage of ACM to be maintained as per norms in an isolated storage room full covered

Standard Operating Procedure-02

Asbestos Fiber Monitoring, Analysis and Identification

Principle

1. The collection of environmental samples including air must follow an appropriate sampling procedure. A review of method for sampling of asbestos fibers has been published (IPCS, 1986). The most commonly used analytical method involves phase contrast optical microscopy (PCOM) in the work place and transmission electron microscopy (TEM) in the general environment. The phase contrast optical microscopy (POCM) is universally recommended for asbestos analysis (Eache and Groff, 1997; Dion and Perrault, 1994) including Bureau of Indian Standard. POCM coupled with polarized light is largely used for asbestos analysis in solid samples (USEPA, 1993). The fiber monitoring has to be done by any NABL/MOEF&CC accredited laboratory either in-house or by third party.

Monitoring of Asbestos Fiber in Air

2. A general survey of inside and outside the storage sites of the work zone has to be conducted to choose the sampling sites. Sampling is to be carried out at visually selected locations appeared more prone to emission or possibility of release of asbestos fiber. The sample collected by drawing a measured quantity of air through cellulose ester a membrane filter by a battery operated sampling pump that was fully charged to operate continuously over the chosen sampling time. The exposed filters will then be placed into plastic petri dishes and transferred carefully to the laboratory.

3. Two types of samples are to be taken, one within the workers breathing zone that is 300 mm radius extending in front of the face, and measured from the midpoint of a line bisecting the ears called *personal samples*. The samples taken at a fixed location mostly near to the source point called *area or static samples.* Personal sampler model "XX 5700000" and low volume vacuum/pressure pump model "XX5622050" attached with monitor or cowl model "MAWP025AC" of Millipore Corporation, USA are to be used for the collection of personal and area samples, respectively. The flow rate of pump is to be adjusted to 1litre per minute. The flow rate checked before and after in each monitoring, those samples showing the difference by >10 percent from the initial flow rate are to be rejected. In both the samples filter holder (Cowl) always pointed downward position to avoid the deposition of heavy particles. An ester cellulose membrane filters "AAWP02500" having 0.8 µm-1.2 µm pore size diameter are to be used throughout the sampling for asbestos counts at work environment.

Mounting Procedure

4. Complete filter is to be placed on clean microscopic slide, dust side up at room temperature. Electrostatic force keeps the filter usually on the slide. Filters are to be exposed to acetone fumes and triacetin (Glycerol triacetate, Sigma). In this procedure a

small quantity of acetone in round bottom flask (500-1000ml) heated at the boiling point underwater bath, the vapors condensed in a simple condensing column. When the sufficient fumes of acetone become ready then pass it throughout on the filter for 3-5 seconds at a distance of 15-25 mm. put the 1-3 drops of Glycerol Triacetate (Triacetin) on the acetone-cleared filter. Place a cover slip on cleared filter by avoiding the air bubbles. Heat the cleared filter at 50°c for 15 minutes and leave it at room temperature for 24 hours under the action of triacetin to clear entire filter. Alternatively, membrane filter can also be made transparent with immersion oil (Leica Microsystems Wetzlar GmbH, Wetzlar). Using a phase contrast microscope with polarized light, Laborlux S (of M/s Leica, Germany) and then counting has to be done at magnification 400X-500x

$C = A/a \times N/n \times 1/r \times 1/t$

Where:

C= concentration in fibers per cubic centimeter rounded to first place of decimal,

N = total no. of fiber counted,

n = number of graticule areas observed,

A= effective filter area in mm^2

a= graticule counting area in mm^2,

r= flow rate of air through filter in $cm^3/min.$, and

t= single sample duration in minutes

5. To rule out the probability of the air borne asbestos in the existing scenario at the said site as well as other similar sites at the different work zones, it is necessary to have the asbestos fiber monitoring and sampling counts to be recorded at regular intervals. The environmental air sampling stations will have to be minimum three at 120 degree angle, within 1000-500 m from the ACM. The sampling frequency has to be in all three stages-Pre-Construction, Construction and Post Construction, while the personal sampling has to be done as stated above.

6. Bureau of Indian Standards (BIS) Guidelines for Safe Use of Products containing Asbestos states that “Asbestos cement products (such as AC pipes) generally contain about 10-15% asbestos fibers in a cement matrix that comprises the rest of the materials and are termed as locked in asbestos products as these products have the asbestos fibers bound in cement. The possibilities of air borne asbestos fiber will be in case of mishandling of encountered pipes with unsafe practice. During storing and installation; recommended work practices shall be followed to avoid harmful exposure”. According to Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016, any waste with asbestos concentration limit of 10,000 mg/kg (i.e. 1%), however this will apply only if the asbestos containing substances are in a friable, powdered or finely divided state. Under the Basel Convention[72], asbestos or asbestos waste in the form of dust and fibers is classified as hazardous waste. The applicable legislation under the present scenario are:

[72] Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, adopted in 1989

Summary of Asbestos Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Remark
Clearing, transfer and disposal of ACM pipes	Possibilities of air borne asbestos if handled unsafely, cut, drilled or broken into pieces that may cause: ❑ Inflammation of the lungs ❑ Mesothelioma ❑ Peritoneial mesotherlioma ❑ Pleural plaques ❑ Asbestosis ❑ Bronchogenic Carcinoma ❑ Second hand-exposure	Implement the AMP strictly that includes identification of hazards, the use of proper safety gear and disposal methods.	DBO Contractor/RUDSICO-EAP	There has to be a suitable call to be taken for in-situ disposal if the removed ACM pipes are not damaged, full length or 4.0 ft length not damaged.
Work in narrow streets	Possibilities of air borne asbestos if handled unsafely cut, drilled or broken into pieces that may cause: ❑ Inflammation of the lungs ❑ Mesothelioma ❑ Peritoneialmesotherlioma ❑ Pleural plaques ❑ Asbestosis ❑ Bronchogenic Carcinoma Second hand-exposure	Conduct awareness program on safety during the construction work Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day 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 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.	DBO Contractor /RUDSICO-EAP	All provision of safe working with proper signage has to be undertaken prior to work initiation, during the work and after the work.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Remark
Interventions in existing AC pipelines	Possibilities of air borne asbestos if handled unsafely cut, drilled or broken into pieces that may cause: ❑ Inflammation of the lungs ❑ Mesothelioma ❑ Peritoneialmesotherlioma ❑ Pleural plaques ❑ Asbestosis ❑ Bronchogenic Carcinoma Second hand-exposure	Appropriate actions as defined in the Asbestos Management Plan will have to be adhered to	DBO Contractor/RUDSICO-EAP	Measure to avoid the encounter & removal has to be prioritized and if the same is not avoided then the measures stated have to be strictly followed.
Documentation /record	Unmonitored ACM might be handled incorrectly and can cause release of airborne asbestos	To be formatted and kept as mentioned in the Asbestos Management Plan	DBO Contractor/RUDSICO-EAP	To be kept intact for easy tracking and reference in legible format. The same can be kept in soft format as well.

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Appendix 18: Sample Outline Spoil Management Plan

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the ULB, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils.
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like a) The type/material, b) Potential contamination by that type, c) Expected volume (site/component specific), d) Spoil Classification etc.

II. Spoils management

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. Documentation

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

Appendix 19: 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

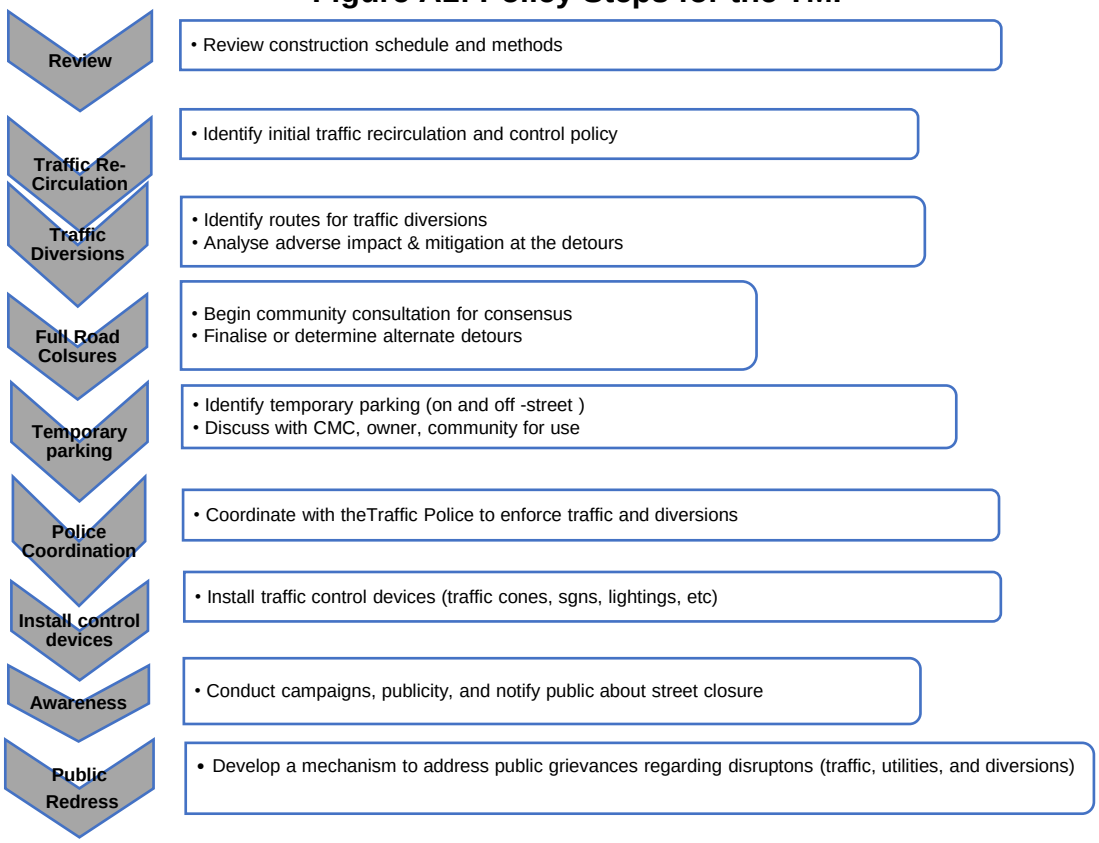
4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

(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:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

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

- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Lane closure on a two-line road with low volume (with yield sign)
- Lane closure on a two-line road with low volume (one flagger operation)
- Lane closure on a two lane road (two flagger operation)
- Lane closure on a four lane undivided Road
- Lane closure on divided roadway
- Half road closure on multi-lane roadway
- Street closure with detour

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

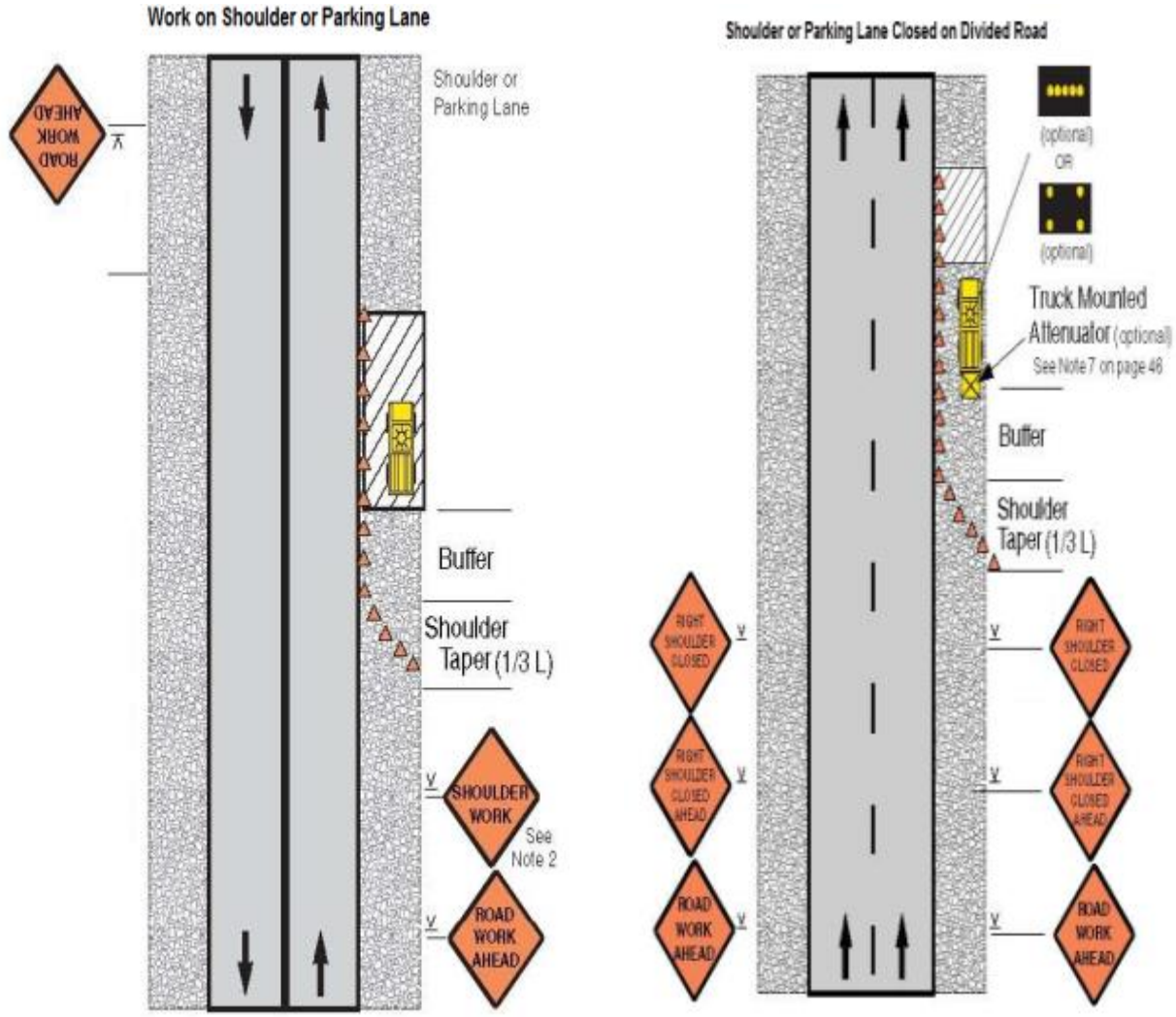


Figure A4 & A5: Work in Travel lane & Lane closure on road with low volume

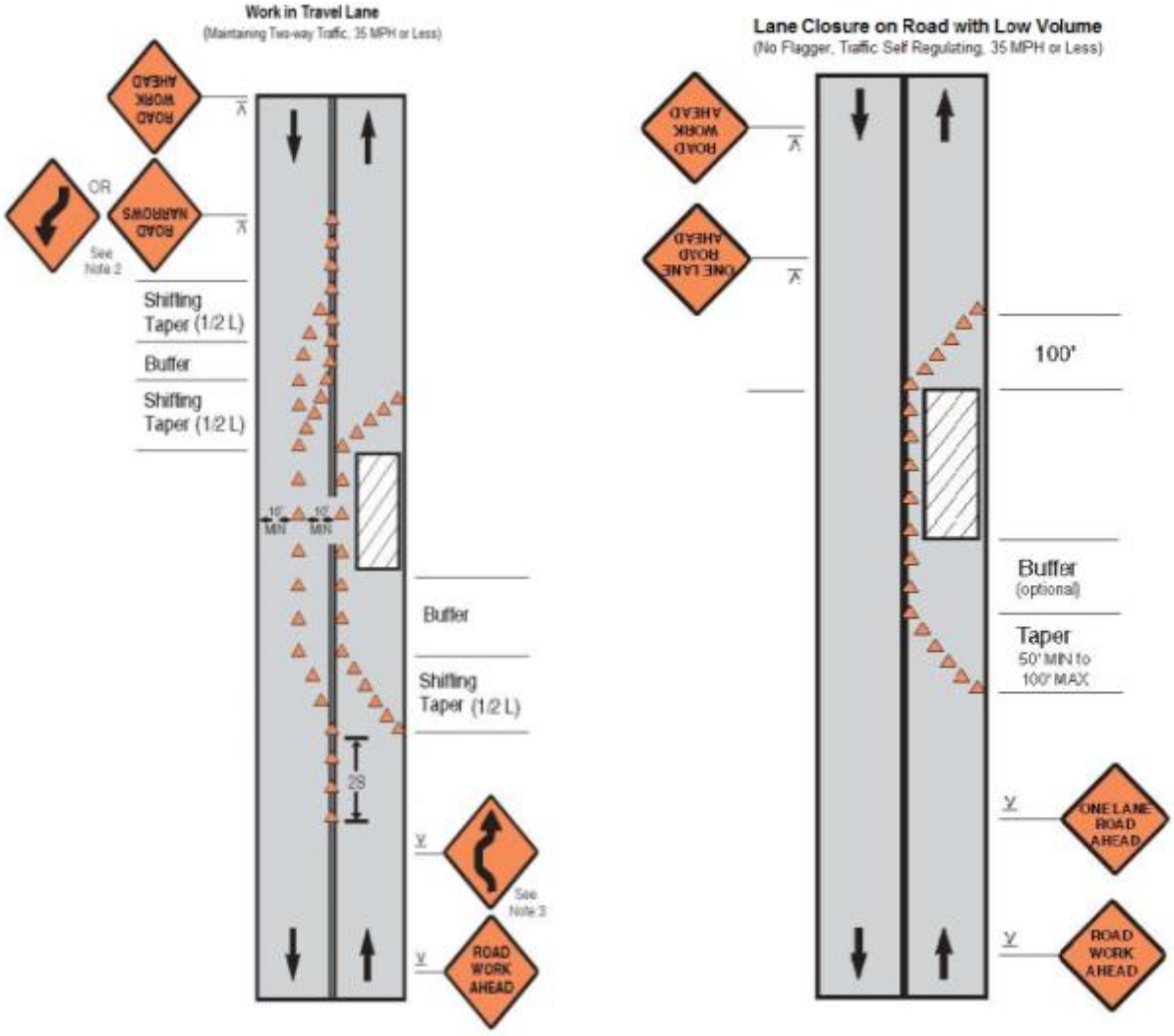
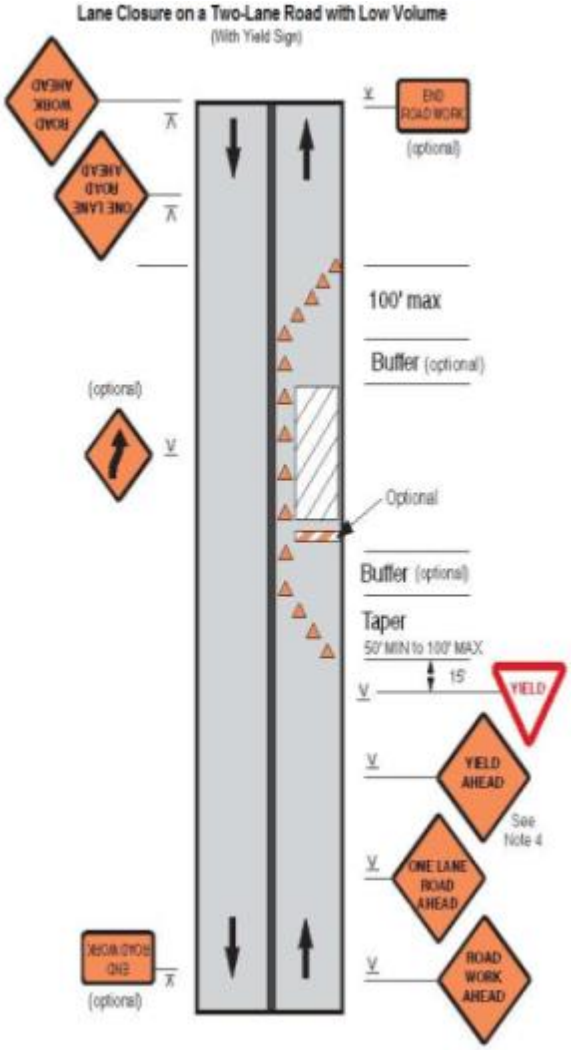


Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)



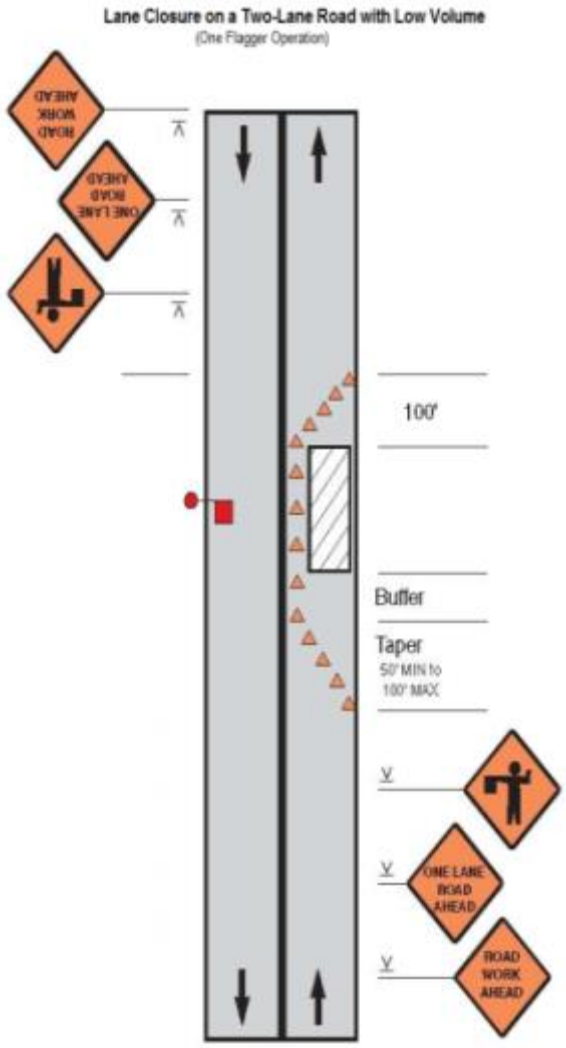


Figure A8 & A9: Lane Closure on a Two-Lane Road (Two Flagger Operation) & Lane Closure on a Four-Lane Undivided Road

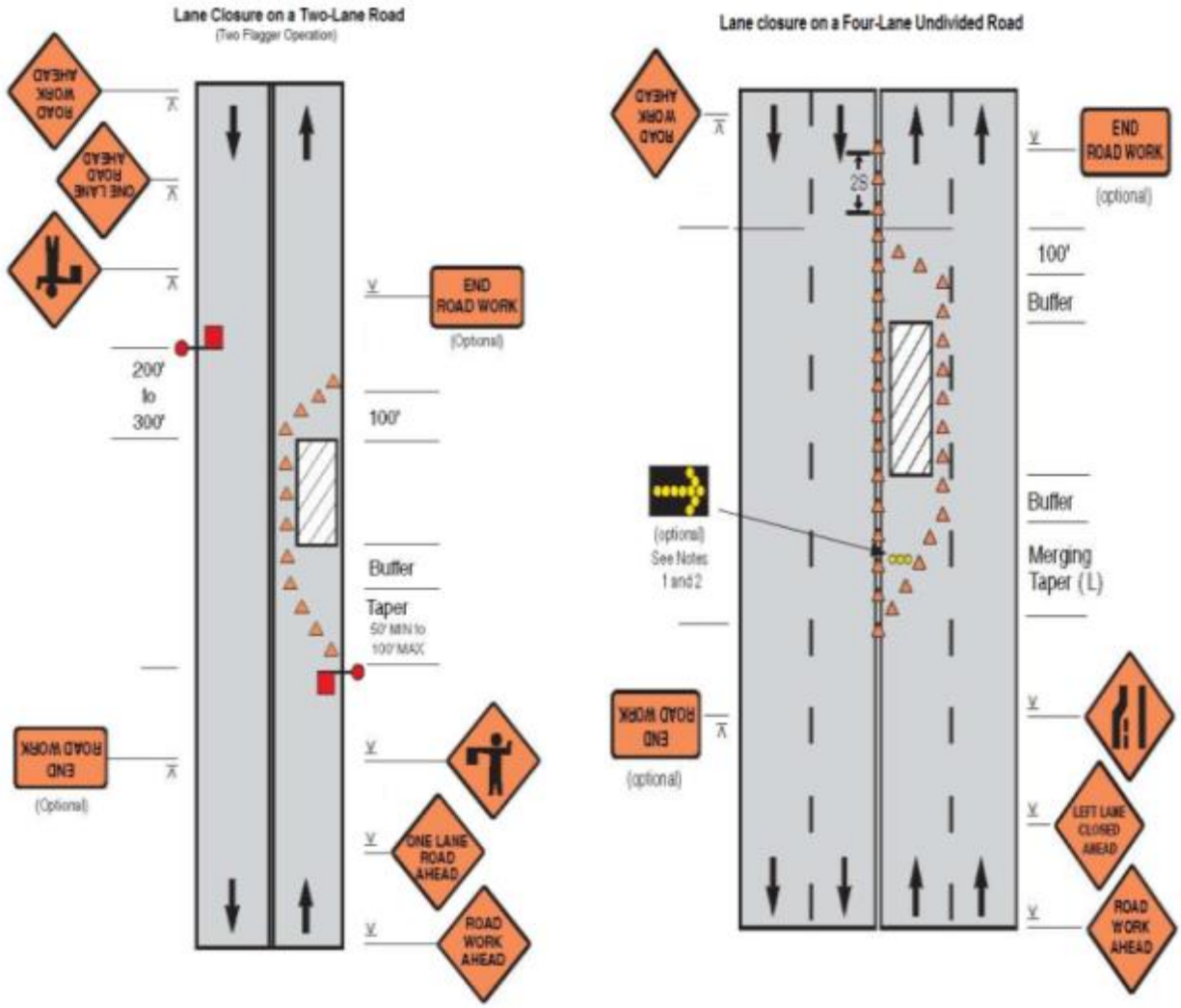
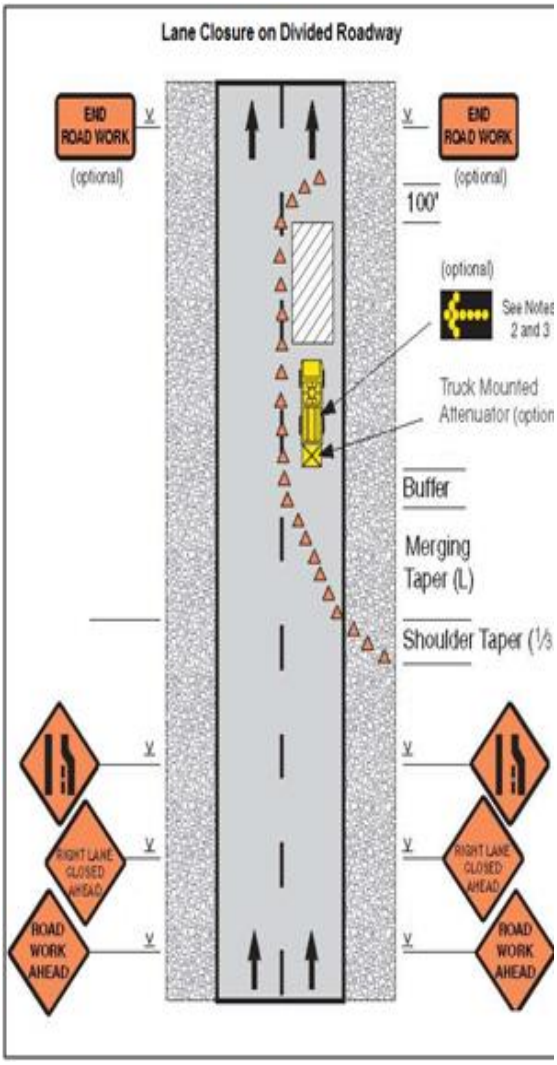


Figure A10 & A11: Lane Closure On Divided Roadway & Half Road Closure On Multi-Lane Roadway



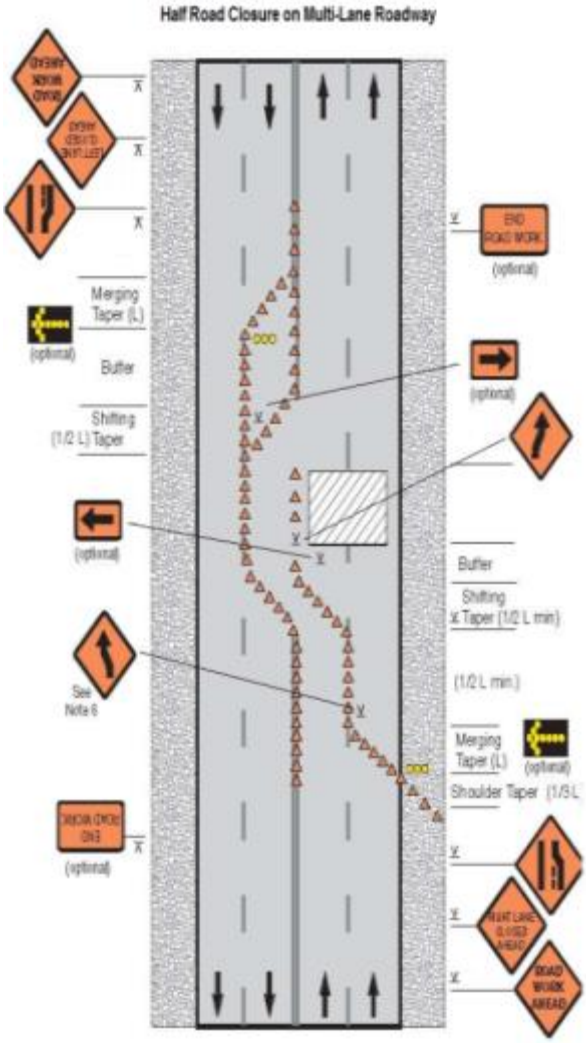
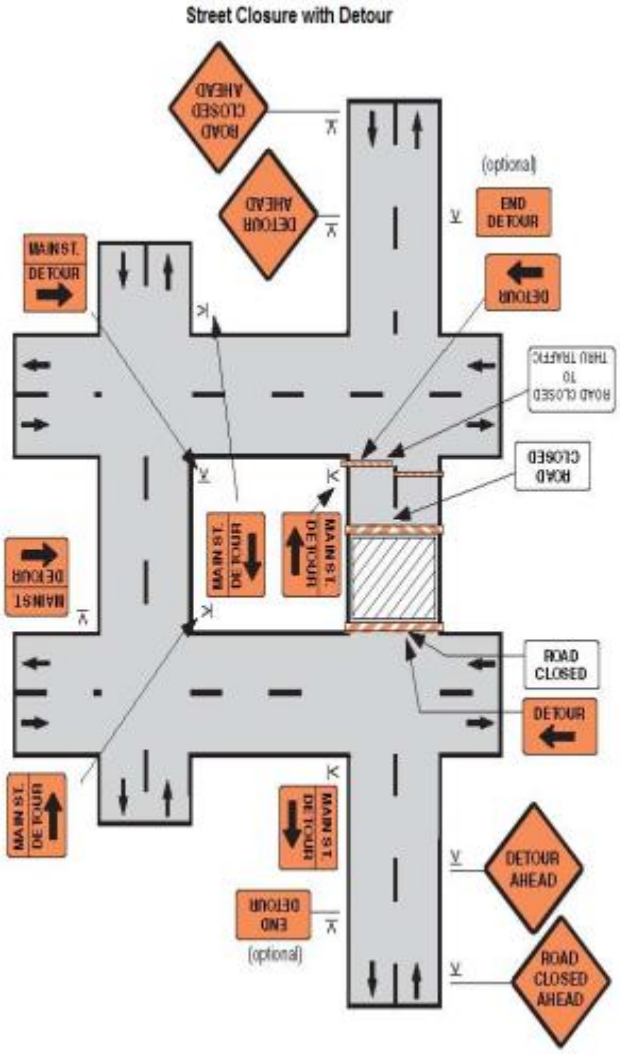


Figure A12: Street closure with detour



Appendix 20: 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 21: 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)

1.1Storage Area

a) 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.

b) 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.

c) 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.

d) Do not store container directly under the sun.

e) Weather cock should be installed near the storage to determine wind direction.

f) The storage building should be of non-combustible construction with at least two exits opening outside.

g) Neutralization system should be provided.

h) Continuous monitoring of chlorine leak detection equipment with alarm should be installed in the storage area.

i) The area should be free and remote from elevators, gangways or ventilating system to avoid dangerous concentration of Chlorine during leak.

j) Two portable foam type fire extinguishers should be provided in the premises.

k) Corrosive substances shall not be stored nearby which react violently with each other.

l) Unauthorized person should not be allowed to enter into the storage area.

m) The floor level of storage shed should be preferably 30 cms (at least one foot) higher from the ground level to avoid water logging.

n) Ensure that all containers are properly fitted with safety caps or hooks.

1**.2. Cylinder & Drum Containers**

a. Store chlorine cylinders upright and secure them so that they do not fall.

b. Drum containers should be stored on their sides on rails, a few inches above the floor. They should not be stacked one upon the other. They should be stored such that the valves are in vertical plane.

c. Keep enough space between containers so as to have accessibility in case of emergency.

d. Store the containers in a covered shed only. Keep them away from any source of heat as excessive heat may increase the pressure in container which will result into burst.

e. Do not store explosives, acids, turpentine, ether, anhydrous ammonia, finely divided metals or other flammable material in the vicinity of Chlorine.

f. Do not store containers in wet and muddy areas.

g. Store filled and empty containers separately.

h. Protective covers for valves are secured even when the containers are empty, except during use in the system.
i. Never use containers as a roller to move other equipment.
j. Never tamper with fusible plugs of tonners.
k. Check leakages every day by means of ammonia torch. However, it should not be touched to brass components like valves of container for safety.
l. Never carry out any welding work on the chlorine system as combustion of steel takes place at 2510C in presence of chlorine.
m. The boxes containing emergency kit, safety applications and self contained breathing apparatus should be kept in working order in an easily approachable area.

1.3. Use of Cylinders & Drum Containers in Process System

a. Use containers in the order of their receipt, as valve packing can get hardened during prolonged storage and cause gas leaks.
b. Do not use oil or lubricant on any valve of the containers.
c. Badly fitting connections should not be forced and correct tool should always be used for opening and closing valves. They should never be hammered.
d. The area should be well ventilated with frequent air changes.
e. Transport the cylinders to the process area by using crane, hoist or railings etc.
f. The drum containers should be kept in a horizontal position in such a way that the valves are in a vertical plane. The upper valve gives out gas and the lower one gives out liquid chlorine.
g. The cylinder should be kept in upright position in order to release gas from the valve. For liquid chlorine withdrawal, it should be inverted with the help of an inverted rack.
h. Connect the containers to the system by using approved accessories.
i. Use copper flexible tube, with lead washer containing 2 to 4% antimony or bonded asbestos or teflon washer. Use yoke clamp for connecting chlorine container.
j. Never use rubber tubes, PVC tubes etc. for making connections.
k. Use the right spanner for operating the valve. Always keep the spanner on the valve spindle. Never use ill fitting spanner.
l. After making the flexible connection, check for the leakage by means of ammonia torch but it should not come in contact with a valve.
m. Keep minimum distance between the container valve and header valve so that during change-over of the container, minimum amount of gas leaks.
n. The material of construction of the adopter should be same as that of valve outlet threads. o. The valve should not be used as a regulator for controlling the chlorine. During regulation due to high velocity of Chlorine, the valve gets damaged which in turn can cause difficulty in closing.
p. The tools and other equipment used for operating the container should be clean and free of grease, dust or grit.
q. Wear breathing apparatus while making the change-over of the container from the process header.
r. Do not heat the container to withdraw more gas at faster rate.
s. Use pressure gauge and flow measuring device to control the flow and to know the quantity of gas left in the container.

t. Use an inverted U type barometric leg or vacuum breaking arrangement for connecting the container to the process piping.
u. Withdrawal of the gas should be stopped when the gas pressure inside the container is between 0.1 to 0.5 kg/cm2 approximately.
v. If withdrawal of the gas from the container connected to the process system has to be suspended for long intervals, it should be disconnected from the system, and the valve cap and hood replaced.
w. Gas containers should be handled by trained persons only.

1.4. Disconnecting Containers from Process System

a. Use breathing apparatus before disconnecting the container.
b. First close the container valve fully. After removal of chlorine the process valve should be closed.
c. Remove the flexible connection, plug the flexible connection in order to avoid entry of humid air. Replace the valve cap or hood on the container.
d. Put the tag on the empty container & bring it to storage area marked for empties. e. Check for the leakage.

1.5. Loading and Unloading of Containers

a. The handling of containers should be done under the supervision of trained and competent person.
b. It should be done carefully with a crane, hoist or slanted ramp. Do not use magnet or sharp object for lifting the containers.
c. Small cylinders should not be lifted by means of valve caps as these are not designed to carry the weight.
d. The containers should not be allowed to strike against each other or against any hard object.
e. Vehicles should be braked and isolated against any movement.
f. After loading, the containers should be secured properly with the help of wooden wedges, rope or sling wire so that they do not roll away.
g. The containers should never be dropped directly to the ground or on the tyre from the vehicle.
h. There should be no sharp projection in the vehicle.
i. Containers must have valve caps and plugs fitted properly.
j. Check containers for leakage before loading/unloading.

1.6. Transportation of Container

a. The name of the chemical along with diamond pictorial sign denoting the dangerous goods should be marked on the vehicle.
b. The name of the transporter, his address and telephone number should be clearly written on the vehicle.
c. The vehicle should not be used to transport any material other than what is written on it. d. Only trained drivers and cleaners should transport hazardous chemical
e. The driver should not transport any leaking cylinder.
f. The cylinder should not project outside the vehicle.

g. The transporter must ensure that every vehicle driver must carry “Trem Card” (Transport Emergency Card) and ‘Instructions in writing booklet’ and follow them.
h. Every driver must carry safety appliances with him, viz; Emergency kit, breathing apparatus etc.
i. The vehicles must be driven carefully, specially in crowded localities and on bumpy roads. Do not apply sudden brakes.
j. Check for the leakage from time to time.
k. In the case of uncontrollable leakage the vehicle should be taken to an open area where there is less population.

1.7. Emergency Kit It consists of various tools and appliances like gaskets, yokes, studs, tie rods hoods, clamps, spanners, mild steel channels, screws, pins, wooden pegs etc. of standard sizes. Separate kits are used for cylinders and tonners. All the gadgets are designed for using in controlling or stopping the leakages from valves, fusible plug and side walls of cylinders and containers used for handling chlorine.
a. Leakage may occur through the valve. There are basically four types of valve leaks.
I. Valve packing
II. Valve seat
III. Defective inlet thread
IV. Broken valve thread
b. Leakage may occur through container wall. For controlling such leakages, clamps are used for cylinders and chain and yoke arrangement is used for tonner. Sometimes wooden peg is used by driving into the leaking hole as a temporary arrangement.
c. Leakage may occur through fusible plug.
i. If the leakage is through the threads of fusible plug, yoke, hood and cap nut arrangement is used to control the leak.
ii. If fusible metal itself in the plug is leaking, yoke and stud arrangement is used to control the leak.

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

a. General Remove the affected person immediately to an uncontaminated area. Remove contaminated clothing and wash contaminated parts of the body with soap and plenty of water. Lay down the affected person in cardiac position and keep him warm. Call a physician for medical assistance at the earliest. Caution: Never attempt to neutralize chlorine with other chemicals.
b. Skin Contact Remove the contaminated clothes, wash the affected skin with large quantity of water. Caution: No ointment should be applied unless prescribed by the physician.
c. Eye Contact If eyes get affected with liquid chlorine or high concentration of chlorine gas, they must be flushed immediately with running water for atleast 15 minutes keeping the eyelids open by hand. Caution: No ointment should be used unless prescribed by an eye specialist.
d. Inhalation If the victim is conscious, take him to a quiet place and lay him down on his back, with head and back elevated (cardiac position). Loosen his clothes and keep him warm using blankets. Give him tea, coffee, milk, peppermint etc. for making good

effect on breathing system. If the victim is unconscious, but breathing, lay him down in the position mentioned above and give oxygen at low pressure until the arrival of doctor. If breathing has stopped, quickly stretch him out on the ground or a blanket if available, loosen his collar and belt and start artificial respiration without delay. Neilson arm lift back pressure method is useful. Automatic artificial respiration is preferable if available. Continue the respiration until the arrival of the doctor. Amboo bag can also be used for this purpose.

3. On-Site Emergency Plan to Cover the Leakage ofChlorine

3.1. 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:

3.2. 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.

3.3. Appointing Key Persons In order to control the incident like chlorine leakage, it is essential to appoint various persons with their well-defined responsibilities. Taking into account the various activities likely to be involved, the following key persons are appointed (i) Site Controller, (ii) Incident controller, (iii) Shift Executive In charge, (iv) Communication Officer, (v) Safety Officer, (vi) Fire and Security Officer, (vii) Utilities and Services In charge, (viii) Traffic Controller, (ix) First Aider

3.4. 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.

3.5. 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.

3.6. 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.

3.7. Communication

Communication officer shall establish the communication suitable to that incident.

3.8. 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.

3.9. Emergency

Measures In case of leakage or spillage of Chlorine, the following emergency measures should be taken:

a) Take a shallow breath and keep eyes opened to a minimum.

b) Evacuate the area.

c) Investigate the leak with proper gas mask and other appropriate Personal protection.

d) The investigator must be watched by a rescuer to rescue him in emergency.

e) If liquid leak occurs, turn the containers so as to leak only gas.

f) In case of major leakage, all persons including neighbours should be warned.

g) 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.

h) Under no circumstances should water or other liquid be directed towards leaking containers, because water makes the leak worse due to corrosive effect.

i) 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.

j) Use emergency kit for controlling the leak.

k) 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.

l) 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.

m) Only specially trained and equipped workers should deal with emergency arising due to major leakage.

n) If major leak takes place, alert the public nearby by sounding the siren.

o) Any minor leakage must be attended immediately or it will become worse.

p) If the leakage is in the process system, stop the valve on the container at once.

3.10. Safety Systems Required at Chlorination Plant

The following safety systems should be kept ready at the chlorination plant:

a. Breathing apparatus.

b. Emergency kit.

c. Leak detectors.

d. Neutralisation tank.

e. Siren system.

f. Display of boards in local language for public cautioning, first aid and list of different authorities with phone numbers.

g. Communication system.

h. Tagging system for equipments.

i. First aid including tablets and cough mixtures.

j. Exhaust fans.

k. Testing of pressure vessels, chlorine lines etc. every year as per factory act.

l. Training & mock drill.

m. Safety showers.

n. Eye fountain.

o. Personal protective equipment.

p. Protecting hoods for ton-containers.

q. Fire extinguishers.

r. Wind cock.

Appendix 22: Details of Public Consultations

A. Summary of Public Consultations Conducted in October 2018 and April 2018

i. Public Consultations at Different Sub-project Locations in Khetri Town (Held on 08/10/2018)

S.No	Name of Persons	Location	Topic Discussed	Outcome
1.	Suresh, Purshottam, Madan Lal, Jai Dayal, Ravi Prasad Saini, C.D.Yadav, Prahlad Singh Songara, Liladhar Songara, Lal Ram & Dhan Shree Ram.	Near STP site (Near Purani Chungi)	Awareness of the project–including Project Coverage area, Present condition of water supply in the town 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. Occurrence of flood 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	Some People are aware of the proposed Project. Present water supply is from tube wells and supply is very erratic. The quality of water is poor. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor. People demand 24X7 supply connections to be provided to their area under the proposed. They are willing to pay for getting regular potable water. People are concerned about the poor sewerage conditions. There is not any forest, wildlife or any sensitive /unique environmental, component nearby the project. There are not any historical/cultural and

S.No	Name of Persons	Location	Topic Discussed	Outcome
			vehicle for construction activities. Requirement of enhancement of other facilities Treated water management released from STP. Willingness to pay for improved services.	religious sites in nearby the subproject area. Climate is dry except during monsoon season. There are no natural disasters such as flood and earthquake occurred in recent past. 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. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise, PPE's will be provided to workers such as ear muff etc. 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

S.No	Name of Persons	Location	Topic Discussed	Outcome
				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. Treated water will be reuse in agricultural activities in nearby area. People are willing to pay for the improved services in the town.
2.	Bhanwar Singh, Pawan Kumar Sharma, Kartar Sharma, Shyam Singh Chouhan, Vijay Kumar Jangid, Jagdish, Mukesh, Kishan, Subhash Chandra Saini, Kuldeep Saini, Dinesh & Babu Lal	Near CWR & PH at A.En. Campus and SPS (Near Ward No.-18 & 16).	Awareness of the project-including Project Coverage area. Present condition of water supply & 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. Present drinking water problem-quantity and quality Dust and noise pollution and disturbances during	Some People are aware of the proposed Project of water supply and sewerage in the town. Sewerage flow in open drains. People are concerned about the poor sewerage conditions and water supply. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor. People demand 24x7 supply connections to be provided to their area under the proposed. They want to engage with the project as a job opportunity and

S.No	Name of Persons	Location	Topic Discussed	Outcome
			construction work. Public Health by proposed water supply & Sewerage subproject Present solid waste collection and disposal problem. Setting up worker camp site within the village/ project locality Plantation measures in nearby the area. Foul smell and vector borne diseases. Safety of residents during construction phase and applying of vehicle for construction activities. Treated water reuse in Agriculture activities etc. Requirement of enhancement of other facilities. Willingness to pay for improved services.	want to become beneficiaries. There is 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. Drainage and sewerage condition is poor in the town and flow in open drains. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic and quality is poor. People demand 24x7 supply connections to be provided to their area under the proposed. They are willing to pay for getting regular potable water. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. PPE's will be mandatory for engaged workers at site. By the proposed project of water supply & sewerage in the

S.No	Name of Persons	Location	Topic Discussed	Outcome
				town, health of public will be improved. Sanitation will be improved by measures of sewage treatment & Management. By the proposed Sewage pumping station, foul smell and vector borne disease will be mitigate. There is enough space available nearby the project area to establish labour camp. People suggested to establish the worker camp away from the habitation so there is no conflict and disturbances. People want to plantation programme in the town and ensure the aftercare measures such as watering and manuring etc. 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. By the proposed project of sewerage in

S.No	Name of Persons	Location	Topic Discussed	Outcome
				the town, treated water will be reuse in agriculture activities etc. The local feels that Parks, play grounds and Community halls are required in this town and in addition. People are willing to pay for improved services in the town.

Photographs of Public Consultation held on 8.10.2018



















Near CWR , PH & SPS (at Ward No. 18 & 16)













Near STP (Near Purani Chungi)

ttendance Sheets of Public Consultations held on 8.10.2018

Consultation with Stakeholders (Project Planning Phase)

wn: Khetri
08/10/2018

Name of the project: Water & Sewer Pusam K (STP.)
Place of consultation: Chungi pass

Name and mobile no.	Designation and/or Address	Signature
Suresh	Helper	
Purshottam	Agriculture.	
Madan Lal.	Shop.	
Jai Dyl.	Shop.	
Ranti Prasad Saini	Shop	
C.D. Yadav.	Ex. Servicemen	9413546027
Prahald singh Songara	Shop	9352 [illegible]
Liladhar Songara	Mechanic.	9314750962
Lal Ram	Shop.	
Dhan Shree Ram	Mechanic	

Consultation with Stakeholders (Project Planning Phase)

Project Town: Khetri
Date: 08/10/2018

Name of the project: Water & Sewage Supply
Place of consultation: A En. Campus SPS

S.No.	Name and mobile no.	Designation and/or Address	Signature
1	Bhanwar Singh.	Retired ICL	8740084585
2	Pawan Kumar Sharma	HDFC. Employee	Talwan 9928107217
3	Kartar Sharma	RSRTC.	
4	Shyam singh Chouhan	PHED.	
5	Vijay Kumar Jagnia	Carpenter	
6	Jadish	House stay.	
7	Mukesh	private job.	9571968249.
8	Kishan	Driver	
9	Subash Chandra Saini	PWD.	
10	Kuldeep Saini	private	7691096960
11	Dinesh	Labour.	9950437402
12	Babu Lal.	Ex. Servicemen PHED.	

Any special issue noted at site:

ii. Stakeholder Consultation Conducted on 5 – 6th April 2018

Sr. No	Name of Persons	Location	Topic Discussed	Response / Outcome
1	Mr. Umrao Singh Kumawat, (Chairman, Municipal Council, Khetri)	Residence of Chairman, Khetri	Present water supply in town, Understanding about the project, Religious place in Khetri town, Industrial development in town, employment status Solid Waste Management conditions Wild life (flora and fauna) found in town Transport facilities History and culture	It was informed that presently Water Supply is being done once in 4-5 day, for half hour to one hour People are not aware about the project but Municipal Council is well aware about the project No sewerage system in the town, septic tank being used, open defecation is not uncommon. Solid waste management in town is done through 4 SW collection and transport tipper and 2 tractor, SW is collected manually from houses and dumped open at Chandbari area of Ward no.2, in the abandoned mining trenches Congested roads in old city Road transport is the only means of transport, nearest railway stations is at Chirawa (30 Kms) from Khetri on Jaipur-Jhunjhunu route Mostly agriculture and business activities exist in town. Khetri copper mine is the major industry of Government where many people provide their service as employee, worker and contractors There are many old heritage private buildings in town and Khetri is famous for heritage and tourism among foreigners
2	Puranmal Saini, Weilder, PHED, Mukesh, Helper, PHED, Gokul	PHED Office	Present Status of Water Supply in the town Work Proposed by RUDSICO-EAP	Present system of water supply is very old and OHSRs and CWR along with pumping machinery is very old due to

Sr. No	Name of Persons	Location	Topic Discussed	Response / Outcome
	Chandra, Pump operator, PHED, Mukesh Saini, PHED		Quality of present Water Supply and present sewerage system Willingness to pay for improved services	which there is need of refurbishment or replacement of these structures, and pipe lines are profusely leaking and there is huge loss of water. People are concerned about the poor supply (intermittent supply once in 4-5 days) and quality of water. People are not aware about the project but supportive of the project. People are willing to pay for improved services. No sewerage system exist in town
3	Mr. Gyarsi Lal, Madan Lal, Bahadur Mal, Mukesh Saini, f	Ward no. 20	Present Status of Water Supply and sewerage in the town Work Proposed by RUDSICO-EAP Quality of present Water Supply. solid waste management	Water supply is intermittent and not reliable, quality is also poor People are willing to pay for the improved quality of water. No proper arrangement of solid waste collection by municipality No sewerage system in the city People are not aware about the project
4	Vinay kumar Jangid, Redisent of ward no. 18,	Ward No 18	Status of land proposed for STP Presence of wildlife near proposed site Awareness about the project	Land proposed for STP is vacant land and part of land is encroached by some people No wildlife exist near SPS site People are not aware about the project
5	Gayatrilal, Madanlal, Bahadurlal,	Ward No-20	Present Status of Water Supply in the town Work Proposed by RUDSICO-EAP Quality of present Water Supply. Status of Sewerage Willingness to pay for improved services	People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. There is no sewerage system in the town. People are supportive of the project. People are willing to pay for improved services.
6	Rafiq,Kanhaiyalal,Bijendra Saini,Fahin Uddin,Lokendra,Pramod Saini	Bus stand	Present Status of Water Supply in the town Work Proposed by RUDSICO-EAP Quality of present Water Supply. Status of Sewerage Willingness to pay for	Water supply is intermittent and on alternate days. . No sewerage in town. People are willing to pay for the improved quality of water.

Sr. No	Name of Persons	Location	Topic Discussed	Response / Outcome
			improved services	
7	Sawarmal Saini,Suresh Saini	Bilwa Bus stand	Present Status of Water Supply in the town Work Proposed by RUDSICO-EAP Quality of present Water Supply. Status of Sewerage 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. (especially women) People understand direct benefits along with latent benefits of the project
8	Pawan kumar Jairiya,Ramsingh Chawaria,Lalchandra Chawaria,Ompraksh Agrawal	Nagar Palika	Present Status of Water Supply in the town Work Proposed by RUDSICO-EAP Quality of present Water Supply. Status of Sewerage 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. (especially women) People understand direct benefits along with latent benefits of the project
9	Sonu Kumawat,Pannalal Agrawal,Rajendra Prasad Gupta,Umesh Kumar Saini,Harish Chandra Saini,Mohmad Tohib	Sabji Mandi	Present Status of Water Supply in the town Work Proposed by RUDSICO-EAP Quality of present Water Supply. Status of Sewerage 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. (especially women) People understand direct benefits along with latent benefits of the project

Photographs Public consultation at Khetri (5-6th April 2018)




Public consultation at Ward no-14 Khetri




Public consultation at Ward no-12 Khetri dt-

Meeting with Chairman,Nagar palika -




Consultation with local public

Consultation with local Businessmen




Consultation with Helper,PHED

Consultation with local public at Ward18



Consultations with public at Singhana Road, near Court



Consultations with vendors in the town



Consultations with vendors in Subji Mandi



KHETARI BUS STAND

Location	Name of Participants	Age	Occupation	Signature	Mob.
Bus Stand	Manoj Kumar	40	Veg.		
"	Tikam Das	40	Fruit		7737975151
MANDI	विजेश कुमार मारवाह	45	contri.		9314529364
	विक्रम	27	Contr.		9461374173
	रतनलाल	51	मजदूर		7023246
	सेवानन्द कुमार	50			3799177521
	मुरारी लाल	60	Citizen.		9855653472
	रामेश्वर	61	Citizen		9829502841
	Kanhaiya	40	मजदूर		9829935251
	Dharmendra Sain	42	Private Job		9829935248

अधिशासी अधिकारी
नगरपालिका, सीकर

B. City Level Committee (CLC) Meeting with Stakeholder on 11.01.2018.

Stakeholder Consultations meeting was held at Jhunjhunu under chairmanship of District Collector, Jhunjhunu on dtd. 02.01.2018. Different stakeholders like PHED, Municipal Council, PWD, Water Resource Department (WRD), public representative (MLA), RUDSICO-EAP officials, Design Consultant etc. were present in this meeting. Proposed scope of works was discussed with stakeholders by design consultant and RUDSICO-EAP. Land issues were also discussed with different stakeholders and concerned departments were agreed to arrange the required lands for different components of the project. Proposed works were approved by CLC members in this meeting. Minutes of Meeting of CLC are given below-

Minutes of City Level Committee (CLC) Meeting Held on 11.01.2018



राजस्थान सरकार
कार्यालय अधीक्षण अभियन्ता आर.यू.आई.डी.पी. फैज III झुन्झुनूं (राज.)
C/o श्री जगमाल सिंह लाम्बा, वार्डनं. 10, तहसील के पास, झुन्झुनूं(राज.)

क्रमांक 1219-33 दिनांक 11/01/2018

बैठक कार्यवाही विवरण

श्रीमान जिला कलक्टर की अध्यक्षता में दिनांक 02.01.2018 को जिला परिषद सभागार में सदर खेतड़ी एवं मण्डावा में पेयजल एवं सिवरेज कार्यों की डीपीआर हेतु सीएलसी की मीटिंग आयोजित की गई जिसमें निम्नलिखित अधिकारी/प्रतिनिधि उपस्थित हुये:—

श्री दिनेश कुमार यादव	जिला कलेक्टर, झुन्झुनू
➢ श्री पुरुषमल डीडी	विधायक खेतड़ी
➢ श्री नरेन्द्र कुमार चौधरा	विधायक मण्डावा
➢ श्री रामेश्वरम	सभापति नगरपालिका मण्डावा
➢ श्री उमराव सिंह	सभापति नगरपालिका खेतड़ी
➢ श्री वी.एल. पारीक	अधीक्षण अभियन्ता (WW) आरयूआईडीपी जयपुर
➢ प्रवीण आसोदिया	अधीक्षण अभियन्ता (WS) आरयूआईडीपी जयपुर
➢ श्री मोहनलाल मीना	अधीक्षण अभियंता, आरयूआईडीपी झुन्झुनू
➢ श्री रविन्द्रकालाल	अधीक्षण अभियन्ता जल स्वा अभि मिशन झुन्झुनू
➢ श्री रमेश चन्द्र रोही	अधिशासी अभियंता, आरयूआईडीपी झुन्झुनू
➢ श्री अनिल जोगपाल	अधिशासी अधिकारी नगरपालिका खेतड़ी
➢ श्री भरत कुमार	अधिशासी अधिकारी नगरपालिका मण्डावा
➢ श्री रणवीर सिंह	खुफिया अधिकारी झुन्झुनू
➢ श्री विनय कुमार	सहायक अभियंता, जल स्वा अभि मिशन खेतड़ी
➢ श्री मोहन लाल	कन्सलटेंट रीटीएस जयपुर
➢ श्री महावीरराम रोही	सहायक अभियंता, पीएचईडी उपखण्ड सूरजगढ़
➢ श्री धर्मेन्द्र सिंह	पार्षद खेतड़ी
➢ श्री मोन्द सिंह	केयूएसएस
➢ श्री सुरजीत सरण	एसडीई पीएचईडी झुन्झुनू

श्रीमान अध्यक्ष महोदय की अनुज्ञा से श्री प्रवीण आसोदिया अधीक्षण अभियन्ता (WS) आरयूआईडीपी जयपुर ने डीपीआर के विभिन्न घटकों/अवयवों के बारे में विस्तार से अवगत कराया तथा डीपीआर [खेतड़ी लागि रू 87.94 करोड़ एवं मण्डावा लागि रू 118.21 करोड़] के अनुमोदन हेतु उपस्थित सदस्यों से निवेदन किया। उपस्थित सभाध अधिशासीगण एवं प्रतिनिधियों द्वारा डीपीआर का स्लाईस में अनुशीलन किया गया।

अन्त में बैठक में उपस्थिति सभी अधिकारीगण/प्रतिनिधिगण का आभार व्यक्त किया गया।
मीटिंग कार्यवाही विवरण श्रीमान जिला कलक्टर झुन्झुनू से अनुमोदित है।

अधीक्षण अभियन्ता
आरयूआईडीपी फैज III झुन्झुनू

क्रमांक 1219-37 दिनांक 11/01/2018

1. माननीय सांसद महोदय,संसदीय क्षेत्र झुन्झुनू
2. श्रीमान पुलिस अधीक्षक झुन्झुनू।
3. माननीय विधायक महोदय, विधानसभा क्षेत्र मण्डावा/खेतड़ी
4. निजी सचिव ,श्रीमान परियोजना निदेशक आरयूआईडीपी जयपुर।
5. सभापति, नगरपालिका, मण्डावा/खेतड़ी
6. अधिशासी अधिकारी, नगरपालिका, मण्डावा/खेतड़ी
7. अधीक्षण अभियन्ता जल स्वा अभि मिशन (सूत्र/प्रोजेक्ट)
8. अधीक्षण अभियंता, सार्वजनिक निर्माण विभाग, झुन्झुनू
9. नगर नियोजक , झुन्झुनू
10. स्थानीय पैप सरकारी जेण्डल प्रतिनिधि/पीडीओस

अधीक्षण अभियन्ता
आरयूआईडीपी फैज III झुन्झुनू

Transcript

A city level committee meeting was held under the chairmanship of District Collector, Jhunjhunu on dated 11.01.2018 Project Consultant briefed them about the proposed water supply and sewerage works and informed that main objective of proposed water supply works is to reduce Non-Revenue Water.

Superintendent Engineer
RUIDP (PIU**)**

CONSULTATION AT STP NEAR KHARIYA KUA, KHETRI DATED 27.02.2020

Consultation with nearby habitants (as per attached attendance sheet) of STP site near Khariya Kua along with Mr. Udai Singh, Executive Officer, Nagar Palika, Khetri and Mr. Narendra Ajmera (ACE, PMU RUIDP, Mr. Rakesh Mudgal, SE, PIU, RUIDP, Mr. Navin Singhal, EE, PIU RUIDP and ADB mission and consultants dated on 27.02.2020 and discussed the environmental concern of proposed STP near Khariya Kua, Khetri. They were agreed and given their verbal consent for construction of Sewage treatment plant at designated place. During discussion following points have discussed and outcomes are as follows:

Points discussed	Outcomes
Awareness of the project–including Project Coverage area,	They were aware of the proposed Project of water supply and sewerage in the town. They were concerned about the poor sewerage conditions.
Presence of any forest, wild life or any sensitive/unique environmental components nearby the project,	There is not any forest, wildlife or any sensitive /unique environmental, component nearby the project.
Presence of historical/ cultural/religious sites nearby.	There are not any historical/cultural and religious sites in nearby the subproject area.
Present solid waste collection and disposal problem	Solid waste collection facility is poor in this area.
Dust and noise pollution and disturbances during construction work.	It was agreed that contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the pollution control measures will be adopted at site to control the fugitive emission in the area and for control of noise.
Safety of nearby residents during construction phase and applying of vehicle for construction activities.	They were agreed that the contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion.
Treated water management released from STP.	People should be made aware through CAPC and outreach team of contractor before start of work in particular area. Treated water will be reuse in agricultural activities in nearby area.

They have given their consent with following conditions:

(i) Adequate Greenbelt should be developed to mitigate the problem of foul smell; if any

(ii) Proper fencing arrangement/boundary should be taken during construction of STP.

(iii) During construction please ensure proper stacking of material should be earmarked place that not to obstruct passage by the contractor.

(iv) All the safety will be provided during construction and operation of STP such as proper fencing, barricades, safe access to houses, reduction of dust and noise etc.

(v) Approach road from main road to STP will be extended upto nearby houses.

(vi) Employment opportunities for nearby habitants shall be explored by contractor to provide employment during construction and operation work of STP.

DETAILS OF PUBLIC CONSULTATION WITH ATTENDANCE SHEET

आज दिनांक 27.02.2020 को सेक्टरी में प्रस्तावित सीवरेज ट्रीटमेन्ट प्लान्ट के समीप निवास कर रहे लोगों से प्रोजेक्ट के बारे में चर्चा की गई। लोगों ने बताया कि विभाग द्वारा इनलोगों को परियोजना के बारे में पूर्णरूप से बताया गया, और इनलोगों को इस कार्य से किसी तरह की परेशानी नहीं है। परियोजना के अधिकारियों द्वारा आश्वासन कराया गया कि आपलोगों के लिए रास्ता पूर्व की तरफ से उपलब्ध रहेगा। सभी लोगों ने बताया कि इनलोग 15 साल से यहाँ निवास करते हैं।

धन्यवाद

Address:

Mobile No.

Appendix 23: 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 officials reviewing grievance)

Action taken:

Whether action taken disclosed: Yes
No

Means of disclosure:

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 24: 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) 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 25: 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 26: 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	Final IEE based on Detailed Design				Site-specific EMP (or Constructi	Remarks
			Not yet due	Submitted to ADB	Disclosed on	Final IEE provided		

		Stage/Detailed Design Completed)	(detailed design not yet completed)	(Provide Date of Submission)	project website (Provide Link)	to Contractor/s (Yes/No)	on EMP) approved by Project Director? (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 (Government Standards)			
			PM10 µg/m³	PM2.5 µg/m³	SO2 µg/m³	NO2 µg/m³

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				
29.	Site Inventory			
30.	List of Asbestos materials storage and installation points			
31.	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					

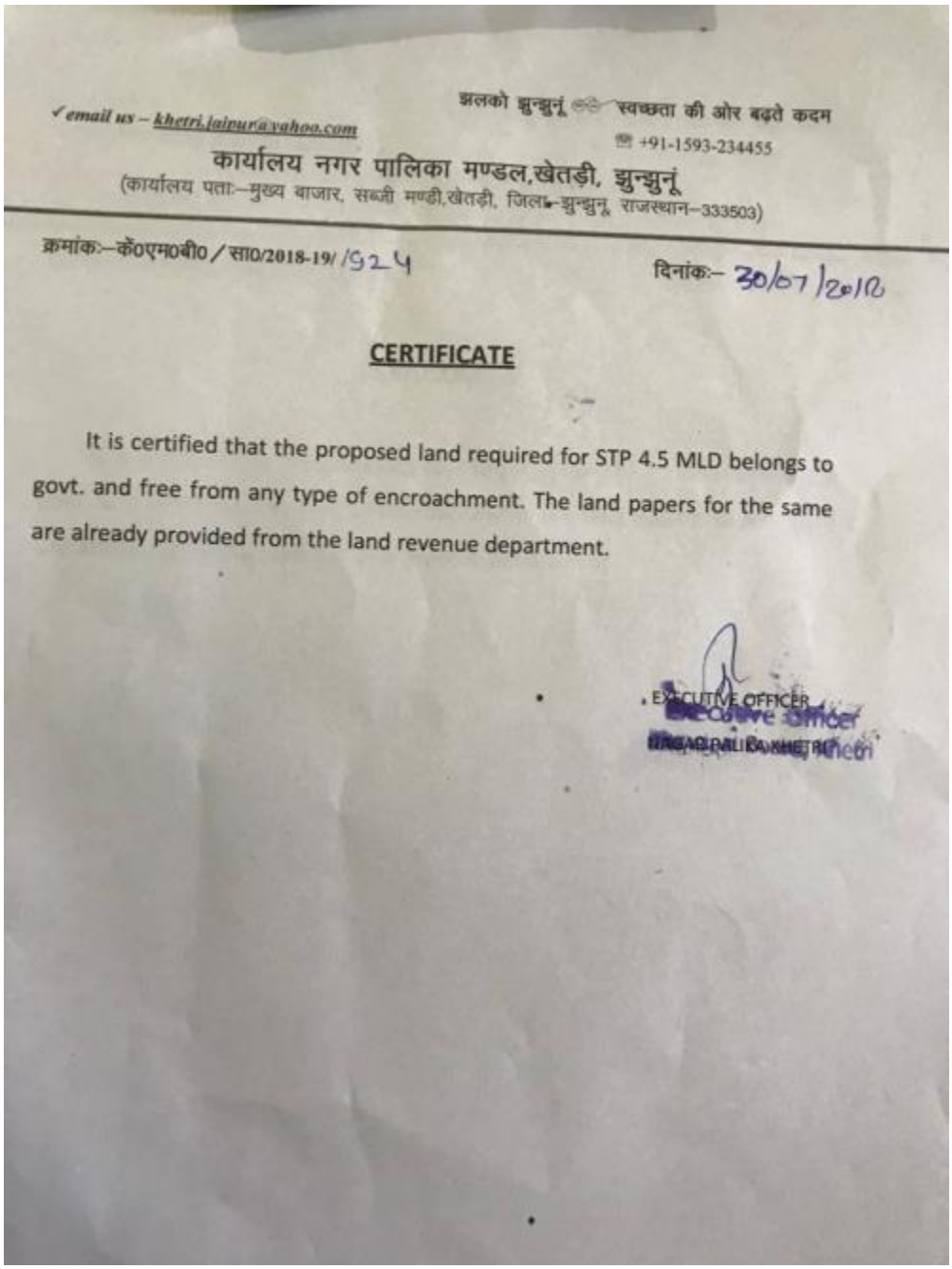
VIII. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

Appendix 27: NOC for STP Site



✓email us – khetri.jaipur@yahoo.com

झलको झुन्झुनूं स्वच्छता की ओर बढ़ते कदम

+91-1593-234455

कार्यालय नगर पालिका मण्डल,खेतड़ी, झुन्झुनूं

(कार्यालय पता:–मुख्य बाजार, सब्जी मण्डी,खेतड़ी, जिला–झुन्झुनू, राजस्थान–333503)

क्रमांक:–के0एम0बी0 / सा0/2018-19/ /924 दिनांक:– 30/07/2018

CERTIFICATE

It is certified that the proposed land required for STP 4.5 MLD belongs to govt. and free from any type of encroachment. The land papers for the same are already provided from the land revenue department.

EXECUTIVE OFFICER

Executive Officer

NAGAR PALIKA KHETRI

Appendix 28: WHO Interim Guidance on Health, 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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