

# Initial Environmental Examination

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(Additional Scope)

The work of Waste Water Subproject is already under execution. The scope of works under execution includes Trunk Main, Lateral and STP. Some additional areas is proposed to lay Secondary and tertiary networks to connect with trunk main.

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## India: Rajasthan Urban Sector Development Investment Program- Sewerage and Sanitation sub-project (Tr-01)

Prepared by Local Self Government Department

For the Government of Rajasthan  
Rajasthan Urban Infrastructure Development Project

The initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

## **ABBREVIATION**

ADB	Asian Development Bank
CWR	Clear Water Reservoir
DSC	Design and Supervision Consultancy
EA	Executing Agency
EAC	Expert Appraisal Committee
FI	Financial Intermediary
GLSR	Ground Level Service Reservoir
GoI	Government of India
GoR	Government of Rajasthan
GSI	Geological Survey of India
IA	Implementing Agency
IEE	Initial Environmental Examination
IPMC	Investment Programme Management Consultancy
IPMU	Investment Programme Management Unit
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LPCD	Litre Per Capita per Day
LPS	Litre Per Second
LSGD	Local Self-Government Department
MFF	Multitranchise Financing Facility
MLD	Million litre Per day
MoEF	Ministry of Environment and Forests
NAAQS	National Ambient Air Quality Standards
OD	Outer Diameter
OHSR	Over Head Service Reservoir
OM	Operations Manual
PHED	Public Health Engineering Department
PMU	Project Management Unit
RCC	Reinforced Cement Concrete
ROW	Right of Way
RPCB	Rajasthan State Pollution Control Board
RSPM	Respirable Suspended Particulate Matter
RUIDP	Rajasthan Urban Infrastructure Development Project
RUSDIP	Rajasthan Urban Sector Development Investment Program
SPM	Suspended Particulate Matter
SPS	Sewage Pumping Station
STP	Sewerage Treatment Plant
ToR	Terms of Reference
UA	Urban Agglomeration
UIDSSMT	Urban Infrastructure Development Scheme for Small and Medium Towns
uPVC	Unplasticized Poly Vinyl Chloride
USEPA	United States Environmental Protection Agency
WC	Water Closets
WTP	Water Treatment Plant

## **WEIGHTS AND MEASURES**

lakh	–	100 thousand = 100,000
crore	–	100 lakhs = 10,000,000
$\mu\text{g}/\text{m}^3$	–	micrograms per cubic meter
km	–	kilometer
lpd	–	liters per day
m	–	meter
mg/l	–	milligrams per liter
mm	–	millimeter
ppm	–	parts per million

## **NOTE{S}**

- (i) In this report, "\$" refers to US dollars.
- (ii) "INR" and "Rs" refer to Indian rupees

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## **EXECUTIVE SUMMARY**

1. Rajasthan Urban Sector Development Investment Program (RUSDIP) is intended to optimize social and economic development in 15 selected towns in the State, particularly district headquarters and towns with significant tourism potential. RUSDIP Phase II is being implemented over a seven year period beginning in 2008, and being funded by a Multitranchise Financing Facility (MFF) loan from the Asian Development Bank (ADB). The Executing Agency is the Local Self-Government Department (LSGD) of the Government of Rajasthan; and the Implementing Agency is the Project Management Unit (PMU) of the Rajasthan Urban Infrastructure Development Project (RUIDP). 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 SPS. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.
2. This Initial Environmental Examination (IEE) has been prepared for the Alwar Sewerage and Sanitation Subproject as part of RUSDIP Tranche-01. The subproject covers (i) providing & laying of sewer line, manholes and allied works (ii) providing house connections. The subproject is needed due to lack of integrated sewerage and sanitary system in Alwar resulting to unsanitary conditions prevailing in the town. Wastewater commonly overflows to the drainage system, which is under-designed and not maintained, causing unhygienic and odorous pools forming on roads and other depressions. The groundwater table is also likely to be contaminated due to seepage of wastewater.
3. Detailed design began in the year 2009 and completed middle of 2010. Work proposed in the DPR and master plans are being taken for execution in phased manner. All works being taken up for execution in phase-1 and phase-2 should be completed by the middle of 2012 and works under phase-3 likely to be completed by the end of 2013.
4. The subproject sites (sewer lines) are located in Alwar town. The subproject sites are not located in areas prone to water-logging, salinisation, flash flood. There are no protected areas, wetlands, mangroves, or estuaries in the subproject sites. Trees, vegetation (mostly shrubs and grasses), and animals are those commonly found in urban areas. The subproject sites are not located in or near any historical, cultural, archaeological or architectural significance.
5. No potential impacts were identified as being due to the subproject design but were identified in relation to construction and operation of the infrastructure. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. An Environmental Management Plan (EMP) is proposed as part of this IEE which includes (i) mitigation measures for significant environmental impacts during implementation, (ii) environmental monitoring program, and the responsible entities for mitigation, monitoring, and reporting; (iii) public consultation and information disclosure; and grievance redress mechanism. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. A number of impacts and their significance have already been reduced by amending the designs.
6. During the construction phase, impacts mainly arise from the need to dispose of large quantities of waste soil and import a similar amount of sand to support the sewer pipes in the trenches; and from the disturbance of residents, businesses, traffic and important buildings by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for mitigation.
7. The use of asbestos cement (AC) pipes in the existing water distribution network presents a particular risk to workers and the public if disturbed, as inhalation of asbestos dust, which is carcinogenic. These systems will not be disturbed under the project and kept in place. Moreover, special measures were developed to protect workers and the public from exposure to

carcinogenic asbestos fibres in the event that AC pipes used in the existing water supply system are uncovered accidentally during excavation work.

8. Specific measures have been developed to avoid damaging important remains in case of chance archaeological finds during excavation work.

9. The project will employ persons from the local workforce who live in the vicinity of construction sites to provide them with a short-term economic gain; and ensure that people employed in the longer term to maintain and operate the new facilities are residents of nearby communities.

10. Once the system is operating, the facilities (sewer network) will operate with routine maintenance. Leaks in the sewer network will be monitored and repaired. It will also be conducted in areas that have already been excavated, so there will be no need to protect archaeological material.

11. The main impacts of the operating sewerage system will be beneficial as the citizens of Alwar city will be provided with an underground sewage system, which will serve a greater proportion of the population. This will improve the quality of life of people as well as benefiting both individual and public health as the improvements in hygiene will reduce the incidence of disease associated with poor sanitation.

12. Mitigation will be assured by a program of environmental monitoring to be conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. Corrective measures to be taken as necessary. 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 Investment Program Management Unit (IPMU).

13. The stakeholders were involved in developing the IEE through face-to-face discussions on site after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations in the town and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation by a nationally-recognized NGO appointed to handle this key element and to ensure stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

14. The subproject is unlikely to cause significant adverse impacts. The potential adverse 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, the classification of the Project as Category "B" is confirmed, and no further special study or detailed EIA needs to be undertaken.

## **I. INTRODUCTION**

### **A. Purpose of the report**

1. Rajasthan Urban Sector Development Investment Program (RUSDIP) is intended to optimize social and economic development in 15 selected towns in the State, particularly district headquarters and towns with significant tourism potential. This will be achieved through investments in urban infrastructure (water supply; sewerage and sanitation; solid waste management; urban drainage; urban transport and roads), urban community upgrading (community infrastructure; livelihood promotion) and civic infrastructure (art, culture, heritage and tourism; medical services and health; fire services; and other services). RUSDIP will also provide policy reforms to strengthen urban governance, management, and support for urban infrastructure and services. The assistance will be based on the State-level framework for urban reforms, and institutional and governance reforms recommended by the Government of India (GoI) through the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT).

2. RUIDP Phase II to will be implemented over a seven year period beginning in 2008, and will be funded by a loan via the Multi-tranche Financing Facility (MFF) of the ADB. The Executing Agency (EA) is the Local Self-Government Department (LSGD) of the Government of Rajasthan (GoR); and the Implementing Agency (IA) is the Project Management Unit (PMU) of the Rajasthan Urban Infrastructure Development Project (RUIDP), which is currently in the construction stage. Alwar, Jaisalmer and Jahalawar/Jalarpatan are the towns chosen to benefit from the first tranche of RUSDIP investment.

3. RUSDIP will improve infrastructure through the design and implementation of a series of subprojects, each providing improvements in a particular sector (water supply, sewerage, solid waste etc) in one town. RUSDIP has been classified by ADB as environmental assessment category B (some negative impacts but less significant than category A). The impacts of subprojects prepared for the first tranche of funding were assessed by 13 Initial Environmental Examination (IEE) Reports and 3 Environmental Reviews, prepared according to ADB Environment Policy and Environmental Assessment Guidelines (2003). This document is the IEE report for the Alwar Sewerage and Sanitation Subproject.

### **B. Extent of the IEE study**

4. Indian law and ADB policy require that the environmental impacts of development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and project development and implementation worldwide.

#### **1. ADB Policy**

5. ADB's Environment Policy (2002) requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in Operations Manual (OM) 20: Section F1/BP (2006) Environmental Considerations in ADB Operations. This states that ADB requires environmental assessment of all project loans, programme loans, sector loans, sector development programme loans, financial intermediation loans and private sector investment operations.



6. The nature of the assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts and are assigned to one of the following categories:

Category A: Projects that could have significant environmental impacts. An Environmental Impact Assessment (EIA) is required.

Category B: Projects that could have some adverse environmental impacts, but of less significance than those for category A. An Initial Environmental Examination (IEE) is required to determine whether significant impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

Category C: Projects those are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

Category FI: Projects that involve a credit line through a financial intermediary (FI) or an equity investment in a FI. The FI must apply an environmental management system, unless all subprojects will result in insignificant impacts.

7. The Bank has categorised this program as Category B and following normal procedure for MFF loans has determined that one Environmental Examination will be conducted for each subproject, with a subproject being the infrastructure improvements in a particular sector (water supply, sewerage, etc) in one town.

## **2. National Law**

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

9. Categories A projects require Environmental Clearance from the National Ministry of Environment and Forests (MoEF). The proponent is required to provide preliminary details of the project in the form of a Notification, after which an Expert Appraisal Committee (EAC) of the MoEF prepares comprehensive Terms of Reference (ToR) for the EIA study, which are finalized within 60 days. On completion of the study and review of the report by the EAC, MoEF considers the recommendation of the EAC and provides the EC if appropriate.

10. 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.

11. Environmental Clearance requirement is not applicable for this subproject under EIA Notification 2006/2009.

12. The summary of environmental regulations and mandatory requirements for the proposed subproject is shown in **Table 1.1**

**Table 1.1: Applicable Environmental Regulations & Legislations and its applicability**

Acts/Guidelines	Purpose	Applicability to subproject
The EIA notification, 2006 (and its subsequent amendments in 2009) provides for categorization of projects into category A and B, based on extent of impact	This states that Environmental Clearance (EC) is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts. Categories A projects require Environmental Clearance from the National Ministry of Environment and Forests (MoEF). Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA).	Not applicable The sub project is not included in schedule of environmental impact assessment notification 2006 and its subsequent amendments till dates so it is not categories as either Category A or Category B. As a result, environmental clearance is not required, either from the state or the central Government.
The Wildlife Conservation Act, 1972,	Clearance from state and national wildlife boards, Central Empowered Committee of Hon'ble Supreme Court of India and the State Wildlife Department, as applicable.	Not Applicable
Rajasthan Forest (Conservation) Act, 1953	Clearance from Forest department for cutting of trees, if any.	Applicable
The Ancient Monuments and Archaeological Sites and Remains Act, 1958, and the rules, 1959 provide guidance for carrying out activities, including conservation, construction and reuse in and around the protected monuments.	Permission from the Archaeological Survey of India for carrying out any construction activities within the prohibited and regulated areas of the ancient monuments and archaeologically protected sites.	Not Applicable
Water (Prevention and control of pollution) Act, 1974, as amended Air (prevention and control of pollution) Act, 1981, as amended and	Consent to Establish (CTE) and Consent to Operate (CTO) from the RSPCB for setting up of sewage treatment plant (STP) & hot mix plants, wet mix plants, stone crushers and diesel generators (if installed for construction). To be obtained by the Contractor, prior to construction.	Applicable
Water (Prevention and Control of Pollution) Cess Act, 1977 including Rules	Applicable to all activities, which discharge effluents as a result of process or operations	Applicable
Public Liability and Insurance Act 1991	Protection form hazardous materials and accidents.	Applicable

Noise Pollution (Regulation and Control Act) , 2000	The standards for noise for day and night have been promulgated by the MoEF for various land uses. DG sets at construction sites should be provided with acoustics enclosures.	Applicable
Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules 1989	To check vehicular air and noise pollution. All vehicles in Use shall obtain Pollution Under Control (PUC) certificates by the contractor	Applicable
Child Labour Act 1986	No child shall be employed or permitted to work in any of the scheduled occupations	Applicable

### 3. Review and Approval Procedure

13. For Category B projects the Draft Environmental Status report and its summary (SIEE) are reviewed by ADB's Regional Department sector division and Environment and Social Safeguards Division, and by the Executing Agency, and additional comments may be sought from project affected people and other stakeholders. All comments are incorporated in preparing the final documents, which are reviewed by the Executing Agency. The EA then officially submits the IEE and SIEE reports to ADB for consideration by the Board of Directors. Completed reports are made available worldwide by ADB, via the depository library system and the ADB website.

### 4. Scope of Study

14. This is the IEE report for the Alwar sewerage and sanitation sector. It discusses the generic environmental impacts and mitigation measures relating to the location, design, construction and operation of physical works proposed under this subproject.

## II. DESCRIPTION OF THE PROJECT

### A. Type, Category and Need

15. This is a sewerage and sanitation sub-project, and as explained above it has been classified by ADB as Category B, because it is not expected to have major negative environmental impacts. Under ADB procedures such projects require an IEE to identify and mitigate the impacts, and to determine whether further study or a more detailed EIA may be required. The sub-project is needed because the present sewerage system is inadequate for the needs of the growing population. Less than 10% of the population (in two newly-built colonies) is connected to sewer, and there is no wastewater treatment so raw sewage is discharged to *nallahs* (natural or man-made drainage channels). In the rest of the town sewage is discharged to septic tanks or surface water drains via illegal connections. This is one of a series of subprojects designed by the RUSDIP that are intended to raise the standards of the municipal infrastructure and services of Alwar and the other urban centres to those expected of modern Asian towns.

### B. Location, Size and Implementation Schedule

16. The sub-project is located in Alwar, the headquarters town of Alwar district, in the north-east of Rajasthan in north-western India (**Figure 2.1**). The infrastructure will extend throughout many parts of the town, where pipes for new secondary and tertiary sewer networks will be buried within or alongside roadways. The sewerage related works are under construction in Tranche 1 programme of RUSDIP for Alwar are Laying of 800 -1200 mm size out fall sewer along Bharatpur Road up to Sewage Treatment Plant Site and Construction of 20 MLD capacity sewage treatment plant near Agyara Dam on Bharatpur Road.

17. The proposed sub-project will improve the present situation of sewerage system up to the intermediate stage. After 2026 the works taken up under phase III will enhance the net work connectivity to STP.

18. The proposed work in this tranche concentrated on additional trunk main (approx. 9 km) and sub-mains and lateral sewer for at added area.

19. Detailed design began in the year 2009 and completed middle of 2010. Work proposed in the DPR and master plans are being taken for execution in phased manner. All works being taken up for execution in phase-I and phase-II should be completed by the middle of 2012 and works under phase-III likely to be completed by the end of 2013.

### C. Description of the Sub-project

#### 1. Assessment of existing situation:

20. Presently, Alwar is district headquarter. Municipal Services in the existing areas of the city are managed by local self government body "Alwar Nagar Parishad". Water Supply to the town is managed by PHED. Development of upcoming areas of the city is looked after by UIT. As per 2001 census Alwar recorded population of 266203 souls. Average of decadal growth rate in population of previous four decades is 32.98%. Growth rate in immediate past decade (1991-2001) has been 26.42%.

21. Large increase in population, industrial and commerce activity has put lot of strain on Municipal services. Sanitation activities like drainage, Solid Waste Management and sewerage (Collection, Conveyance, Treatment & safe disposal) are progressively becoming insufficient to meet present day requirements. Existing system of wastewater collection and disposal is not suitable to maintain current standards of hygiene. Existing infrastructure of

Alwar Nagar Parishad is unable to cope with the load and fresh investment for up gradation of facilities is urgently required to maintain healthy and hygienic environment in the city.

22. Water supply to city is based on ground water sources. Present capacity of the system is approximately 31 MLD, However supply level is somewhere near 27 MLD. Net per capita day supply being made is 60 liters as against the standards of range from 115-135 liters per capita per day. At present 170 Tube wells and 261 hand pumps (maintained by PHED) are used for meeting the water requirement of town. The total nos. of water connections in the Alwar are approximately 37048.

23. Schemes for improving water supply are under implementation and planning. It is envisaged that water supply is likely to increase to level of 135 LPCD

24. Growth in City population and increase in water supply rate are resulting in generation of increased quantity of wastewater. Leaving a small part of the city (newly developed UIT colonies) city has no closed sewerage system. Most of the households are having septic tanks or pit latrines and wastewater is discharged into soak pits or in open surface drains. Presently the sewage of the city is discharged through 4 open drains and an underground sewer that is provided for newly developed colonies. The open drains flow below the railway track and discharge eastwards at a) Tijara Phatak, b) Railway gate no 112, c) Kalimuri Nallah, and d) Open Nallah at Rupbass. The closed sewerage provided for new colonies discharges in to the Tuleda river near Tuleda village. Present arrangement of wastewater collection and disposal is unsafe and issue requires to be addressed on urgent basis.

25. Concerned authorities in Govt. of Rajasthan and Local bodies are aware of the potential hazards and working to evolve complete wastewater management programme. It is planned to set up sewage collection, treatment and disposal facilities. Work is included in Rajasthan Urban Infrastructure Sector Development Investment Programmes (RUSDIP) which is currently undertaken for development civic infrastructure for 15 towns of Rajasthan. Some work related to overall improvement of sanitation condition in the town is taken up in tranche-01 of the programme. Laying of an outfall sewer (primary Network) and construction of STP is under implementation. Secondary and tertiary networks are required to be designed and implemented. The additional scope of work of the sub project is about secondary and tertiary network for Alwar.

## **2. Scope of work for proposed Sub-project :**

### **Earlier Scope**

26. Subproject components covered under earlier package are as under:

27. Table 2.2 shows the nature and size of the various components of the subproject under earlier package. There are three main elements: provision of a network to collect sewage from three new colonies and the two colonies already provided with sewerage; a trunk sewer to transport waste to the STP; and a new STP to treat sewage to Indian legal standards. The descriptions shown in Table 1 are based on the present proposals, which are expected to be substantially correct, although certain details may change as development of the subproject progresses, particularly in the detailed design stage. It should also be noted that at this stage the infrastructure has been designed to determine overall feasibility and budget costs.

28. The network pipes will be of Reinforced Cement Concrete (RCC), and will be located alongside roads and streets, in the government-owned Right of Way (RoW). The 12 km tertiary network will collect sewage from individual houses in three colonies that have a sufficient water supply, in Shantikunj and areas known as Scheme 2 and Scheme 3. These

pipes will be of small diameter (200 and 350 mm) and will be located in shallow trenches (ca 1.5 m in depth). The 9 km secondary network (lateral sewers) will transport sewage from these areas and the two colonies that already have a sewerage system (Shiva-ji Park and Ambedekar Colony), and pipes will be larger (500 mm in diameter) and located in deeper trenches (ca 2 m).

29. The 18 km trunk sewer will also be of RCC pipes, and will convey sewage from the secondary network to the STP at Agyara Dam. These pipes will be 800 -1200 mm in diameter and will be located alongside the Bharatpur Road, in a 2.3 m trench.

30. The STP will be built on 32.65 ha of unused Government land immediately east of Agyara Dam , and will consist of two rows of equally sized ponds (approximately 50 x 100 m and 2-3 m in depth) dug into the soil, each with slightly sloping sides and a flat bed. RCC pipe-work and one or two pumping stations will also be built on the site, which will be surrounded by a security fence when completed. As per EARF the site selected for Sewage treatment Plant is more than 500 m away from any inhabitant area

### Enhanced scope

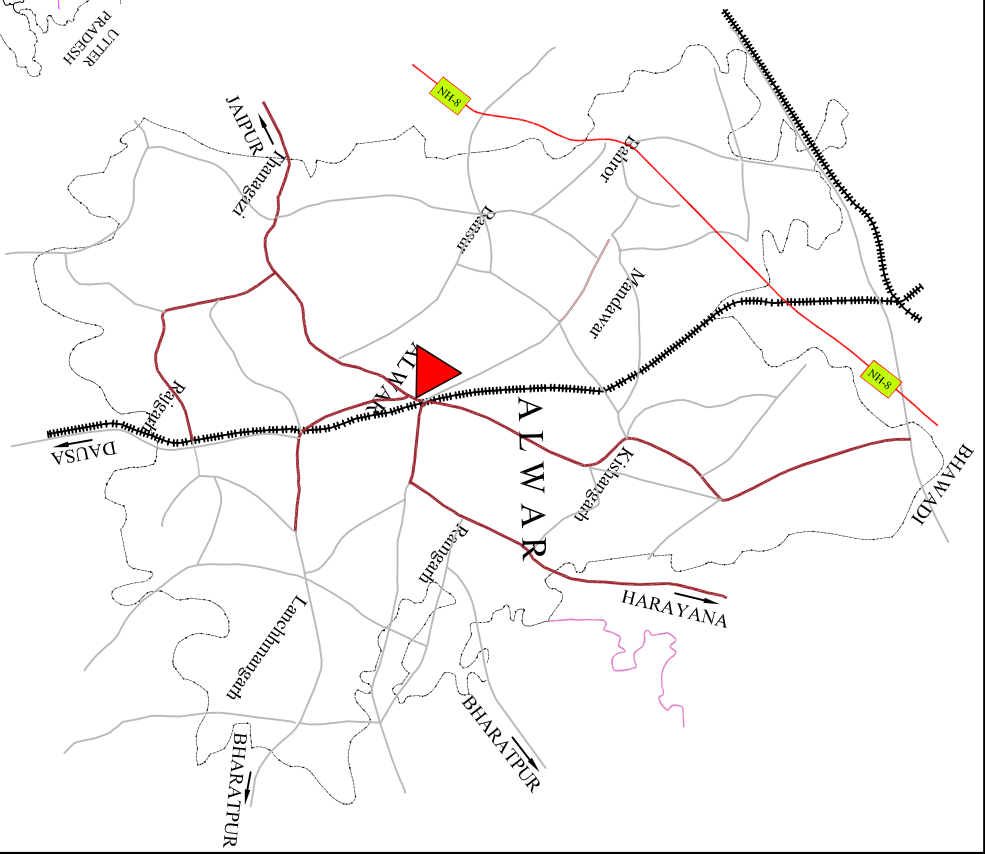
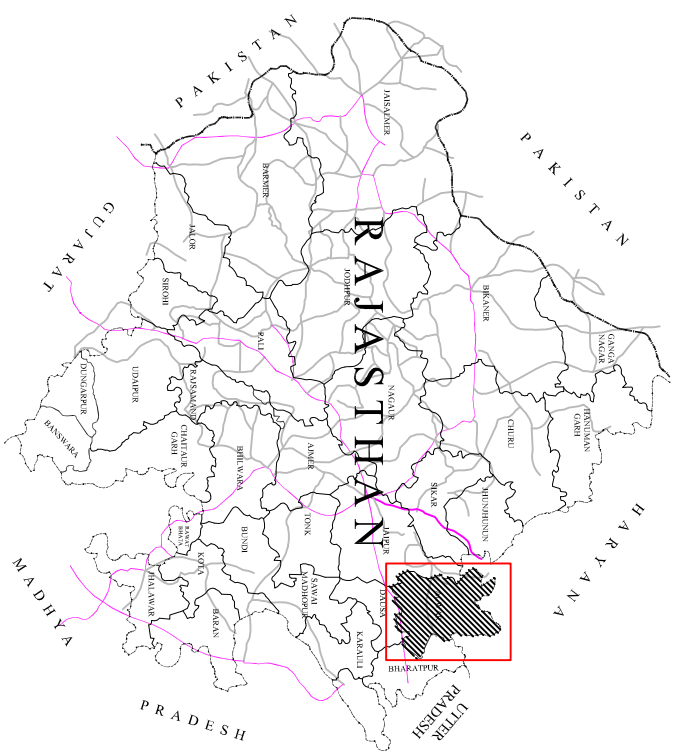
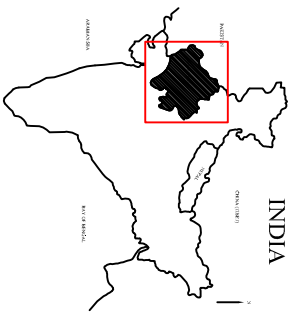
31. **Table 2.2** shows the nature and size of the various components of the subproject under new package. In new package main components include supply, laying, jointing, testing and commissioning of various Main and lateral sewer network connecting to outfall, along with road restoration and all necessary manholes appurtenances etc. at Alwar town. The areas where the sewerage network proposed under proposed new package (WW-04 Lot-1) are colonies developed by UIT & Housing board like Scheme No. 1, 5, 6, 7, 8, 10, Manu Marg, Alkapuri, Bank Colony, Nahru Nagar, Keshav Nagar, Moti Dungari, HKM Nagar, Budh Vihar, Vijay Nagar, South West Block, Malviya Nagar. The sewerage network will collect sewage from individual houses in these colonies and will transport the sewage to the trunk sewer through secondary network. The proposed diameter wise distribution of sewer has been shown in table below.

32. Subproject components covered under new package are as under:

- Laying of Trunk Mains of sizes 600 mm to 700 mm for length of 2525 M.
- Laying of Sub-Mains & laterals of sizes 200 mm to 500 mm dia. for a length of 42223 m

**Table 2.1 Proposed diameter wise and locality wise distribution of sewers**

Pipe Size Dia. MM	Arya Nagar	Bank Colony and Alkapuri	Scheme 10	Keshav Nagar	Moti Dungari	Malviya Nagar	Scheme - 5	Scheme - 7	Scheme - 8	Total
200	5318	6221	6889	1786	1530	4345	2369	676	7151	36285
250	447	450	1491	0	0	0	340	0	293	3021
300	164	81	0	0	0	164	0	0	588	997
350	0	0	0	0	639	0	0	0	0	639
400	0	0	0	0	0	76	0	0	0	382
450	533	0	0	0	0	0	0	0	0	533
500	55	0	0	311	0	0	0	0	0	366
600	0	0	0	1372	0	0	0	975	0	2358
700	0	0	0	0	0	0	0	75	0	167
<b>Total</b>	<b>6517</b>	<b>6752</b>	<b>8380</b>	<b>3469</b>	<b>2169</b>	<b>4585</b>	<b>2709</b>	<b>1726</b>	<b>8032</b>	<b>44748</b>



Rajasthan Urban Sector  
Development Investment Program  
ADB TA 4814-IND

### Alwar Regional Setting Map

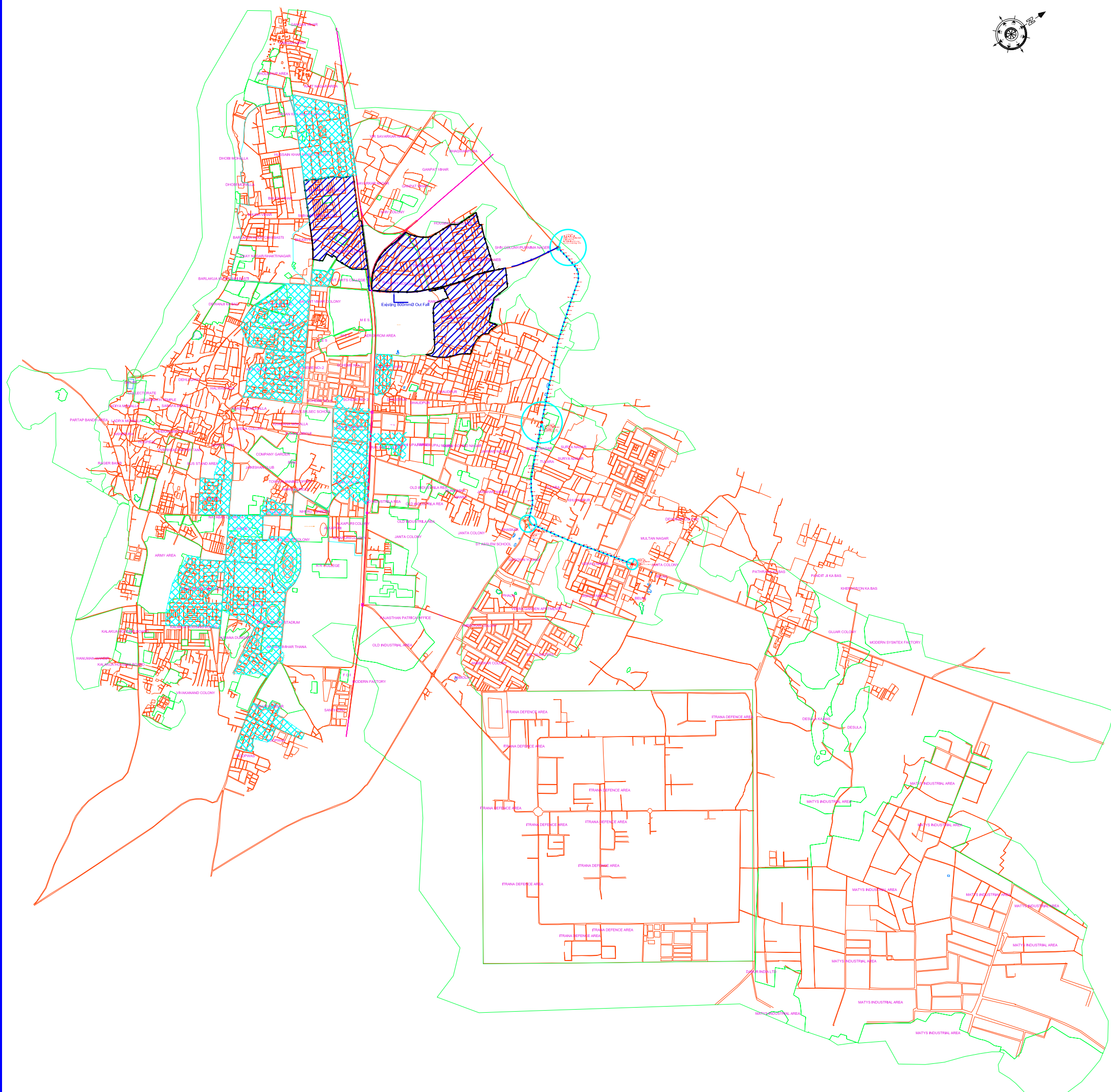
#### LEGEND:-

- International Boundary
- State Boundary
- District Boundary
- National Highway
- Other road
- Railway
- District Headquarter  
Program Town

#### OVERLAY LEGEND:-

GOVT. OF RAJASTHAN  
ASIAN DEVELOPMENT BANK

DRAWN:-	CHECKED:-
DATE:-	APPROVED:-
SCALE:-	









		-:LEGEND:-		CONSULTANT		RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM (RUSDIP)						
DRAWING TITLE	DRAWING NO.					PROJECT		RAJASTHAN PACKAGE-WW04 ALWAR		CITY/TOWN:- ALWAR		
						TITLE BASEMAP, ALWAR TOWN SHOWING INCLUSION POINTS FOR OUT FALL.						
						Prepared by		APPROVED	MARKED	DATE	REVISION	DESCRIPTION BY
						JOMON		D. BHATTER				
						STATUS		FOR APPROVAL				
								SCALE AS SHOWN	DATE Oct, 2009			
		EXISTING SEWERAGE NETWORK		PROPOSED SEWERAGE NETWORK		d. bhatte & associates consultants for pollution control project Plot no - 292, Kansai Section Ambarnath(ms) - 421501 e mail : bhatteassociates@gmail.com						




**Rajasthan Urban Sector  
Development Investment Program  
ADB TA 4814-IND**

## Alvar Site Location Plan

LEGEND:-

- |   |                  |
|---|------------------|
|  | Forest           |
|  | Habitation       |
|  | Water Bodies     |
|  | State Highway    |
|  | National Highway |
|  | Other Roads      |

OVERLAY LEGEND:-

- 
- Proposed STP Site

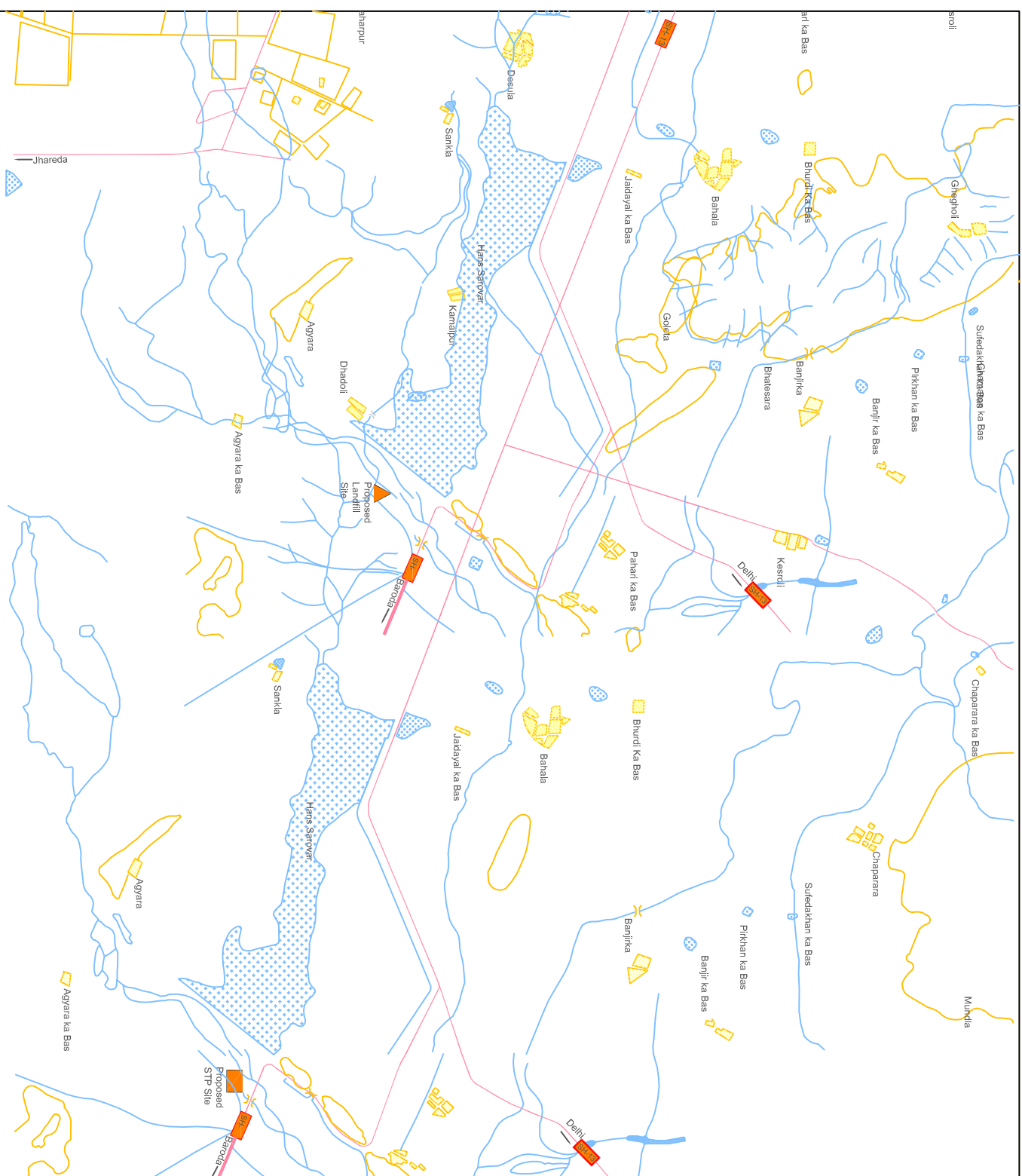
GOVT. OF RAJASTHAN  
ASIAN DEVELOPMENT BANK

SAWN :-	CHECKED :-
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DATE :-	APPROVED :-
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SALE :-	
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Figure :-



**Alwar**  
**Sewage Treatment Plant Layout**

**LEGEND:-**

-  Anaerobic Pond
-  Facultative Pond
-  Proposed Area for future expansion

**OVERLAY LEGEND:-**

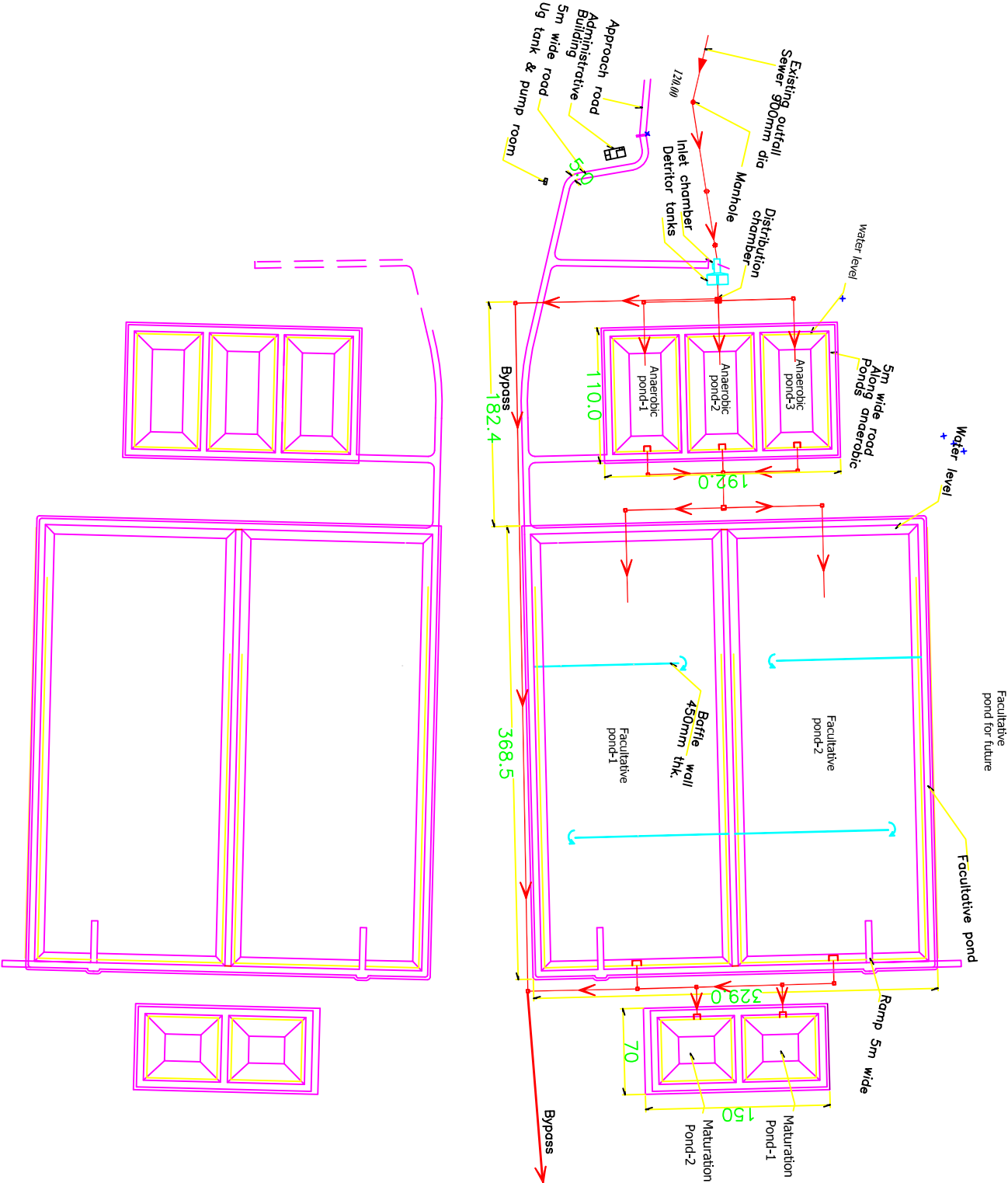
GOVT. OF RAJASTHAN  
ASIAN DEVELOPMENT BANK

DRAWN :-                      CHECKED :-

DATE :-                              APPROVED :-

SCALE :-

Figure :-



**Table 2.2: Improvements in sewerage infrastructure proposed in Alwar**

Infrastructure	Function	Description	Change Location
<b>Earlier Scope</b>			
Sewage Treatment Plant (STP)	Aerobic treatment of sewage according to Indian wastewater discharge standards	RUSDIP/TR-01/ALW/WW/02 (Lot-2) A series of oxidation ponds and waste stabilisation ponds, 2-3 m in depth, built in stages, to reach a total capacity of 20 MLD	On 32.65 ha of unused government-owned land, located on the eastern side of Agyara Dam. Initial planning indicates that site/shape/ dimensions are inadequate to fit various components of the proposed facultative ponds based STP. Later additional government land adjacent to earlier land is acquired to fulfil the requirement
Trunk Sewer and secondary sewers	Transport sewage from the town to the STP	RUSDIP/TR-01/ALW/WW/01 (Lot-2) & WW/02 (Lot-1) Laying 18.075 km of Outfall & Trunk Mains of sizes 800–1200 dia. mm Reinforced Cement Concrete (RCC) pipe including 1.55 km by trench less technology  RUSDIP/TR-01/ALW/WW/03 700 mm to 1100 mm dia. for a length of 9063 m	Buried in a trench in the Right of Way (ROW) alongside the existing ROW
Tertiary Sewer Network	Collect sewage from colonies that do not have a sewerage system at present	RUSDIP/TR-01/ALW/WW/03 Laying of Sub-Mains & laterals of sizes 200 mm 600 mm dia. for a length of 23220 m	Buried in shallow trenches alongside lanes and roads in colonies that have a good water supply
Remodelling of effluent disposal drain	Discharge of treated effluent from STP Due to poor water carrying capacity of drain, flooding is common during rain , and therefore remodelling of drain will be beneficial for farmers. There	Initially it is planned to discharge treated effluent in a small natural drain flowing near the site. The water will be utilized for irrigation when required or will flow down to Ruparel river, about 5 km from the STP site. The drain carries runoff and as well as Agyara Dam discharges / overflows. Owing erratic	Near STP site- drain will be constructed – additional component which planned later to take care runoff water from dam, flood water and to take effluent water from STP Drains located within the

Infrastructure	Function	Description	Change Location
	will also be benefits due to available of treated water for irrigation	rainfall and no flow from the drain , the drain is mostly dry except during short period of monsoon . The drain is not very well defined , and the surrounding farmers levelled the drain banks/ beds and utilize for cultivation.	ROW, no land acquisition required Proposed drain- 1.9 km (1.3 km within STP site and 0.6 km within SW landfill site), depth of the drain 1.6 m and width 3 m. As per design the volume of the proposed drain is sufficient to carry flood water
<b>Enhanced Scope</b>			
Trunk Sewer and secondary sewers	Transport sewage from the town to the STP	RUSDIP/TR-01/ALW/WW/04 (Lot-1) Laying trunk mains of sizes 600 mm and 700 mm dia. for a length of 2525 m Reinforced Cement Concrete (RCC) pipe	Buried in a trench in the Right of Way (ROW) alongside the existing ROW
Tertiary Sewer Network	Collect sewage from colonies that do not have a sewerage system at present	RUSDIP/TR-01/ALW/WW/04 (Lot-1) Laying of Sub-Mains & laterals of sizes 200 mm 500 mm dia. for a length of 42223 m	Buried in shallow trenches alongside lanes and roads in colonies that have a good water supply

### III. DESCRIPTION OF THE ENVIRONMENT

#### A. Physical Resources

##### 1. Location

33. Alwar is located in the north-eastern part of Rajasthan, between the longitudes of 76° 35' to 76° 40' East, and latitudes of 27° 30' 20" to 27° 36' 30" North. The town is in the foothills of the Aravali Mountain range, at an altitude of 268 m above sea level, and is 160 km south of the national capital Delhi and 150 km north-east of the state capital Jaipur. Alwar is one of the fastest growing towns in Rajasthan, and is an important trading centre, with good road and rail links. The municipal area covers 49.3 km<sup>2</sup>, and the population is 260,000.

##### 2. Topography, soil and geology

34. Alwar Township is relatively flat, located in the alluvial plain beneath the Arvali Mountains in the west. The soil is mainly alluvial and non-calcareous, semi-consolidated to consolidated, brown in colour, and loamy sand to sandy loam in texture. Exposed rocks belong to the Delhi Super-group of lower proterozoic age, consisting of schist, quartzites, slates and gneisses. Sub-surface layers of unconsolidated quaternary formations form the principal aquifer system.

35. According to the Vulnerability Atlas of India, part of Alwar District, including Alwar Town, is in an area of high earthquake risk (Zone IV). Although Rajasthan has not experienced a major earthquake in the recent past, there have been 37 events with a magnitude of 5-7 since 1720, with the most recent occurring in 2001. This measured 6.9 on the Richter Scale, but because the epicentre was in neighbouring Gujarat, no major damage was reported in Alwar.

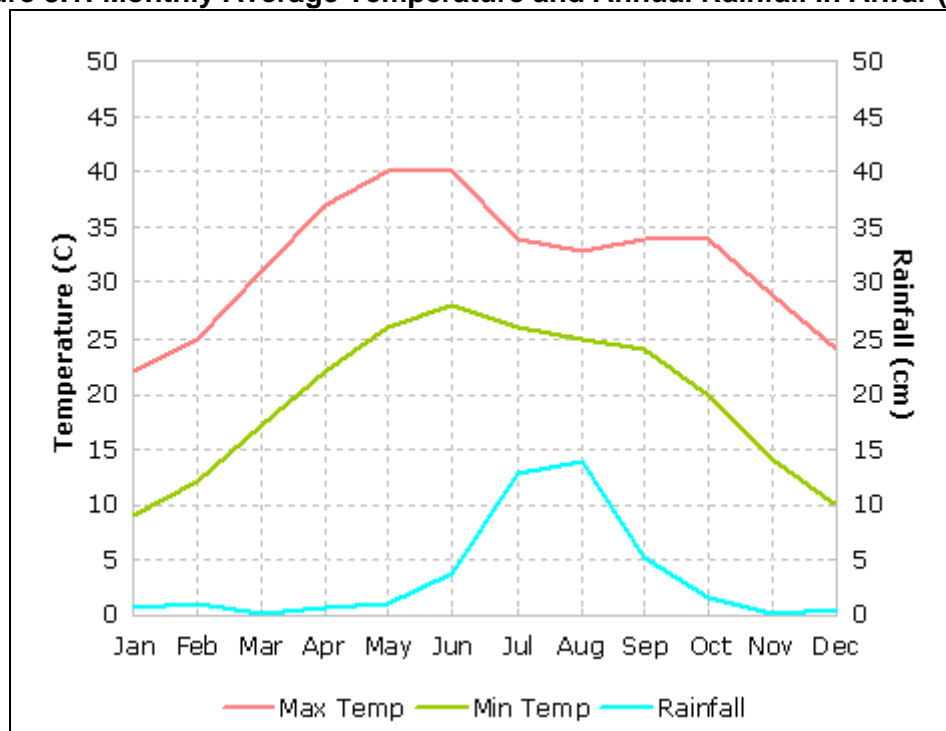
##### 3. Climate

36. The climate is semi-arid and mostly dry, with a hot summer period in April to July, followed by a short monsoon in July to September, and a cool dry winter period between October and March. Average daily temperatures peak at around 41°C in June (when the minimum is 28°C at night), and in January the temperature falls to an average of 23°C during the day and 8°C at night. The long term average annual rainfall is 638 mm, of which around 85% falls during the monsoon. However rainfall is highly variable, and has been generally low in most recent years.

37. The monthly average temperature and rainfall is shown in **Figure 3.1**.

38. Relative humidity is around 70% during the monsoon, but is much lower throughout the rest of the year, falling to 20-25% in the summer. Winds are generally light and variable during the cool winter period, and mainly from the north and north-west, and the strongest winds are the south-westerlies that bring the monsoon in June and July.

**Figure 3.1: Monthly Average Temperature and Annual Rainfall in Alwar (2010)**



Note: These are average maximum and average minimum temperature for Alwar. The highest temperature in Alwar for the month is usually higher than the average maximum temperature. Similarly, the lowest temperature in Alwar for the month is usually lower than the average minimum temperature.

#### 4. Air Quality

39. The Rajasthan State Pollution Control Board (RSPCB) monitors air quality at three stations in Alwar town, two in industrial areas and one in a residential quarter. Data shows that particulate matter is high because of the dry atmosphere, dusty roads and surrounding land, and Respirable Suspended Particulate Matter (RSPM: particles < 10µm) and Suspended Particulate Matter (SPM) frequently exceed National Ambient Air Quality Standards (NAAQS, **Table 3.1**). In contrast, levels of chemical pollutants (oxides of sulphur and nitrogen) are below national standards, presumably because of the limited development of heavy industry.

**Table 3.1: Ambient Air Quality in Alwar (Annual Average, 2009-10; units in µg/m<sup>3</sup>)**

Monitoring Station	Land use	RSPM	SPM	SOx	NOx
RIICO pump house	Industrial	130	234.08	7.81	21.07
Gorav salwax	Industrial	240.17	385.75	7.87	21.29
Regional office, Alwar	Residential	175.58	334.08	7.76	21.40
NAAQ Standard	Industrial	150	500	120	120
NAAQ Standard	Residential	100	200	80	80

RSPM: Respirable Suspended Particulate Matter; SPM: Suspended Particulate Matter

Source: Annual Report of Rajasthan State Pollution Control Board 2009-10

Note: Environmental monitoring for the parameters of Air, Water and Noise has been carried out for the proposed subproject in April-May 2012. The data will be provided later as monitoring report of the laboratory is awaited.

#### 5. Surface Water

40. The State of Rajasthan is predominantly dry, except for some parts of the south and south-east, and Chambal is the only perennial river. There are certain seasonal rivers in Alwar District, including the Ruparel, Sabi, Chuhar, Sidh and Landoha, which carry

monsoon drainage from upland areas. Several of these have been impounded, to provide water for irrigation. Ruparel is the nearest seasonal river to Alwar, and passes through the Sariska Tiger Reserve and the village of Bara 19 km south of Alwar. This feeds Jaysamandh Lake through an 8 km long manmade feeder canal from Bara Weir.

41. There are no natural lakes in Alwar District, although there are a few of artificial lakes formed from water retained by manmade bunds, of which Jaysamandh and Siliserh are the largest. Jaysamandh Dam is 6 km south of the town between the villages of Ballana and Liwari, and is an earth and concrete structure built in 1910. The lake has a maximum capacity of 34 ML, but rarely fills to that level. Siliserh Lake is 13 km south-west of the town and is retained behind an earth embankment and masonry wall built in 1845 across a tributary of the Ruparel. The capacity of the lake is 14 ML, and water for irrigation feeds into two masonry canals running from the dam.

42. Hans Sarovar is another small lake 5 km south-east of the town, near Agyara village. It is formed behind an earth embankment built in 1910, and the water is used for pumped irrigation in nearby farms, although as the lake rarely fills to capacity, such usage is limited. The lake receives untreated and partially treated effluent from the nearby Matsya Industrial Area (MIA), where there are several chemical plants and other industries. In March 2010 water sample of Hans Sarovar has been tested. The results show that water was very low in volume and bright pink in colour, presumably from the discharge of dye and/or other chemicals.

**Table 3.2: Surface Water Quality at Hans Sarovar at Alwar**

Parameters	Results
pH	7.38
TSS (mg/l)	1260
Oil & Grease(mg/l)	48
COD(mg/l)	600
BOD(mg/l)	250

## 6. Groundwater

43. The main aquifer around Alwar is contained within unconsolidated quaternary formations of silt, sand kankar and boulder, and is reported to have a potential yield of 20-30 m<sup>3</sup>/h. According to the GoI Central Ground Water Board (CGWB 2006<sup>1</sup>), groundwater occurs under unconfined conditions at shallow depth (18-28 m below ground level) and in a semi-confined condition at deeper levels (around 65 m), and is tapped by a number of tube-wells, which discharge at a rate of between 25 and 68 m<sup>3</sup>/h.

44. Seasonally the aquifer declines between November and May and recharge begins with the monsoon rains in mid-June. However there has been an alarming decline over the past 20 years from over-extraction and low rainfall, and CGWB reports that the water table in Alwar town has fallen from 9 m in 1984 to 27 m in 2004, at an average rate of 0.91 m per year. Agriculture accounts for more than 80% of the use, and major reductions occur during *Rabi* crop irrigation in October-April.

45. Groundwater quality has also declined as a result of urbanization, disposal of untreated domestic and industrial wastewater and excessive usage of fertilizers. Recent analyses by the Public Health Engineering Dept (PHED) shows high levels of nitrate and iron in water from existing tube-wells.

<sup>1</sup> CGWB Western Region, Micro Level Studies, Ground Water Scenario, Alwar Urban Area, July 2007.

**Table 3.3: Groundwater quality in Alwar (2007-08)**

	Monitoring Location								BIS Drinking Water Standard	
Parameter	Sivaji Park		Police Lane		Kala Kuva		Samola			
pH	7.75	8.16	7.62	8.29	8.12	7.84	7.1	8.6	6.5-9.0	NR
EC	1195	1140	580	650	700	1150	1900	1980	NLP	NLP
Co <sub>3</sub>	Nil	Nil	Nil	Tr	Nil	Nil	Nil	120	NLP	NLP
HCO <sub>3</sub>	183	256	207	220	146	451	659	793	NLP	NLP
Cl	213	234	43	92	107	121	149	57	250	1000
SO <sub>4</sub>	125	11	28	20	45	30	110	142	200	400
NO <sub>3</sub>	61	65	32	39	46	67	130	11	45	100
Total Hardness									300	
	300	360	160	210	150	250	160	140		600
Ca	32	44	36	40	24	92	12	36	75	200
Mg	54	61	17	27	22	4.9	32	12	30	100
Na	155	112	58	68	90	168	378	437	NLP	NLP
K	4.2	3.3	2.6	4.1	11	9.8	1.2	1	NLP	NLP
F	0	0.33	0	0.55	0	0.79	0	1.5	1.0	1.5
Zn	-	0.620	-	4.180	-	0.653	-	1.000	5.000	15.000
Cu	-	0.032	-	0.172	-	0.014	-	0.014	0.050	1.500
Ni	-	0.001	-	BDL	-	0.005	-	BDL	NLP	NLP
Mn	-	0.020	-	0.015	-	0.044	-	0.021	0.100	0.300
Fe	-	1.915	-	0.029	-	7.390	-	0.532	0.300	1.000
Pb	-	BDL	-	BDL	-	0.025	-	0.013	0.050	NR

Source: CGWB. All units are mg/l except EC in  $\mu$ mhos/cm. BIS = Bureau of Indian Standards  
NLP-No Limit Prescribed; NR-No Relaxation; BDL-Below Detectable Level; Tr-Trace

46. The monitoring has been carried out by Rajasthan Pollution Control Board at various locations at Alwar during year 2009-2010. The data on DO, pH, BOD and MPN is given in **Table 3.4**. During 2009 to 2010 pH and BOD ranged from 7.21 to 7.55 mg/l and 4 to 9 mg/l respectively.

**Table 3.4: Groundwater quality in Alwar (2009-2010)**

SL	Location	Dissolved Oxygen (mg/l)		pH		BOD (mg/l) (3 days at 27° C)		Total Coliforms, MPN/100ml	
1	RIICO Pump House	3.10	3.30	7.41	7.55	4	7	0.21	0.04
2	MACI Borewell, MIA Alwar	1.94	2.10	7.40	7.21	4	4	0.34	0.63
3	Kothi Vala Kuva, Village Bagar Rajput, Alwar	2.13	2.70	7.28	7.54	9	9	0.26	0.59

(Annual Report Pollution Control Board 2009-2010)

## B. Ecological Resources

47. Alwar Town is an urban area surrounded by land that was converted for agricultural use many years ago. There is no remaining natural habitat in the town, and the flora is limited to artificially planted trees and shrubs, and the fauna comprises domesticated animals (cows, goats, pigs and chickens), plus other species able to live close to man (urban birds, rodents and some insects). There are three Reserved Forests (RF) to the west of the city (Bhurasid RF, Alwar RF and Dholdhup RF), where hill slopes feature scrub vegetation and mixed dry deciduous forest. Although there are no rare species or important timber trees, the vegetation is reported to be important for soil conservation.



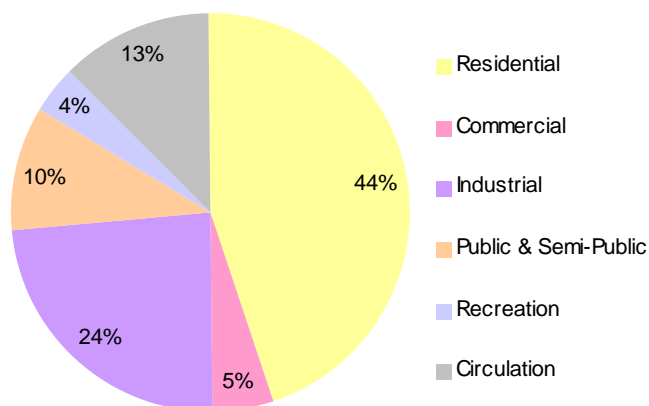
48. The nearest protected area to Alwar is the Sariska Tiger Reserve, 40 km to the southwest, which was designated as a sanctuary in 1955 and a tiger reserve in 1979. The reserve covers 900 km<sup>2</sup> of forested hills and plateaux, although habitat has been degraded by agriculture and the fauna depleted by poaching. There is no ASI or UNESCO site comes under this sub-project.

49. There is no forest area nearby (within radius of 10 km from project site) the project location.

## C. Economic Development

### 1. Land use

50. Located close to the national capital, Alwar was traditionally a services and administrative town, with little industrial development. However as Delhi has grown, so Alwar has benefited from its trade, infrastructure and prosperity, and has experienced rapid economic growth over the past 20 years. Alwar was recently selected as a regional town under the National Capital Plan for integrated development of the area around Delhi. The urban area of Alwar covers 49 km<sup>2</sup>, and although almost half of this is in residential use there is also a significant amount of industry, occupying 24% of the total land.



Source: Alwar Urban Improvement Trust

**Figure 3.2: Current land use in Alwar Town**

### 2. Industry and Agriculture

51. There are two industrial areas: the Old Industrial Area covers 88 ha and houses 42 units, mostly small-scale engineering such as stone polishing because of the ready availability of decorative stone from quarries in the surrounding hillsides. The Matsya Industrial Area (MIA) was established more recently by the Rajasthan Industrial Infrastructure Corporation (RIICO) and covers over 1,000 ha in the west of the town. Currently there are 213 operating industries in MIA, mostly mineral-based (88 units) and chemical (61). Of these, 28 operations are of large or medium scale and the remainder are small-scale.

52. There are also many households engaged in handicrafts in the town, such as the manufacture of cotton and wool products, and there are large numbers of small shops and businesses alongside the roads, particularly in the centre of the town.

53. Agriculture is easily the most important industry, both in Alwar District (where 65% of the total area is cultivated) and outside the headquarters town. Over 80% of the cultivated area is irrigated, mostly by groundwater. Many areas practice double cropping and the main

seasons are *Kharif* (April-September: maize, cotton, etc) and *Rabi* (October-March: wheat, barley, mustard, etc).

### 3. Infrastructure

54. PHED provides a piped municipal water supply to the whole city, which is entirely groundwater-based because of the lack of a dependable surface water source. The present usage is 26.8 MLD, extracted by 170 tube-wells located in and around the town. However water is only available for 1-2 hours per day, mainly because of system losses (estimated at 40%) and low and unequal network pressure.

55. Only two newly developed colonies (Shivaji Park and Ambedkar Colony, housing approx. 10,000 people each) have an underground piped sewerage system, and as there is no treatment facility, raw sewage is discharged into natural drainage channels. Most households depend on pit latrines and septic tanks, and some have made illegal connections through which sewage enters open storm water drains, polluting both surface and ground water.

56. There are 51 km of concrete storm water drains in the main city area, but these cover only 13% of the total road network and the contents (which frequently include raw sewage) are discharged untreated into a *nallah* (natural or man-made drainage channel).

57. There is no proper solid waste management system in the town, and although the Alwar Municipal Council (AMC) has provided dustbins in a few areas, in the rest of the town garbage is dumped in the streets and drains, and on vacant plots of land. Alwar generates an estimated 90 tons of solid waste per day and AMC collects around 57 tons from its manual street sweeping operation (conducted in the main city only), and removes other waste from open dumpsites irregularly. This is transported on open vehicles to the outskirts of the town, where it is dumped on open ground as there is no landfill.

58. Thermal power is the main source of energy in Rajasthan, contributing 89% of the electricity, compared to hydropower, which produces the remainder. State-level companies (Rajya Vidyut Utpadan Nigam Ltd, RVUN; and Rajya Vidyut Prasaran Nigam Ltd, RVPN) are responsible for power generation and transmission respectively, and distribution is provided by a regional company, the Jaipur Vidyut Vitran Nigam Ltd (JVVNL). Power is supplied from the central grid by overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. The power supply is erratic and there are frequent outages in warmer months, and large fluctuations in voltage.

### 4. Transportation

59. Alwar is provided with a relatively good transportation system, particularly in the outer parts of the town, where streets are wide and not heavily utilised by traffic. The situation is different in the centre of the town however where roads are narrower and more congested (with both traffic and pedestrians), and the smaller roads are surfaced with concrete. The total road network is 421km in length, of which 70% are surfaced with bitumen/tar, 23% are concrete and 7% are WBM (Water-borne Macadam). The majority of roads (48%) are maintained by UIT, 38% by the Public Works Department (PWD) and 24% by AMC, and the condition is generally poor, with many roads in need of repairs and resurfacing.

60. Transport in the town is mainly by personal vehicles (bicycles and motor cycles) or auto- and bicycle-rickshaws, and privately owned mini-vans provide a form of intermediate public transport system. There are good road links between Alwar and surrounding towns,

and a good quality road to the State capital Jaipur in the south-west and the national capital Delhi in the north-east. The national railway also runs through Alwar, and there are daily services through Rewari and Delhi in the north and Dausa and Jaipur in the south. The nearest airports are at Jaipur (150 km away) and Delhi (160 km).

## **D. Social and Cultural Resources**

### **1. Demography**

61. According to the national census the population of Alwar was 0.2 million in 1991 and 0.27 million in 2001, which shows an annual increase of 3.5% over the decade. The local authority however estimates that there are now 350,000 people in the town, which is occupied at an average population density of 6420 persons per km<sup>2</sup>.

62. Overall literacy is 82.8%, reported at 91.4% for males and 72.9% for females, which is considerably better than literacy in the state as a whole, which is 60.4% overall, and 75.7% for males and 44.0% for females. The sex ratio is however significantly below the natural 1:1 ratio, being 853 females per 1000 males, lower than both the state and national averages (879 and 929 respectively).

63. According to the census, in 2001 only 28.8% of the population was in paid employment, significantly lower than both the state and national averages (42.1 and 39.1% respectively). This indicates that most of the townspeople are engaged in the informal sector, earning a living where they can, from small trading, casual labour, etc. Of those that are employed, almost all (98%) are involved in the service and industrial sectors, with the remainder being engaged in agricultural activities.

64. Between 85-90% of people are Hindus and the remainder are mainly Muslims, Sikhs and Jains. The main local languages are Khariboli and Mewati, although almost all people speak the national language of Hindi and a few also speak English. Other languages spoken include Sindhi, Punjabi and Urdu, because Rajasthan borders Pakistan. About 3% of the population are from Scheduled Tribes (ST), but these are all part of the mainstream population; around 16% of the population belong to scheduled castes (SC).

### **2. Health and educational facilities**

65. There are good educational facilities in Alwar district, which serve both townspeople and inhabitants of surrounding villages and towns. There are 3885 primary and middle schools, 356 secondary and senior higher secondary schools, 38 general degree colleges in the district.

66. As the district headquarters town, Alwar is the main centre for health facilities in the area and there are six hospitals, plus a special TB hospital, 42 clinics, two family welfare centres, and three homeopathic hospitals in the city.

### **3. History, culture and tourism**

67. Legend suggests that the town of Alwar was founded in 1049 by Maharaja Alaghraj. In the mediaeval period it was ruled by the Yadu dynasty in the 11<sup>th</sup> century, Shamsuddin Altamash the Sultan of Delhi in the 12<sup>th</sup> century, the Chauhans in the 13<sup>th</sup> century, followed by Mewatis, Mughals, Marathas and Jats, until finally it was captured by the Kachhwaha Rajputs in the late 1600's.

68. Alwar Fort, known locally as Bala Quila, was built in 1550 by Hasan Khan Mewati, and is one of the few forts in Rajasthan to pre-date the rise of the Mughals. It stands on a

hill and rises 330 m above the city, and measures 5 km by 1.5 km. There are six entrances to the fort and 5 km of ramparts.

69. Tourism has risen in importance in Alwar over the past 20 years, and in 2005 there were 85,000 visitors, 90% from within India and 10% from abroad. Alwar Fort and Sariska Tiger Reserve 40 km away are the main attractions, but there are other interesting locations in and around the town including:

- The City Palace complex, which lies immediately below the fort, and was once the home of the maharajah. It has an impressive architecture, with many intricate ghats (staircases) and pavilions. The palace now houses government offices, and there is a museum and a large ornate pond (known as Sagar), surrounded by 12 chhatries or cenotaphs of red marble;
- Siliserh Lake, provides a dam, lake and four-storey palace dating from the mid-19<sup>th</sup> century, which has now been converted to a hotel and restaurant. The lake is both functional and attractive, set amongst low wooded hills, and attracts tourists from Alwar and beyond;
- Jaisamandh Dam is in a more remote location and reached by a narrow rural road, and its architecture and the surrounding landscape make it a further attraction for increasing numbers of tourists.

#### **IV. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: LOCATION AND DESIGN**

70. ADB Environmental Assessment Guidelines require that an IEE should evaluate impacts due to the location, design, construction and operation of the project. Construction and operation are the two activities in which the project interacts physically with the environment, so they are the two activities during which the environmental impacts occur. In assessing the effects of these processes therefore, all potential impacts of the project are identified, and mitigation is devised for any negative impacts. This has been done in Sections V and VI and no other impacts are expected.

71. In many environmental assessments there are certain effects that, although they will occur during either the construction or operation stage, should be considered as impacts primarily of the location or design of the project, as they would not occur if an alternative location or design was chosen. For example, if a STP produces an effluent that does not meet legally established standards, then this is an impact of the design as it would not occur if a more rigorous treatment technology had been adopted.

In the case of this subproject there are few impacts that can clearly be said to result from either the design or location. This is mainly because:

- The project is relatively small in scale and involves straightforward construction and low-maintenance operation, so it is unlikely that there will be major impacts;
- Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other ground disturbance. However the routine nature of the impacts means that most can be easily mitigated adopting sound practice of engineering;
- In the key field in which there could be significant impacts (archaeology), those impacts are clearly a result of the construction process rather than the project design or location, as they would not occur if this did not involve trenching or other ground disturbance.

72. The one area in which the impacts could be said to be related to the design and location of the subproject, is the effect of the operating STP near surface and groundwater, if the treated effluent is discharged to the adjacent nallah. This would not occur if the STP was located elsewhere, or if a treatment technology is good enough to remove nitrate and phosphate.

## V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: INFRASTRUCTURE CONSTRUCTION

### A. Screening out areas of no significant impact

73. From the descriptions given in Section II.C, it is clear that implementation of the project will affect a significant proportion of the town as branches of the new sewerage network will be laid alongside many roads and streets. Areas outside the town will also be affected, by construction of the trunk sewer and STP.

74. However it is not expected that the construction work will cause major negative impacts, mainly because:

- Most of the network and the trunk sewer will be built on unused ground alongside existing roads and can be constructed without causing major disruption to road users and any adjacent houses, shops and other businesses;
- Most network construction will be conducted by small teams working on short lengths at a time so most impacts will be localised and short in duration;
- The overall construction programme will be relatively short for a project of this nature.

75. As a result, there are several aspects of the environment that are not expected to be affected by the construction process and these can be screened out of the assessment at this stage as required by ADB procedure. These are shown in **Table 5.1**, with an explanation of the reasoning in each case.

76. These environmental factors have thus been screened out presently but will be assessed again before implementation of project.

**Table 5.1: Fields in which construction is not expected to have significant impacts**

Field	Rationale
Climate	Short-term production of dust is the only effect on atmosphere
Geology and seismology	Excavation will not be large enough to affect these features
Fisheries & aquatic biology	No rivers or lakes will be affected by the construction work – pipe laying only
Wildlife and rare or endangered species	There is no endangered species in the town or on the government owned areas outside the town on which facilities will be built
Coastal resources	Alwar is not located in a coastal area
Population and communities	Construction will not affect population numbers, location or composition

### B. Sewage Treatment Plant

#### 1. Construction method

77. As explained above, provision of a Sewage Treatment Plant will involve construction of the following structures on 32.65 ha of land immediately east of Agyara Dam:

- A series of oxygenation and waste stabilisation ponds, each approximately 50 x 100 m and 2-3 m in depth;
- Pump stations and pipes with valves to transfer material between ponds;
- An outfall drains (renovation) to discharge the treated wastewater.

78. Although the site is fairly large the construction will be straightforward, involving mainly simple excavation. The ponds will be dug by backhoe diggers and bulldozers, and soil will be transferred into trucks for offsite disposal. Clay will then be applied to the floor and sloping sides of each pond and after watering will be covered with low density polyethylene (LDPE) sheeting. A thin layer of cement mortar is then added, and concrete tiles are embedded into the surface by hand, with more cement grouting applied to seal joints between tiles.

79. Trenches for the pipe-work will also be dug by backhoe, and pipes will be brought to site on trucks, offloaded and placed into each trench by small cranes or pipe-rigs, after which soil will be replaced by hand to cover the trench.

80. Foundations for the small pump houses will be dug by backhoe, and concrete and aggregate will be tipped in to create the foundations and floor. The brick sides will then be built by hand by masons and pumps will be brought in on trucks and placed inside the pump house by crane. The roof material will then be attached by hand.

## **2. Physical Resources**

81. Although the impacts of constructing the STP will be confined to a single site, because of its size and the invasive nature of the excavation work, physical impacts could be significant, so mitigation measures will be needed.

82. Ponds will be dug on around 80% of the site, and if these are excavated to a depth of 2.5 m, around 400,000 m<sup>3</sup> of waste soil will be generated. This is a very large amount of waste, which could not be dumped without causing further physical impacts on air quality (dust), topography, soil quality, etc. It will be important therefore to reduce the amount of dumping by finding beneficial uses for as much waste soil as possible. This will require:

- Contacting the town authorities to arrange for the use of this material where possible in construction projects, to raise the level of land prior to construction of roads or buildings, or to fill previously excavated areas, such as brickworks;
- Preventing the generation of dust (which could affect surrounding agricultural land and crops) by removing waste material as soon as it is excavated, by loading directly onto trucks, and covering with tarpaulins to prevent dust during transportation.

83. Another physical impact associated with large-scale excavation is the effect on drainage and the local water table if groundwater and/or surface water collect in the voids. Given the difficulties of working in wet conditions the Contractor will almost certainly conduct all excavation in the dry season, so this should avoid any impacts on surface water drainage. However sub-surface water could still collect in the ponds given the proximity of the lake created by Agyara Dam and the fact that farmers irrigate the surrounding agricultural land. If water collects in any quantity it will need to be pumped out, and it should then be donated to neighbouring farmers to provide a beneficial use to the communities most affected by this aspect of the work, and improve public perceptions of the project.

### **3. Ecological Resources**

84. Farmers graze small herds of goats on the site of the proposed STP, and this has reduced the vegetation to scrub. There is therefore no ecological interest at the site, so construction will cause no adverse ecological impacts. There are however some trees that will need to be removed, and given global concerns regarding the loss of trees, the project should make a small positive ecological contribution by planting two native trees at a nearby site for every one that is removed.

### **4. Economic Development**

85. The site of the proposed STP (including the additional land) is owned by the government so there should be no need to acquire land from private owners, which might affect the income and assets of owners and tenants. The land is also not used for any purpose except for the unauthorized grazing of goats, and there is other suitable grazing nearby, so this activity should not be affected. The land is not farmed and there are no industries or housing in the vicinity so there should be no impact on income-generating activities. There is also no infrastructure on the site, and the construction work will be designed to avoid any effects on the integrity of the nearby Bharatpur Road and Agyara Dam.

86. The only aspect of the work that has any economic implications is the transportation of waste material from the site to locations where it can be put to beneficial use as recommended above. This will require a large number of lorry movements, which could disrupt traffic near the site and particularly in Alwar if such vehicles were to enter the town. The transportation of waste will be implemented by the Construction Contractor in liaison with the town authorities, and the following additional precautions should be adopted to avoid effects on traffic:

- Planning transportation routes so that heavy vehicles do not enter Alwar town and do not use narrow local roads, except in the immediate vicinity of delivery sites;
- Scheduling transportation activities to avoid peak traffic periods.

### **5. Social and Cultural Resources**

87. Although the STP will be built on an uninhabited and un-used site, with no residential areas nearby, there is a risk that the work could damage social and cultural resources, so careful mitigation and strict adherence by the EA and Contractor will be necessary.

88. Rajasthan is an area with a rich and varied cultural heritage that includes many forts and palaces from the Rajput and Mughal periods, and large numbers of temples and other religious sites, so there is a risk that any work involving ground disturbance could uncover and damage archaeological and historical remains. Given that this particular location is uninhabited and shows no sign of having been used to any extent in the past, then it could be that there is a low risk of such impacts. Nevertheless this should be ascertained by consulting the appropriate authorities, and appropriate steps should be taken according to the nature of the risk. This should involve:

- Consulting historical and archaeological authorities at both national and state level to obtain an expert assessment of the archaeological potential of the site;



- Selecting an alternative location if the site is considered to be of medium or high risk;
- Including 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 to the project;
- Developing a protocol for use by the Contractor 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;
  - Stopping work immediately to allow further investigation if any finds are suspected;
  - Calling in the state archaeological authority if a find is suspected, and taking any action they require to ensure its removal or protection in situ.

89. There are no modern-day social and cultural resources (such as schools and hospitals) near the site, and no areas that are used for religious or other purposes, so there is no risk of other impacts on such community assets.

90. Finally, there could be some short-term socio-economic benefits from the construction work if local people are able to gain employment in the construction workforce. To ensure that such gains are directed towards communities most directly affected by this part of the scheme, the Contractor should be required to employ at least 50% of the STP labour force from communities within a radius of say 2 km from the site, if sufficient people are available.

## **C. Sewerage Network and Trunk Sewer**

### **1 Construction method**

91. Provision of Outfall and Trunk-main will be built outside the town along side the Bharatpur Road to transfer sewage to the STP (Tranche 1) will involve construction of:

- Laying 18.075 km of Outfall & Trunk Mains of sizes 800–1200 dia. mm Reinforced Cement Concrete (RCC) pipe including 1.55 km by trench less technology,
- 700 mm to 1100 mm dia. for a length of 9063 m
- Laying of Trunk Mains of sizes 600 mm to 700 mm for length of 2525 m

92. Sewerage system in part of the town will consist of:

- Laying of Sub-Mains & laterals of sizes 200 mm 600 mm dia. for a length of 23220 m
- Laying of Sub-Mains & laterals of sizes 200 mm to 500 mm dia. for a length of 42223 m (enhancement in scope)<sup>2</sup>
- New drain will be constructed for carries runoff and Aggarav dam discharge

93. These two elements of the project involve the same kinds of construction and will produce similar effects on the environment, so their impacts are considered together.

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<sup>2</sup> Some additional area of the town is proposed to lay secondary and tertiary networks to connect with trunk main

94. Most pipes will be buried in trenches immediately adjacent to roads, in the un-used area within the ROW, alongside the edge of the tarmac. The trunk main and secondary network will be located alongside main roads, where there is generally more than enough free space to accommodate the pipeline. However in parts of the tertiary network where roads are narrow, this area is occupied by drains or the edges of shops and houses etc., so the trenches may have to be dug into the edge of the road.

95. Trenches will be dug by backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed nearby, and the pipes (brought to site on trucks and stored on unused land nearby) will be placed in the trench by crane or using a small rig. After the pipes are joined, loose soil will be shovelled back into the trench, and the surface layer will be compacted by hand-operated compressor.

96. Pipes are normally covered by 1.2 m under soil, and a clearance of 100 mm is left between the pipe and each side of the trench to allow backfilling. Trenches will therefore be quite large, a maximum of 3 m deep and 1.4 m wide for the trunk main, and a minimum of 1.5 m deep and 0.7 m wide for the tertiary network.

97. At intervals, small chambers (ca 1-2 m<sup>3</sup>) will be created to allow inspection and clearance of blockages and sediment during operation. These will be excavated by backhoe, and hardcore and concrete (mixed on site) will be tipped in to form the base. Brick sides will then be added by masons by hand, and the top will be sealed at ground level by a metal manhole cover.

98. As noted above, some of the narrower roads are constructed of concrete and have no available space at the edge because of the presence of drains, or shop- and house-fronts encroaching into the ROW. In these places, it may be necessary to break open the surface of the road using hand-held pneumatic drills, after which the trench and pipeline will be constructed as described above. On completion, a concrete layer will be re-applied to the surface to repair the road.

## **2 Physical Resources**

99. Construction of trenches will have similar physical impacts to the excavation work at the STP, although their extent and significance will be different because trenches are linear structures and the network is located in the town. Since length of the trunk main is not much the generation of waste will be less. Although this is <10% of the quantity produced at the STP it is still a significant amount of waste, and in this case there are additional considerations because piles of soil could impede traffic and other activities in the town (see below) and dust could affect inhabitants during dry weather. These impacts should be mitigated by applying the measures to minimise waste and dust, and there will need to be some additional precautions to control dust. The Contractor should:

- Contact the town authorities to find beneficial uses for the waste material, in construction projects, to raise the level of land prior to construction of roads or buildings, or to fill previously excavated areas, such as brickworks;
- Remove waste material as soon as it is excavated (by loading directly into trucks), to reduce the amount stockpiled on site;
- Use tarpaulins to cover loose material when transported from the site by truck;
- Cover or water stockpiled soil to reduce dust during windy weather.

100. The other important physical impact associated with large-scale excavation (effects on surface and groundwater drainage) should not be an issue in this case because of the very low rainfall in this area and the very low water table. In addition the Contractor will

almost certainly conduct all excavation in the dry season, to avoid the difficult working conditions during the monsoon.

101. The physical impacts of trenching will also be reduced by the method of working, whereby the network and trunk sewer will probably be constructed by small teams working on short lengths at a time, so that impacts will be mainly localised and short in duration. Physical impacts are also mainly temporary as trenches will be refilled and compacted after pipes are installed, and any disturbed road surfaces will be repaired. Because of these factors and the mitigation measures proposed above, impacts on the physical environment are not expected to be of major significance.

### **3 Ecological Resources**

102. There are no significant ecological resources in and around the project locations, so construction of the network and trunk sewer should have no ecological impacts. But actual impact can be assessed after finalisation of alignment. However, roadside trees should not be removed unnecessarily to build the trenches, and to mitigate any such losses the Contractor should be required to plant and maintain three new trees (of the same species) for each one that is removed.

### **4 Economic Development**

103. As the network and trunk sewer pipelines will all be conducted within the ROW of existing roads (either adjacent to the road, or beneath the road surface in narrower streets) there will be no need to acquire land, so there should be no direct effect on the income or assets of landowners, or the livelihoods of tenants.

104. There could be some economic impacts however, if the presence of trenches, excavated material, workers and machinery discourage customers from visiting shops and businesses adjacent to network construction sites, and the businesses lose income as a result. These losses will be short in duration as work at any one site should be completed in a week or less. However the loss of income could be significant for small traders and other businesses that exist on low profit margins. These impacts should therefore be mitigated by:

- Leaving spaces for access between mounds of excavated soil, and providing footbridges so that pedestrians can cross open trenches;
- Increasing the workforce in these areas to ensure that work is completed quickly;
- Consulting affected businesspeople to inform them in advance when work will occur.

105. ADB policy on Involuntary Resettlement requires that no-one should be worse off as a result of an ADB-funded project, and a separate Resettlement Plan and Resettlement Framework have been prepared to examine these issues and provide appropriate mitigation. This establishes that, in addition to the above practical measures to reduce the economic impact of the construction work, owners and tenants of affected businesses will also be compensated in cash for any income they lose.

106. Excavation could also damage existing infrastructure, in particular storm drains and water supply pipes, both of which are located alongside roads in the town. It will be particularly important to avoid damaging existing water pipes as these are mainly manufactured from Asbestos Cement (AC), which can be carcinogenic if inhaled, so there

are serious health risks for both workers and the public (see below). It will be important therefore to avoid these impacts by:

- Obtaining details from the Municipal Board of the nature and location of all infrastructure, and planning the sewer networks so that all such sites are avoided;
- Integrating the construction of the various Alwar subprojects (in particular water supply and sewerage) so that:
  - Different pipelines are located on opposite sides of the road wherever feasible;
  - Roads and inhabitants are not subject to repeated disturbance by trenching in the same area for different purposes.

107. Transport is another type of infrastructure that will be affected by some of the work, as in the narrower streets there is not enough space for excavated soil to be piled off the road. As noted above the road itself, may also be excavated in places where there is no available land alongside. Traffic will therefore be disrupted, and in some very narrow streets the whole road may need to be closed for short periods. The Contractor should therefore plan this work in conjunction with the town authorities and the police force, so that work can be carried out during periods when traffic is known to be lighter, and alternative routes and diversions can be provided where necessary. The Contractor should also increase the workforce in areas such as this, so that the work is completed in the shortest possible time.

108. It is inevitable that there will be an increase in the number of heavy vehicles in the town (particularly trucks removing waste and delivering pipes and other materials to site), and this could disrupt traffic and other activities, as well as damage fragile buildings if vibration is excessive. These impacts will therefore need to be mitigated by:

- Careful planning of transportation routes with the municipal authorities to avoid sensitive areas as far as possible, including narrow streets, congested roads, important or fragile buildings and key sites of religious, cultural or tourism importance;
- Scheduling the transportation of waste to avoid peak traffic periods, the main tourism season, and other important times.

## **5 Social and Cultural Resources**

109. There is a risk that sewer construction, which involves extensive disturbance of the ground surface, could damage undiscovered archaeological and/or historical remains, or even unknown sites. The risks are in fact considerably higher in this case, because such artefacts are more likely to occur in areas that have been inhabited for a long period. The preventative measures described in Section V.B.5 will thus need to be employed and strictly enforced. These are:

- Consulting national and state historical and archaeological authorities to assess the archaeological potential of all construction sites;
- Selecting alternative routes to avoid any areas of medium or high risk;
- Including state and local archaeological, cultural and historical authorities and interest groups as project stakeholders to benefit from their expertise;

- Developing a protocol for use in conducting all trenching, to recognise, protect and conserve any chance finds (see Section V.B.5 for details).

110. Sewer construction will also disturb some modern-day social and cultural resources, such as schools, hospitals, temples, and sites that are of interest to tourists. (such as the fort and City Palace complex). Impacts will include noise, dust, and interrupted access for pedestrians and vehicles, and in cases where pneumatic drills are used to break the surface of concrete roads, there could be a risk of damage from vibration. Mitigation will therefore be needed to protect these resources and to enable usage by local people and visitors to continue throughout the construction work. This will be achieved through several of the measures recommended above, including:

- Consulting the town authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- Limiting dust by removing waste soil quickly, covering and watering stockpiles, and covering soil with tarpaulins when carried on trucks;
- Increasing the workforce in sensitive areas to complete the work quickly;
- Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses);
- Using modern vehicles and machinery with standard adaptations to reduce noise and exhaust emissions, and ensuring they are maintained to manufacturers' specifications.

111. In addition, the Executing Agency and Contractor should:

- Consult municipal authorities, custodians of important buildings, cultural and tourism authorities, and affected communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

112. There is invariably a safety risk when substantial construction like this is conducted in an urban area, and precautions will thus be needed to ensure the safety of both workers and citizens. The Contractor will be required to produce and implement a site Health and Safety Plan, and this should include such measures as:

- Excluding the public from the site;
- Ensuring that all workers are provided with and use appropriate Personal Protective Equipment;
- Health and Safety Training for all site personnel;
- Documented procedures to be followed for all site activities;
- Accident reports and records; etc.

113. An additional, particularly acute health risk presented by this work derives from the fact that, as mentioned above, the existing water supply system comprises mainly AC pipes, so there is a risk of contact with carcinogenic material if these pipes are uncovered in the

course of the work. Precautions have already been introduced into the design of the project to avoid this, of which the most important is that:

- The locations of all new infrastructures will be planned to avoid locations of existing AC pipes so AC pipes should not be discovered accidentally.

114. Given the dangerous nature of this material for both workers and the public, additional precautions should be taken to protect the health of all parties in the event (however unlikely) that AC pipes are encountered. The design consultant should therefore develop a protocol to be applied in any instance that AC pipes are found, to ensure that appropriate action is taken. This should be based on the approach recommended by the United States Environmental Protection Agency (USEPA)<sup>3</sup>, and amongst other things, should involve:

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

115. There could again be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to communities that are affected by the work, as suggested in Section B.5, the Contractor should be required to employ at least 50% of his labour force from communities in the vicinity of construction sites. Creating a workforce from mainly local people will bring additional benefits by avoiding problems that can occur if workers are imported; including social difficulties in the host community and issues of health and sanitation in poorly serviced temporary camps.

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<sup>3</sup> In the USA, standards and approaches for handling asbestos are prescribed by the Occupational Health and Safety Administration (OHSA) and the Environmental Protection Agency (EPA) and can be found at <http://www.osha.gov/SLTC/asbestos>

## VI. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: OPERATION AND MAINTENANCE

### A. Screening out areas of no significant impact

116. Although the sewerage system will need regular maintenance when it is operating, with a few simple precautions this can be conducted without major environmental impacts (see below). There are therefore several environmental sectors which should be unaffected once the system begins to function. These are identified in **Table 6.1** below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further. Presently most of the sub-project components are in design stage.

**Table 6.1: Fields in which operation and maintenance of the completed sewerage system is not expected to have significant impacts**

Field	Rationale
Climate, topography, geology, seismology	There are no known instances where the operation of a relatively small sewerage system has affected these factors
Fisheries & aquatic biology	The only local fishery is in local pond, which will not be affected
Wildlife, forests, rare species, protected areas	None of these features are in or outside the town
Coastal resources	Alwar is not located in a coastal area

117. These environmental factors have thus been screened out presently but will be assessed again before implementation.

### B. Operation and maintenance of the improved sewerage system

118. The new sewerage system provided during the first phase of investment will collect and treat all surface water, domestic wastewater and sewage produced by 40% of the town, and the remainder of the inhabited area and future expansion will be served by additional sewers provided via subsequent tranches of funds. Although treatment will not be to the standards of more developed countries, the technology is approved by the Public Health Engineering Department, and the discharge after treatment will comply with Indian standards.

119. The sewer pipes will not function without maintenance, as silt inevitably collects in areas of low flow over time. The project will therefore provide equipment for cleaning the sewers, including buckets and winches to remove silt via the inspection manholes, diesel-fuelled pumps to remove blockages, and tankers to transport the waste hygienically to the STP.

120. Piped sewers are not 100% watertight and leaks can occur at joints. Any repairs will be conducted by sealing off the affected sewer and pumping the contents into tankers, after which the faulty section will be exposed and repaired following the same basic procedure as when the sewer was built. Trenches will be dug around the faulty section and the leaking joint will be re-sealed, or the pipe will be removed and replaced.

121. At the STP sewage sludge will need to be removed from the active treatment ponds every four or five years. This is a simple process that does not require a Sludge Management Plan. Ponds are allowed to dry out naturally and the solid sludge is removed by manual digging. 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 and farmers are normally allowed to remove the dry material for application to their land.

## **C. Environmental impacts and benefits of the operating system**

### **1 Physical Resources**

122. The provision of an effective sewerage system in 60% of the town should improve the physical appearance and condition of the city area that will no longer be discharged to the *nallahs*. This measure and the fact that there will be fewer septic tanks and less sewage discharged to drains, should also improve the appearance of the town and the quality of surface water drainage and groundwater. Clearly there will be further significant improvements once the whole town is connected to sewer via the future funding.

123. There are also certain environmental risks from the operating system, most notably from leaking sewer pipes as untreated faecal material can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the Government Agency (GA) responsible for operating the sewerage system establishes a procedure to routinely check the operation and integrity of the sewers, and to implement rapid and effective repairs where necessary. If trenches are dug to locate and repair leaks or remove and replace lengths of pipe, the work will follow the same procedure as occurred when the infrastructure was provided. However the impacts should be much less significant as the work will be infrequent, and will affect individual small locations for short periods only. Work will not be conducted during rainfall so there will be no effect on drainage, and the excavated soil will be replaced in the trench so there will be no waste. Physical impacts should thus be negligible.

### **2 Ecological Resources**

124. Although the new sewerage system will improve the environment of the town, there are unlikely to be significant ecological benefits as there are no natural habitats or rare or important species. If effluent from the STP was discharged into the nearby *nallah* there could be some small ecological benefits as marsh plants and animals will colonise the small wetland that is likely to be formed. However the risks of contaminating groundwater are more significant, so it would be more appropriate to forego this ecological gain in favour of the better disposal method suggested above, whereby the effluent is supplied to farmers to irrigate and fertilize their fields.

### **3 Economic Development**

125. Although repairs to the sewer network could result in shops losing some business if access is difficult for customers whilst the work is carried out, any losses will be small and short-lived and will probably be at the level of normal business fluctuations. It should therefore not be necessary to compensate for such losses. Nevertheless simple steps should be taken to reduce the inconvenience of the works, including:

- Informing all residents and businesses about the nature and duration of any repair work well in advance so that they can make preparations if necessary;
- Requiring contractors employed to conduct these works to provide wooden walkways across trenches for pedestrians and metal sheets where vehicle access is required;



- Consulting the local police regarding any such work so that it can be planned to avoid traffic disruption as far as possible, and road diversions can be organised if necessary.

#### **4 Social and Cultural Resources**

126. Although there is a high risk of excavation in the town discovering material of historical or archaeological importance, there will be no need to take precautions to protect such material when areas are excavated to repair leaks in the sewer network, as all work will be conducted in trenches that have already been disturbed when the infrastructure was installed.

127. Repair work could cause some temporary disruption of activities at sites of social and cultural importance such as schools, hospitals, temples, etc, so at these locations the same precautions as employed during the construction period should be adopted. These include:

- Consulting the town authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- Completing work in these areas quickly;
- Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required;
- Consulting municipal authorities, custodians of important buildings, cultural and tourism authorities, and local communities to inform them of the work in advance, and avoid sensitive times, such as religious and cultural festivals.

128. The responsible authorities will employ local contractors to conduct repairs of the sewer network, and contractors should be required to operate the same kinds of Health and Safety procedures as used in the construction phase (see Section V.C.5) to protect workers and the public. This should include application of the asbestos protocol if any AC pipes are encountered.

129. The use of local contractors will provide economic benefits to the companies and the workers they employ. There is however little prospect of directing these benefits to persons affected by any maintenance or repair works as contractors will utilise their existing workforce.

130. The citizens of the town will be the major beneficiaries of the new sewerage system, as toilet waste from those areas served by the new network will be removed rapidly and treated to an acceptable standard. This should improve the environment of these areas, and in conjunction with the development of other infrastructure (in particular water supply), should deliver major improvements in individual and community health and well-being. Diseases of poor sanitation, such as diarrhoea and dysentery, should be reduced, so people should 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.

## VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

### A. Summary of environmental impacts and mitigation measures

131. **Table 7.1** lists the potential adverse impacts of the Alwar sewerage subproject as identified and discussed in Sections IV, V and VI, and the mitigation proposed to reduce these impacts to acceptable levels. The table also shows how the mitigation will be implemented and who will be responsible.

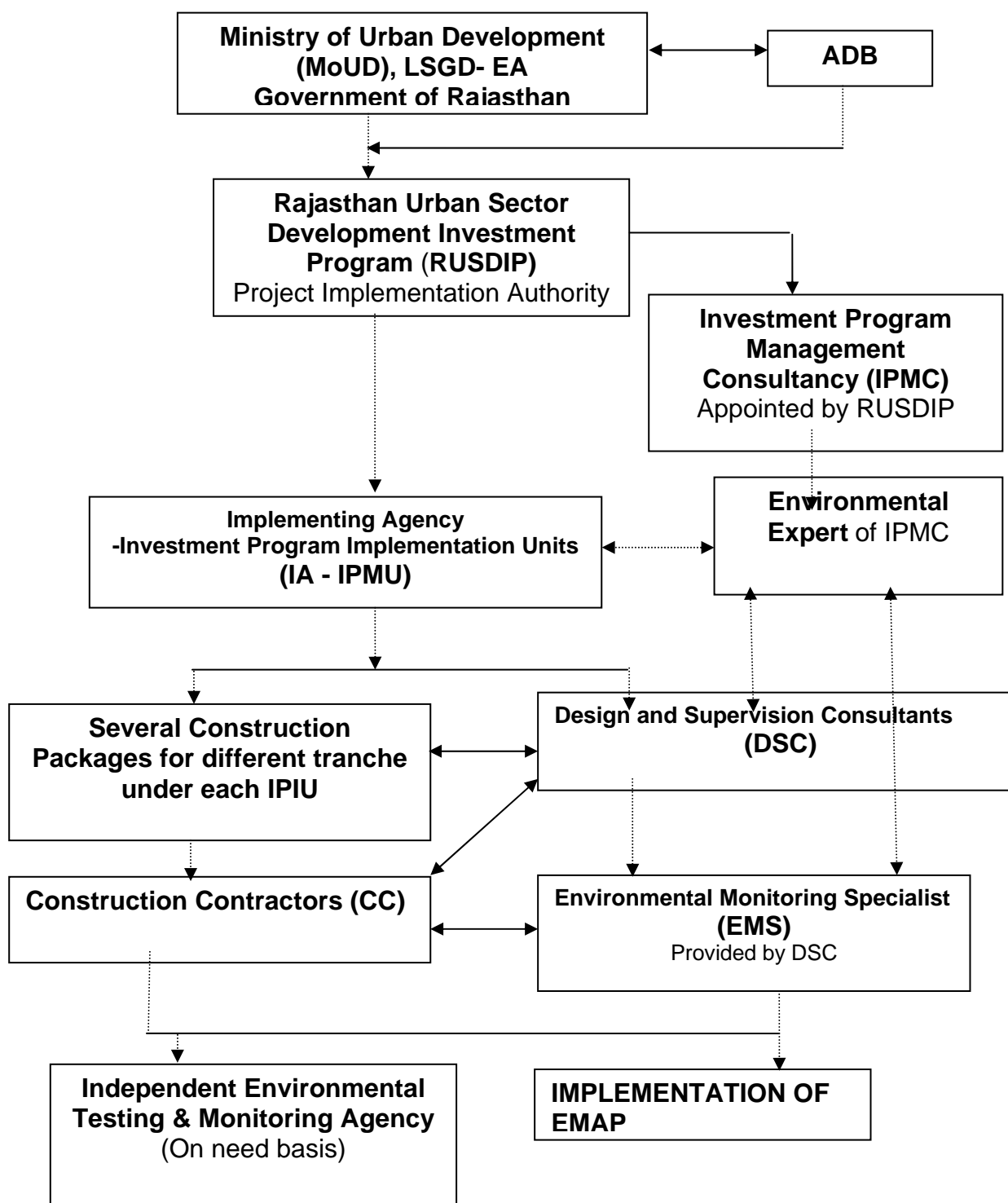
### B. Institutional arrangements for project implementation

132. The main agencies involved in managing and implementing the subproject are:

- LSGD is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan.
- The Implementing Agency (IA) is the Project Management Unit of the ongoing RUIDP, which will be expanded to include a broader range of skills and representation from the Urban Local Bodies (ULB, the local government in each town). Assigned as the RUSDIP Investment Program Management Unit (IPMU), this body will coordinate construction of subprojects across all towns, and ensure consistency of approach and performance.
- The IPMU will be assisted by Investment Program Management Consultants (IPMC) who will manage the program and assure technical quality of design and construction; and Design and Supervision Consultants (DSC), who will design the infrastructure, manage tendering of Contractors and supervise the construction process.
- Investment Program Implementation Units (IPIU) will be established in seven zones across the State to manage implementation of subprojects in their area. IPIUs will be staffed by professionals seconded from government departments (PHED, PWD), ULBs, and other agencies, and will be assisted by consultants from the IPMC and DSC as necessary.
- The IPMU will appoint Construction Contractors (CC) to build elements of the infrastructure in a particular town. The CCs will be managed by the IPIU, and construction will be supervised by the DSC.
- LSGD will be assisted by an inter-ministerial Empowered Committee (EC), to provide policy guidance and coordination across all towns and subprojects. The EC will be chaired by the Minister of Urban Development and LSG, and members will include Ministers, Directors and/or representatives of other relevant Government Ministries and Departments.
- City Level Committees (CLCs) have also been established in each town, chaired by the District Collector, with members including officials of the ULB, local representatives of state government agencies, the IPIU, and local NGOs and CBOs. The CLCs will monitor project implementation in the town and provide recommendations to the IPIU where necessary.

133. **Figure 7.1** shows institutional responsibility for implementation of environmental safeguard at different level.

**Figure 7.1: Institutional Responsibility- RUSDIP**



**Table 7.1: Environmental impacts and mitigation for the Alwar Sewerage Subproject**

Potential Negative Impacts	Sig	Dur <sup>4</sup>	Mitigation Activities and Method	Responsibility	Location
<b>Construction: Sewage Treatment Plant</b>					
Excavation will produce large amounts of waste soil	M	P	Find beneficial uses for waste soil in construction, land raising and infilling of excavated areas	Contractor	All sites
Stockpiled soil could create dust in windy weather	M	T	Remove soil as soon as it is excavated	Contractor	All sites
Dust could also be produced when soil is transported	M	T	Use tarpaulins to cover dry soil when carried on trucks	Contractor	
Rain and ground water could collect in excavated areas	M	T	Conduct all excavation in the dry season	Contractor	All sites
			Pump out groundwater & provide to farmers for irrigation	Contractor	STP site
Some trees will need to be removed from the site	M	P	Only remove trees if it cannot be avoided	Contractor	All sites
			Plant and maintain two trees for every one removed		
Traffic may be disrupted by lorries carrying waste soil	M	T	Plan routes to avoid Alwar Town and narrow local roads	Contractor	From STP site
			Schedule transportation to avoid peak traffic periods		
Ground disturbance could damage archaeological and historical remains	S	P	Request state and local archaeological authorities to assess archaeological potential of proposed STP site	DSC	All sites
			Select alternative if site has medium-high potential	DSC	
			Include state and town historical authorities as project stakeholders to benefit from their expertise	LSGD	
			Develop and apply protocol to protect chance finds (excavation observed by archaeologist; stop work if finds are suspected; state authority to plan appropriate action)	DSC and Contractor	
Economic benefits if local people are employed in Contractor's workforce	M	T	Contractor should employ at least 50% of workforce from communities in vicinity of STP site	Contractor	All sites
<b>Construction: Sewerage Network and Trunk Sewer, runoff carrying drain</b>					
Trenching will produce additional amounts of waste soil	M	P	As above: find beneficial uses in construction or infill	Contractor	All sites
Waste soil may create dust when stored or transported	M	T	As above: remove waste soil as soon as it is excavated	Contractor	All sites
			As above: cover soil with tarpaulins on trucks		
			Cover or damp down stored soil in dry weather		
Trees may be removed along pipeline routes	M	P	As above: avoid removing trees, plant 2 for every 1 cut	Contractor	All sites
Shops may lose income if customers' access is impeded	M	T	Leave spaces for access between mounds of soil	Contractor	Network sites
			Provide bridges to allow people/vehicles to cross trench	Contractor	
			Increase workforce in these areas to finish work quickly	Contractor	
			Inform shopkeepers of work in advance	LSGD	
			*Compensate businesses for lost income	LSGD	

Sig = Significance of Impact (NS = Not Significant; M = Moderately Significant; S = Significant). Dur = Duration of Impact (T = Temporary; P = Permanent)

Potential Negative Impacts	Sig	Dur <sup>4</sup>	Mitigation Activities and Method	Responsibility	Location
Trenching could damage other infrastructure	S	P	Confirm location of infrastructure and avoid these sites	DSC	Network sites
			Locate water and sewer pipes on opposite sides of roads	DSC	
Roads/people may be disturbed by repeated trenching	M	T	Integrate subprojects to conduct trenching at same time	DSC/LGD	Network
Traffic will be disrupted if lack of space means that dug soil has to be placed on the road, and/or sewers have to be located in the road itself	M	T	Consult authorities – work in light traffic periods	Contractor	Network sites
			Ensure police provide diversions when necessary	Contractor	
			As above: increase workforce to finish this work quickly	Contractor	
Traffic, people and activities could be disrupted by trucks carrying waste soil or delivering materials to site	M	T	Plan routes to avoid narrow streets, congested roads, important/fragile buildings, key religious and tourism sites	Contractor	Network sites
			Plan work to avoid peak traffic and main tourism season		
Major risk that ground disturbance in town could damage archaeological and historical remains	S	P	As above: ask authorities to assess potential of all sites	DSC	All sites
			As above: alternative sites where risk is high/medium	DSC	
			As above: include state/local authorities as stakeholders	LSGD	
			As above: apply protocol to protect chance finds	DSC/CC	
Sites of social/cultural importance (schools, hospitals, temples) may be disturbed by noise, dust, vibration and impeded access	M	T	Identify buildings at risk from vibration damage and avoid using pneumatic drills nearby	Contractor	Network sites
			As above: remove waste quickly, cover/spray stockpiles, cover soil when carried on trucks		
			As above: increase workforce to finish work quickly		
			As above: use bridges to allow access (people/vehicles)		
			Use modern vehicles/machinery & maintain as specified	Contractor	All sites
			Consult relevant authorities, custodians of buildings, local people to address issues & avoid work at sensitive times	Contractor	Network sites
Workers and the public are at risk from accidents on site	M	T	Prepare and implement a site Health and Safety Plan that includes measures to:	Contractor	All sites
			- Exclude the public from site;		
			- Ensure that workers use Personal Protective Equipment		
			- Provide Health & Safety Training for all personnel;		
			- Follow documented procedures for all site activities;		
Existing water supply system uses AC pipes, a material that can be carcinogenic if inhaled as dust particles	S	T	- Keep accident reports and records.		
			Design infrastructure to avoid locations of AC pipes	DSC	Network
			Train all construction personnel in dangers of AC pipes and how to recognise them in situ	Contractor	All sites
			Develop and apply protocol if AC pipes are encountered. This should include:	Contractor	Network sites
			- immediate reporting of any occurrence to management		
			- removal of all persons to a safe distance		
			- use of appropriate breathing apparatus and protective suits by workers delegated to deal with AC material		

Potential Negative Impacts	Sig	Dur <sup>4</sup>	Mitigation Activities and Method	Responsibility	Location
			- safe removal and long-term disposal of AC material		
Economic benefits for people employed in workforce	M	T	As above: 50% of workforce from affected communities	Contractor	All sites
<b>Operation and Maintenance</b>					
Leaking sewers can damage human health and contaminate soil and groundwater	M	T	Detect and repair sewer leaks rapidly and effectively	GA	Network sites
Sludge is removed from treatment ponds every 5 years	S	T	Dry sludge and test for absence of bacteria & pathogens	GA	STP
			Sell dried sludge to farmers to fertilize land		
Shops may lose small amounts of income if customers' access is impeded by network repair works	S	T	As before: inform shopkeepers of work in advance	GA	Network sites
			As before: provide walkways and bridges for vehicles	OMC	
			As before: request police to divert traffic if necessary	OMC	
Sites of social/cultural importance may be disturbed by noise, dust, vibration, impeded access for short time during network repairs	S	T	As before: avoid using drills/trucks near fragile buildings	OMC	Network sites
			As before: finish work quickly in sensitive areas	OMC	
			As before: provide walkways and bridges for vehicles	OMC	
			As before: consult authorities and communities, inform them of work in advance, avoid sensitive periods	GA	
Health and safety of workers & the public could be at risk from repair work and AC pipes of old water supply system	M	T	Prepare and operate H&S plan with same measures as used in construction phase	OMC	All sites
			Apply previously-developed protocol to protect all persons if AC pipes are encountered		
Local people will benefit if employed by project	M	P	STP workers should be residents of neighbouring areas	GA	STP
<b>Location and Design</b>					
Discharge of treated effluent to <i>nallah</i> could pollute surface & groundwater with nitrate, phosphate, etc	M	P	Conduct bacteriological tests to ensure safety of effluent	GA	STP
			Sell treated wastewater to farmers for irrigation		

134. Resettlement issues will be coordinated centrally by a Resettlement Specialist within the IPMU, who will ensure consistency of approach between towns. A local Resettlement Specialist will also be appointed to IPIUs of zones in which there are resettlement impacts and they will prepare and implement local Resettlement Plans following the framework established in Tranche 1.

135. Environmental issues will be coordinated by an Environmental Specialist within the IPMU/ IPMC, who will ensure that all subprojects comply with environmental safeguards. An Environmental Monitoring Specialist (EMS) who is part of the DSC team will implement the Environmental Monitoring Plan from each IEE (see below), to ensure that mitigation measures are provided and protect the environment as intended. Domestic Environmental Consultants (DEC) will be appointed by each IPIU to update the existing IEEs in the detailed design stage, and to prepare IEEs or EIAs for new subprojects, where required to comply with national law and/or ADB procedure.

### C. Environmental Monitoring Plan

136. **Table 7.1** shows that most mitigation activities are the responsibility of the Construction Contractors<sup>5</sup> (CC) employed to build the infrastructure during the construction stage, or the O&M Contractors employed to conduct maintenance or repair work when the system is operating. Responsibility for the relevant measures will be assigned to the Contractors via the contracts through which they are appointed (prepared by the DSC during the detailed design stage), so they will be legally required to take the necessary action. There are also some actions that need to be taken by LSGD in their role as project proponent, and some actions related to the design that will be implemented by the DSC.

137. A program of monitoring will be conducted to ensure that all parties take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. This will be conducted by a qualified Environmental Monitoring Specialist (EMS) from the DSC. The EMS will be responsible for all monitoring activities and reporting the results and conclusions to the IPMU, and will recommend remedial action if measures are not being provided or are not protecting the environment effectively. The EMS may be assisted by environmental specialists in particular technical fields, and junior or medium-level engineers who can make many of the routine observations on site. Post-construction monitoring will be conducted by the relevant Government Agency (GA) to whom responsibility for the infrastructure will pass once it begins to operate<sup>6</sup>.

138. **Table 7.1** shows that most of the mitigation measures are fairly standard methods of minimising disturbance from building in urban areas (maintaining access, planning work to avoid sensitive times, finding uses for waste material, etc), and experienced Contractors should be familiar with most of the requirements. Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects. There will also be some surveys of residents, as most of the measures are aimed at preventing impacts on people and the human environment.

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<sup>5</sup> During implementation the contractor will submit monthly progress reports, which includes a section on EMP implementation to the IPIU. The IPIU will submit reports to the IPMU for review. The IPMU will review progress reports to ensure that the all mitigation measures are properly implemented. The IPMU will consolidate monthly reports and submit quarterly reports to ADB for review

<sup>6</sup> In the operational period some infrastructure will be the responsibility of the Municipal Boards/Councils, whilst others will be the responsibility of the appropriate branch of the State government (such as PWD, PHED, etc)

139. **Table 7.2** shows the proposed Environmental Monitoring Plan (EMP) for this subproject, which specifies the various monitoring activities to be conducted during all phases. Some of the measures shown in **Table 7.1** have been consolidated to avoid repetition, and there has been some re-ordering to present together those measures that relate to the same activity or site. The EMP describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring). It does not show specific parameters to be measured because as indicated above, most measures will be checked by simple observation, by checking of records, or by interviews with residents or workers.

140. Given the scale of the investment in providing the infrastructure, LSGD will also wish to conduct monitoring during the operational period to ensure the correct functioning of the STP and confirm the long-term benefits of the scheme. There will also be bacteriological surveys when the STP is operating, to ensure the safety of dried sludge and treated effluent before sale to farmers to fertilize and irrigate fields. Table 7 shows that these long-term surveys will monitor:

- the chemical and bacteriological quality of treated STP effluent;
- the bacteriological content of dried sewage sludge;
- the health of the population and the prevalence of diseases of poor sanitation.

141. An accredited consulting laboratory will be appointed to collect and analyse samples of treated effluent and dried sludge once per month for the first five years of operation of the STP. A domestic social studies consultant will be appointed to monitor public health and the incidence of disease, once per year over the same five year period, after collecting baseline data during the construction period.

#### **D. Environmental management and monitoring costs**

142. Most of the mitigation measures require the contractors to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. Regardless of this, any costs of mitigation by the contractors (those employed to construct the infrastructure or the local companies employed to conduct O&M when the system is operating) are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation is the responsibility of LSGD, which will be provided as part of their management of the project. Costs of compensating shopkeepers for loss of business income during the construction period (**Table 7.1**) are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

143. The remaining actions in the Environmental Management Plan are:

- The environmental monitoring during construction, conducted by the EMS;

144. These have not been budgeted elsewhere, and their costs are shown in **Table 7.3**, with details of the calculations shown in footnotes beneath the table. The figures show that the total cost of environmental management and monitoring for the project as a whole (covering design, period of construction and the first five years of operation) is **INR 0.99 million**.



**Table 7.2: Environmental Monitoring Plan**

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
<b>CONSTRUCTION</b>					
Find beneficial uses for waste soil (construction, land raising, infill)	All sites	Contractor	Site observations; CC records	Monthly	EMS
Remove waste soil as soon as it is excavated	All sites	Contractor	Site observations	Weekly	EMS
Use tarpaulins to cover soil when transported on trucks	All sites	Contractor	Site observations	Weekly	EMS
Avoid Alwar Town and narrow local roads when transporting soil	Network sites	Contractor	Observations off site; CC record	Weekly	EMS
Avoid transporting soil during peak traffic periods	Network sites	Contractor	Observations on and off site	Weekly	EMS
Cover or damp down stockpiled soil in dry weather	Inhabited areas	Contractor	Site observations	Weekly	EMS
Conduct all excavation work in the dry season	All sites	Contractor	Site observations	Monthly	EMS
Pump groundwater from excavated areas and provide to farmers	STP site	Contractor	Site observations; farmer survey	Monthly	EMS
Leave spaces for access between mounds of soil	Network sites	Contractor	Site observations	Weekly	EMS
Provide bridges to allow people & vehicles to cross open trenches	Network sites	Contractor	Site observations	Weekly	EMS
Only remove trees if it cannot be avoided	All sites	Contractor	Site observations	Weekly	EMS
Plant and maintain three trees for every one removed	All sites	Contractor	Observations on/off site; CC records	Monthly	EMS
*Compensate businesses for lost income	Where required	LSGD	Shopkeeper survey; LSGD record	As needed	IMA <sup>7</sup>
Increase workforce in inhabited areas to finish work quickly	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Inform shopkeepers and residents of work in advance	Network sites	LSGD	Resident surveys; CC records	Monthly	EMS
Confirm location of infrastructure and avoid these sites	Network sites	DSC	Site observation; design reports	Monthly	EMS
Locate water and sewer pipes on opposite sides of roads	Network sites	DSC	Site observation; design reports	Monthly	EMS
Integrate subprojects to conduct trenching at same	Network sites	DSC/LSGD	Site observation; design	Monthly	EMS

<sup>7</sup> Resettlement issues (asterisked) will be monitored by an Independent Monitoring Agency (IMA) established under the Resettlement Framework

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
time			reports		
If work will affect traffic, conduct when traffic is light	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Ensure police provide traffic diversions when required	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Request archaeological authorities to assess potential of all sites	All sites	DSC	DSC records; design reports	As needed	EMS
Select alternatives if sites have medium or high potential	All sites	DSC	DSC records; design reports	As needed	EMS
Include state and town historical authorities as stakeholders	All sites	LSGD	CC records; observations at meetings	As needed	EMS
Develop and apply archaeological protocol to protect chance finds	All sites	DSC and CC	DSC and CC records; site observations	Weekly	EMS
Plan transport routes to avoid narrow streets, important or fragile buildings, religious and tourism sites	Network sites	Contractor	Observations off site: CC record	Weekly	EMS
Plan work to avoid peak traffic and main tourism season	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Avoid using pneumatic drills near buildings at risk from vibration	Network sites	Contractor	Site observations; CC records	Weekly	EMS
Use modern vehicles and machinery and maintain as specified	All sites	Contractor	Site observations; CC records	Monthly	EMS
Consult authorities, custodians of buildings, communities: address key issues, avoid working at sensitive times	Network sites	Contractor	Site observations; CC records; resident surveys	Monthly	EMS
Prepare and implement a site H&S Plan including personal protection from transmission of HIV/AIDS (safety of workers/public)	All sites	Contractor	Site observations; CC records	Monthly	EMS
Exclude public from the site	All sites	Contractor	Site observations; CC records	Monthly	EMS
Ensure that workers wear Personal Protective Equipment	All sites	Contractor	Site observations; CC records	Monthly	EMS
Provide Health and Safety training including process of transmission of HIV/AIDS for all personnel	All sites	Contractor	CC records; worker interviews	Monthly	EMS
Follow documented procedures for all site activities	All sites	Contractor	Site observations; CC records	Monthly	EMS

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
Keep accident reports and records	All sites	Contractor	CC records	Monthly	EMS
Design infrastructure to avoid known locations of AC pipes	Network sites	DSC	DSC records; design reports	As needed	EMS
Train all personnel in dangers and recognition of AC pipes	All sites	Contractor	Site observations; CC records	Monthly	EMS
Develop and apply protocol if AC pipes are encountered	All sites	DSC/CC	DSC & CC records; site observations	Weekly	EMS
If AC pipes are encountered, report to management immediately	All sites	Contractor	Site observations; CC records	Weekly	EMS
Remove all persons to safe distance	All sites	Contractor	Site observations; CC records	Weekly	EMS
Workers handling AC: wear breathing apparatus; protective suits	All sites	Contractor	Site observations; CC records	Weekly	EMS
All AC material must be removed and disposed of safely	All sites	Contractor	Observations on and off site; CC records	As needed	EMS
Employ at least 50% of workforce from communities near sites	All sites	Contractor	CC records; worker interviews	Monthly	EMS
Air, water, noise, soil quality monitoring	Construction site	Contractor	CC records	Twice in a year	EMS
<b>OPERATION AND MAINTENANCE</b>					
Detect and repair sewer leaks rapidly and effectively	Network sites	GA	Site observation; resident survey	Monthly	LSGD
Sell dried inert sludge to farmers to fertilize land	STP	GA	Site observation; farmer survey	Monthly	LSGD
Inform shopkeepers and residents of work in advance	Network sites	GA	Resident surveys	Monthly	LSGD
Provide walkways and bridges for vehicles	Network sites	OM Contractor	Site observation; resident survey	Monthly	LSGD
Request police to divert traffic if necessary	Network sites	OM Contractor	Site observations	Monthly	LSGD
Avoid using drills or heavy vehicles near fragile buildings	Network sites	OM Contractor	Site observations	Monthly	LSGD
Finish work quickly in sensitive areas	Network sites	OM Contractor	Site observations; OMC records	Monthly	LSGD
Consult communities, avoid working during sensitive periods	Network sites	GA	Site observation; resident survey	Monthly	LSGD

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
Prepare and operate H&S plan to protect workers and citizens	All sites	OM Contractor	Site observations; OMC records	Monthly	LSGD
Apply AC protocol to protect all persons if AC pipes encountered	All sites	OM Contractor	Site observations; OMC records	Monthly	LSGD
STP workers should be residents of neighbouring areas	STP	GA	Employer record; worker survey	Monthly	LSGD
<b>LOCATION AND DESIGN</b>					
Sell treated wastewater to farmers for irrigation	STP	GA	Site observation; farmer survey	Monthly	LSGD
<b>LONG-TERM SURVEYS</b>					
Survey of chemical and bacteriological quality of STP effluent	STP	GA	Water quality sampling/analysis	Monthly for 5 years	Consulting lab
Bacteriological surveys of dried STP sludge	STP	GA	Bacterial sampling/analysis		Social studies consultant
Survey of public health and incidence of water borne disease	Alwar Town	GA	Hospital records; resident surveys	Annual for 6 years	Social studies consultant

**Table 7.3: Environmental management and monitoring costs (INR)**

Item	Quantity	Unit Cost	Total Cost	Sub-total
<b>1. Implementation of EMP (3 years)</b>				
Domestic Environmental Monitoring Specialist	1 x 6 month	140,000 <sup>8</sup>	840,000	
Survey Expenses	Lumpsum	150,000	150,000	990,000

<sup>8</sup> Unit costs of domestic consultants include fee, travel, accommodation and subsistence

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

### **A. Project stakeholders**

145. Most of the main stakeholders have already been identified preliminary. If any other stakeholders that are identified during project implementation will be brought into the process in the future. Primary stakeholders are:

- Residents, shopkeepers and businesspeople who live and work alongside the roads in which network improvements will be provided and near sites where facilities will be built
- Owners and users of any land that is acquired along the transmission main route;
- Custodians and users of socially and culturally important buildings in affected areas;
- State and local authorities responsible for the protection and conservation of archaeological relics, historical sites and artefacts;
- State and local tourism authorities.

146. Secondary stakeholders are:

- LSGD as the Executing Agency;
- Other government institutions whose remit includes areas or issues affected by the project (state and local planning authorities, Department of Public Health Engineering, Local Government Dept, Ministry of Environment and Forests, Roads and Highways Division, etc);
- NGOs and CBOs working in the affected communities;
- Other community representatives (prominent citizens, religious leaders, elders, women's groups);
- The beneficiary community in general; and
- The ADB and Government of India, Ministry of Finance.

### **B. Consultation and disclosure to date**

147. Some informal discussion was held with the local people during site visit. Issues discussed are

- Awareness and extent of the project and development components
- Benefits of Project for the economic and social upliftment of community
- Labour availability in the Project area or requirement of outside labour involvement
- Local disturbances due to Project Construction Work
- Necessity of tree felling etc. at project sites

- Water logging and drainage problem if any
- Drinking water problem
- Forest and sensitive area nearby the project site

148. Local populations are very much interested on the project and they will help project authorities in all aspects. Public consultation results specifically on environmental issues are shown in **Appendix III**.

149. The public Consultation and group discussion meeting were conducted by RUIDP on Date 27 July, 2009 after advertising in Local NEWS papers. The objective of the meeting was to appraise the stakeholders about the environmental and social impacts of the proposed program and the safeguards provided in the program to mitigate the same. In the specific context of Alwar, the environmental and social impacts of the proposed subprojects under Tranche 1 in Alwar were discussed.

150. Meetings and individual interaction were held at potentially temporarily affected areas; and local informal interviews were conducted to determine the potential impacts of sub-project construction to prepare the sample Environmental Framework. A town-wise stakeholder consultation workshop was conducted which provided an overview of the Program and sub-projects to be undertaken in Alwar; and discussed the Government and ADB's Environment policies acts and potential environment impacts of the sub-projects in Alwar. During the workshop, Hindi versions of the Environmental Framework were provided to ensure participants understood the objectives, policy principles and procedures related to Environment, English and Hindi versions of the Environmental Framework have been placed in the Urban Local Body (ULB) office and Environmental Framework will be provided later on. The NGO to be engaged to implement the Mitigation Measures will continue consultations, information dissemination, and disclosure. The Environmental Framework will be made available in the ULB office, Investment Program Project Management Unit and Implementation Unit (IPMU and IPIU) offices, and the town library. The finalized IEE containing Mitigation Measures will also be disclosed in ADB's website, the State Government website, the local government website, and the IPMU and IPIU websites. ADB review and approval of the RP is required prior to award of civil works contracts.

**151. Major Issues discussed during Public consultation are**

- (i) Proposed waste water management project should ensure proper hygienic disposal of sewerage water in all wards of city.
- (ii) Executive agency should give preference to engage internationally reputed contractor like Gammon, HCC, etc as people do not have faith about the local contractors in respect of quality of works as well as timely completion of work;
- (iii) Livelihood affected households should be given assistance in the mode of cash compensation;
- (iv) Local people should be employed by the contractor during construction work;
- (v) Adequate safety measures should be taken during construction work;
- (vi) Mobile kiosks/vendors/hawkers have shown willingness to shift in nearby places without taking any compensation and assistance from the Executing Agency;

- (vii) Local people have appreciated the waste water management proposal of the government and they have ensured that they will cooperate with the Executing Agency during project implementation.

### **C. Future consultation and disclosure**

152. LSGD will extend and expand the consultation and disclosure process significantly during implementation of RUSDIP. They will appoint an experienced NGO to handle this key aspect of the programme, who will conduct a wide range of activities in relation to all subprojects in each town, to ensure that the needs and concerns of stakeholders are registered, and are addressed in project design, construction or operation where appropriate. The programme of activities will be developed during the detailed design stage, and is likely to include the following:

➤ Consultation during detailed design:

- Focus-group discussions with affected persons and other stakeholders (including women's groups, NGOs and CBOs) to hear their views and concerns, so that these can be addressed in subproject design where necessary;
- Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the project.

➤ Consultation during construction:

- Public meetings with affected communities to discuss and plan work programmes and allow issues to be raised and addressed once construction has started;
- Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

➤ Project disclosure:

- Public information campaigns (via newspaper, TV and radio) to explain the project to the wider city population and prepare them for disruption they may experience once the construction programme is underway;
- Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in Hindi;
- Formal disclosure of completed project reports by making copies available at convenient locations in the study towns, informing the public of their availability, and providing a mechanism through which comments can be made.

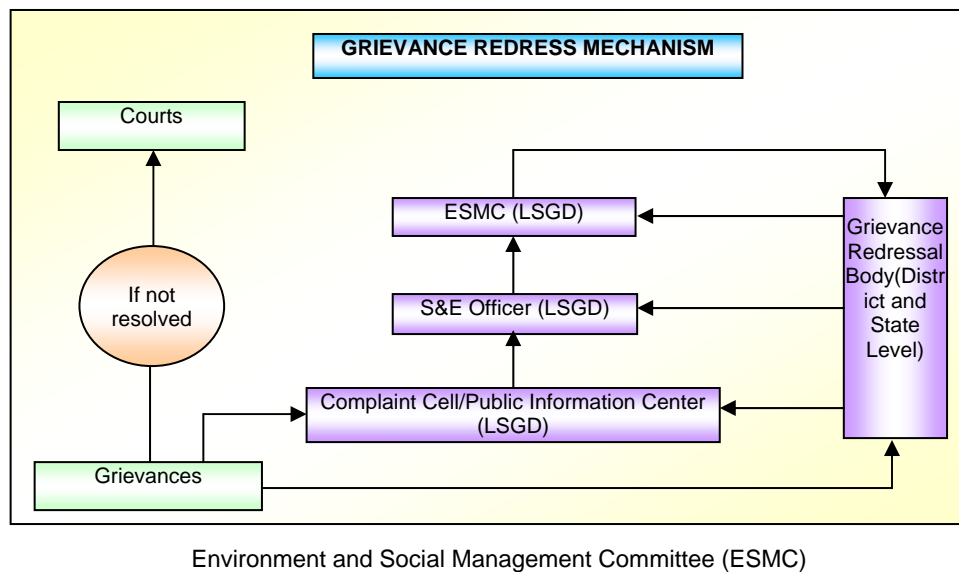
### **D. Grievance Redress Mechanism**

153. The project authority will establish a mechanism to receive and facilitate resolution of affected persons' concerns, complaints and grievances about the project's environmental

performance. The grievances mechanism should be scaled to the risks and adverse impacts of the project. It will be addressed affected peoples' concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all the affected people at no cost and without retribution. The affected people will be informed by appropriate mechanism. The figure given below indicates the grievance redress mechanism for this purpose.

154. During implementation process performance monitoring fact sheet will be prepared against each possible environmental impacts.

**Figure 8.1: Grievance redress mechanism - RUSDIP**





## IX. FINDINGS AND RECOMMENDATIONS

### A. Findings

155. The Project is designed to improve the quality of life of small town residents and enhance the small towns' roles as market, services, and manufacturing centers. It has a strong community development focus reinforced by integrated poverty reduction, health and hygiene improvement investment projects. The towns' economies will benefit from enhanced productivity as a result of health improvement, time savings in collecting water, as well as from increased urban efficiency arising from improved roads, bridges, drainage, drinking water and sanitation. Residents in towns will also benefit from savings in health care costs.

156. During project design, community meetings were held with beneficiaries to discuss sanitation, poverty, resettlement, affordability issues, and environmental concerns. Socioeconomic surveys obtained information and individual views on current situations and future preferences. Potential environmental impacts of urban infrastructure improvements are mainly short-term during the construction period and can be minimized by the proposed mitigating measures and environmentally sound engineering and construction practices.

157. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Alwar Sewerage and Sanitation Subproject. Potential negative impacts were identified in relation to construction and operation of the improved infrastructure, and the design and location of the subproject. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the outline designs for the infrastructure. These include:

- Locating the trunk main and sewerage networks within the ROW of existing roads, to avoid the need to acquire land or relocate people;
- Locating sewers on unused land adjacent to roads wherever possible, to avoid damaging roads and disrupting traffic and other activities.

158. This means that the number of impacts and their significance has already been reduced by amending the design.

159. Changes have also been made to the location of elements of the project to further reduce impacts. These include:

- Locating the STP on government-owned land to avoid the need for land acquisition and relocation of people;
- Locating the 15 km trunk main in the ROW alongside the Bharatpur Road, to avoid acquiring agricultural land and affecting the livelihoods of farmers and farm workers.

160. Regardless of these and various other actions taken during the IEE process and in developing the subproject, there will still be impacts on the environment when the infrastructure is built and when it is operating. This is mainly because of the invasive nature of trenching work; the sewer network is located in a town, some parts of which are densely populated; and because Rajasthan is an area with a rich history, in which there is a high risk that ground disturbance may uncover important archaeological remains. Because of these factors the most significant impacts are on the physical environment, the human environment, and the cultural heritage.

161. During the construction phase, impacts mainly arise from the need to dispose of large quantities of waste soil; and from the disturbance of residents, businesses, traffic and important buildings by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. These include:

- Finding beneficial uses for waste material;
- Covering soil and sand during transportation and when stored on site;
- Planning work to minimize disruption of traffic and communities;
- Providing temporary structures to maintain access across trenches where required.

162. Although there will be no need to acquire land or relocate people, roadside businesses will lose some income as access will be difficult for customers when work is in their vicinity. ADB policy requires that no-one should be worse off as a result of an ADB-funded project, so these losses will be compensated through a Resettlement Plan and Framework prepared to comply with Bank policy on Involuntary Resettlement.

163. One field in which impacts are much less routine is archaeology, and here a series of specific measures have been developed to avoid damaging important remains. These include:

- Assessing the archaeological potential of all proposed construction sites, and selecting alternative locations to avoid any areas of medium or high risk;
- Including archaeological, cultural and historical authorities and interest groups as project stakeholders to benefit from their expertise;
- Developing a protocol for use in conducting all excavation to ensure that any chance finds are recognized, protected and conserved.

164. Special measures were also developed to protect workers and the public from exposure to carcinogenic asbestos fibres in the event that Asbestos Cement pipes used in the existing water supply system are encountered accidentally during excavation work. These are to:

- Avoid all known sites of AC pipes when the locations of new infrastructure are planned in the detailed design stage;
- Train all construction personnel to raise awareness of the dangers of AC and enable early recognition of such pipes if encountered;
- Develop and apply a protocol to protect workers and the public if AC pipes are encountered (including evacuation of the immediate area, use of protective equipment by workers, and safe removal and disposal of AC material).

165. There were limited opportunities to provide environmental enhancements, but certain measures were included. For example it is proposed that the project will:

- Employ in the workforce people who live in the vicinity of construction sites to provide them with a short-term economic gain;

166. These and the other mitigation and enhancement measures are summarised in **Table 7.1**, which also shows the location of the impact, the body responsible for the mitigation, and the programme for its implementation.

167. On completion the sewerage system should operate with routine maintenance, which should not significantly affect the environment, providing certain pre-conditions are met. These are that:

- The operation and integrity of sewers are checked regularly and any leaks are repaired rapidly and effectively to avoid public health risks and contamination of land and water;

168. The repair of sewers will have fewer environmental impacts than the original sewer construction as the work will be infrequent and will affect small areas only. It will also be conducted in areas that have already been excavated, so there will be no need to protect archaeological material.

169. The main impacts of the operating sewerage system will be beneficial as human waste from those areas served by the new network will be removed rapidly and treated to an acceptable standard. This will improve the environment and appearance of these areas, and the health and quality of life of the citizens. Diseases of poor sanitation should be reduced, which should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.

170. **Table 7.1** also assesses the effectiveness of each mitigation measure in reducing each impact to an acceptable level. This is shown as the level of significance of the residual impact (remaining after the mitigation is applied). This shows that all impacts will be rendered at least neutral (successfully mitigated), and that certain measures will produce a benefit (in addition to the major benefits provided by the operating scheme).

171. Mitigation will be assured by a program of environmental monitoring conducted during both construction and operation to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. 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 IPMU. There will also be longer-term surveys to ensure the safety of sewage sludge and treated effluent for use in agriculture, and to monitor the expected improvements in the health of the population.

## **B. Recommendations**

172. There are three straightforward but essential recommendations that need to be followed to ensure that the environmental impacts of the project are successfully mitigated. These are that LSGD should ensure that:

- All mitigation, compensation and enhancement measures proposed in this environmental status report (**Table 7.1**) are implemented in full, as described in the text above;
- The Environmental Monitoring Plan proposed in Section VII.C of this report is also implemented in full.

## **X. CONCLUSIONS**

173. The environmental status of the proposed improvements in sewerage and sanitation in Alwar Town has been assessed. Issues related to Involuntary Resettlement were assessed by a process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the subproject.

174. The overall conclusion of process is that provided the mitigation, compensation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject. There should in fact be some small benefits from recommended mitigation and enhancement measures, and major improvements in quality of life and individual and public health once the scheme is in operation.

175. There are no uncertainties in the analysis, and no further studies are required to comply with ADB procedure or national law.

## Appendix I: 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 Urban Sector Development Investment Program

Sector Division:

Sewerage and Sanitation sub-project

Screening Questions	Yes	No	Remarks
<b>A. PROJECT SITING IS THE PROJECT AREA...</b>			
▪ <b>DENSELY POPULATED?</b>	√		As per the census 2001, the urban population of Alwar was 2,66,203 which rises by 2.67 % annually, hence the project is coming up at a densely populated area.
▪ <b>HEAVY WITH DEVELOPMENT ACTIVITIES?</b>	√		Since Alwar is one of the least developed areas of Rajasthan, hence it is not loaded with developmental activities. It is infact an effort to develop the same
▪ <b>ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?</b>			There is no protected/environmental sensitive area along the sewerage line
• <b>CULTURAL HERITAGE SITE</b>		√	Alwar city is one of the jewels of the Rajasthan state. Historical monuments such as Alwar Fort, Bhangarh, Bharathari, Sariska Moosi rani ki chattri, City palace, Sariska palace, Jain temple, Palace museum, pandupol, siliserh, neemrana fort mugul gumbad are some of the places of Tourist's attractions. Alwar is also called the gateway of Rajasthan
• <b>PROTECTED AREA</b>		√	The nearest protected area is Sariska tiger reserve forests is located at a distance of about 40 km from the project site. Which is out of project impact zone
• <b>WETLAND</b>		√	No

Screening Questions	Yes	No	Remarks
• <b>MANGROVE</b>		√	No
• <b>ESTUARINE</b>		√	No
• <b>BUFFER ZONE OF PROTECTED AREA</b>		√	The site is not within the buffer zone of the protected area of the tiger reserve forests as it is situated at a distance of about 40 kms from it, thus there will be no impact on it.
• <b>SPECIAL AREA FOR PROTECTING BIODIVERSITY</b>		√	The Sariska Tiger Reserve is one of the most famous national parks in India located in the Alwar district of the state of Rajasthan. This area was a hunting preserve of the erstwhile Alwar state and it was declared a wildlife reserve in 1955. In 1978, it was given the status of a tiger reserve making it a part of India's Project Tiger scheme. The present area of the park is 866 km <sup>2</sup> . The park is situated 107 km from Jaipur and 200 km from Delhi.
• <b>BAY</b>		√	No
<b>B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE...</b>			
▪ impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.		√	The disposal is to be done in a scientific manner hence no impact is estimated.
▪ deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?		√	The subproject will rather result in improvement of environmental conditions
▪ degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?		√	
▪ dislocation or involuntary resettlement of people?		√	The nature of the work does not call for displacement of communities. In other ways, it will benefit the society by providing better sewerage network which will further prevent the contamination of ground water and surface water resources.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable group?		√	

Screening Questions	Yes	No	Remarks
▪ degradation of cultural property, and loss of cultural heritage and tourism revenues?		√	There will be no impact on the cultural monuments as the proposed project will include the development of various main and Lateral sewer networks connecting to outfall along with the road restoration
▪ occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?		√	
▪ water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters?		√	The nature of the proposed project does not call for the same.
▪ air pollution due to urban emissions?		√	There will be no air pollution during construction of Sewer and the treatment is to be carried out with aerobic process thus no such air pollution will be there.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation?		√	
▪ road blocking and temporary flooding due to land excavation during rainy season?	√		Alternate routes will be provided to avoid road blockage. Adequate measures will be taken to prevent the temporary flooding.
▪ noise and dust from construction activities?	√		Little increase in noise levels and dust emission is anticipated from construction activities and shall be contained by taking proper mitigation measures as and when required. Sprinkling of water on the dust will be done frequently to prevent the fugitive dust emissions. Regular monitoring will be done to ensure noise and dust emissions within the limits as prescribed by RPCB.
▪ traffic disturbances due to construction material transport and wastes?		√	Contractor will provide a separate stockyard for storage of construction material to avoid such problems.
▪ temporary silt runoff due to construction?		√	Temporary silt runoff will arise only during heavy rains. To prevent this, adequate measures will be taken to minimize the silt runoff.
▪ hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		√	The nature of the proposed project does not call for the same
▪ water depletion and/or degradation?		√	Sewerage will be discharged after achieving the prescribed norms of RPCB & norms of CPHEEO.

Screening Questions	Yes	No	Remarks
▪ overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?		√	Sewerage will be discharged after achieving the prescribed norms of RPCB & norms of CPHEEO.
▪ contamination of surface and ground waters due to improper waste disposal?		√	The proposed sewer line development will not call for sludge disposal on land.
▪ pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?		√	
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	
▪ social conflicts if workers from other regions or countries are hired?		√	Preference will be given to the local workers in order to minimize the chances of such conflicts.
▪ 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?	√		There will be no use of chemical and explosives during operation. Construction and operation will be carried out as per the standard norms. Thus risk to community health and safety will be minimized
▪ 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?		√	During construction proper barricading and safety measures will be followed. Proposed sewer line development will not call for exposure of workers.



<b>Climate Change and Disaster Risk Questions</b> The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
<ul style="list-style-type: none"> <li>Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)?</li> </ul>	√		As per Rajasthan Earthquake Zoning Map Alwar Falls under Earthquake moderate risk zone – III (MSK - VII)
<ul style="list-style-type: none"> <li>Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., increased extreme rainfall increases flooding, damaging proposed infrastructure)?</li> </ul>		√	
<ul style="list-style-type: none"> <li>Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?</li> </ul>		√	
<ul style="list-style-type: none"> <li>Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by paving vulnerable groundwater recharge areas, or using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?</li> </ul>		√	

\* Hazards are potentially damaging physical events.

## Appendix II: Environments, Hazards and Climate Changes

Environment	Natural Hazards and Climate Change	Example Impact on Urban Development
<b>Arid/ Semi-arid and desert environment</b>	Low erratic rainfall of up to 500 mm rainfall per annum with periodic droughts and high rainfall variability. Low vegetative cover. Resilient ecosystems & complex pastoral and systems, but medium certainty that 10–20% of drylands degraded; 10-30% projected decrease in water availability in next 40 years; projected increase in drought duration and severity under climate change. Increased mobilization of sand dunes and other soils as vegetation cover declines; likely overall decrease in agricultural productivity, with rain-fed agriculture yield reduced by 30% or more by 2020. Earthquakes and other geophysical hazards may also occur in these environments.	Encroachment of sand dunes into urban areas; increased dust and respiratory diseases in peri-urban areas; water and energy shortages in urban areas due to reduced rainfall
<b>Humid and sub-humid plains, foothills and hill country</b>	More than 500 mm precipitation/yr. Resilient ecosystems & complex human pastoral and cropping systems. 10-30% projected decrease in water availability in next 40 years; projected increase in droughts, heatwaves and floods; increased erosion of loess-mantled landscapes by wind and water; increased gully erosion; landslides likely on steeper slopes. Likely overall decrease in agricultural productivity & compromised food production from variability, with rain-fed agriculture yield reduced by 30% or more by 2020. Increased incidence of forest and agriculture-based insect infestations. Earthquakes and other geophysical hazards may also occur in these environments.	Increases in the intensity of precipitation and floods inundate transport infrastructure causing disruptions in traffic and economic activity; increased food insecurity in urban areas as production levels fall and prices rise
<b>River valleys/ deltas and estuaries and other low-lying coastal areas</b>	River basins, deltas and estuaries in low-lying areas are vulnerable to riverine floods, storm surges associated with tropical cyclones/typhoons and sea level rise; natural (and human-induced) subsidence resulting from sediment compaction and ground water extraction; liquefaction of soft sediments as result of earthquake ground shaking. Tsunami possible/likely on some coasts. Lowland agri-business and subsistence farming in these regions at significant risk.	Ground subsidence damages and disrupts services such as water supply and sanitation, energy and transport; increases in the intensity of floods can erode solid waste landfills which can result in the contamination of water resources
<b>Small islands</b>	Small islands generally have land areas of less than 10,000km <sup>2</sup> in area, though Papua New Guinea and Timor with much larger land areas are commonly included in lists of small island developing states. Low-lying islands are especially vulnerable to storm surge, tsunami and sea-level rise and, frequently, coastal erosion, with coral reefs threatened by ocean warming in some areas. Sea level rise is likely to threaten the limited ground water resources. High islands often experience high rainfall intensities, frequent	Sea-level rise and storms increase threats to economic growth and populations which are concentrated along coastlines; reduced land availability for urban expansion; damage to port and tourism facilities from sea-level rise, storms and floods.

Environment	Natural Hazards and Climate Change	Example Impact on Urban Development
	landslides and tectonic environments in which landslides and earthquakes are not uncommon with (occasional) volcanic eruptions. Small islands may have low adaptive capacity and high adaptation costs relative to GDP.	
<b>Mountain ecosystems</b>	Accelerated glacial melting, rockfalls/landslides and glacial lake outburst floods, leading to increased debris flows, river bank erosion and floods and more extensive outwash plains and, possibly, more frequent wind erosion in intermontane valleys. Enhanced snow melt and fluctuating stream flows may produce seasonal floods and droughts. Melting of permafrost in some environments. Faunal and floral species migration. Earthquakes, landslides and other geophysical hazards may also occur in these environments.	Human insecurity resulting from glacial lake outbursts and landslides; Reduced income from tourism activities as snow patterns change
<b>Volcanic environments</b>	Recently active volcanoes (erupted in last 10,000 years – see <a href="http://www.volcano.si.edu">www.volcano.si.edu</a> ). Often fertile soils with intensive agriculture and landslides on steep slopes. Subject to earthquakes and volcanic eruptions including pyroclastic flows and mudflows/lahars and/or gas emissions and occasionally widespread ashfall.	Damage to infrastructure, loss of life and livelihoods due to natural disasters

## APPENDIX III

### PUBLIC CONSULTATION- ENVIRONMENT- Alwar Waste water project

#### Issues discussed

- Awareness and extent of the project and development components
- Benefits of Project for the economic and social Upliftment of Community
- Labour availability in the Project area or requirement of outside labour involvement
- Local disturbances due to Project Construction Work
- Necessity of tree felling etc. at project sites
- Water logging and drainage problem if any
- Drinking water problem
- Forest and sensitive area nearby the project site
- Movement of wild animal nearby the town

1. **Date & time of Consultation:- 29.06.10 at 09.30 AM , Location :- Shantikunj**

2. **Date & time of Consultation:- 29.06.10 at 14.30 PM, Location :- DM residency**

**Table-1: Issues of the Public Consultation- Design phase**

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
1	Awareness of the project – including coverage area	The people in the nearby areas are aware of the upcoming project. As per the local people, the DSC consultants have informed them regarding the development of sewerage network at Alwar town in order to provide better sanitation facilities.	--
2	In what way they may associate with the project	<ul style="list-style-type: none"> <li>• The local people are of the view that local people should be hired depending upon their efficiency and expertise.</li> <li>• They are ready to connect their houses with the upcoming sewer line.</li> </ul>	Preference will be given to the local labour during the implementation of the project as per the requirement.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	During the consultation, it was found that there will be no such impact on the wildlife sanctuary as it is approximately 40 km from the proposed project area.	
4	Presence of historical/ cultural/ religious sites nearby	Sites of cultural/ historic/ religious importance were not found in the close proximity of the proposed project site.	--
5	Unfavorable climatic Condition	As per the local people's view, the summer season is not appropriate to commence the work as the temperature reaches about 45°C. During the heavy rains, there might arise some problems in the execution of the project.	Climatic conditions will be taken into account while the execution stage.
6	Occurrence of flood	Due to poor drainage conditions	Proper actions should be taken

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
		people suffer from water stagnancy in the area. There has been no report of Flood in the project area.	during the execution of the project so that the condition does not worsen due to our project.
7	Drainage and sewerage problem facing	Due to poor drainage condition people suffer from water stagnancy in their area.  Due to the lack of proper sewerage system, the ground water at times is found contaminated. Also it creates unhygienic conditions due to which diseases also prevails.	The proposed sewerage network will improve the drainage as well as the sewerage network within the town.
8	Present drinking water problem – quantity and Quality	Most of the areas are supplied water by PHED. The groundwater at times is contaminated because of the mixing of the raw sewage from soak pits with ground water.	The drinking water should be treated before supplying.
9	Present solid waste collection and disposal Problem	The Municipal Board takes care of the solid waste management of Alwar town. Crude dumping of solid waste is still going on. Almost 62 TPD of the total solid waste is dumped at Golata site. This mismanaged site can become a serious cause for an epidemic.	A landfill site and a compost plant is under construction at Alwar which will certainly reduce these problems.
10	Availability of labour during construction time	Sufficient labour is available in this area.	Availability of labour is not a problem here, if required labour from nearby areas will be hired.
11	Access road to project Site	The site is accessible via road from all sides.	--
12	Perception of villagers on tree felling and Afforestation	The local people were of the view that trees should not be cut; if urgent it should be minimum in number and number of trees cut should be replaced by planting trees in the nearby areas.	It has been explained that during construction sewer lines and manholes trees are not going to be affected. If in any case, trees are brought cut down thrice the number of trees cut will be planted in the nearby areas.
13	Dust and noise and Pollution and disturbances during construction work	People are aware of the fact that during construction work some amount of dust and noise will arise. But they wanted that it should be minimized as much as possible. It has been explained that as per Safeguard policy of the project for abatement of pollution, control system will be considered	PUC certified vehicles should be used during material handling and transportation activities. Sprinkling of water should be done in order to minimize the fugitive dust emissions. Vehicles movement will be controlled & appropriate measure will be taken to combat the same.
14	Setting up worker camp site within the village/ project locality	As per the people, local labours should be hired which will minimize the requirement of setting of a temporary work shelter.	Preference will be given to the local labour during the implementation of the project as per the requirement.

Sr. No.	Key Issues/Demands	Perception of community	Action to be Taken
15	Safety of residents During construction phase and plying of vehicle for construction Activities	People were of the view that safety measures like cautionary boards, signals, barricades should be used at the project site in order to minimize any mishap.	Safeguard policy should be Implemented in order to minimize the accidents.
16	Requirement of enhancement of other facilities	According to the people interviewed better facilities should be implemented in order to overcome the problems related to solid waste disposal, unhygienic conditions and nuisances due to stray animals and birds. Also, foul smell is a big problem in summer and rainy season.	Actions should be taken in order to improve the sanitation facilities and upliftment of community.

### NAME AND POSITION OF PERSONS CONSULTED:

Magan Lal Saini S/o Mehtab Singh, Shantikunj, Alwar  
Barkat Ali, Shantikunj, Alwar  
Anil Kumar Gupta S/o Babu Lal Gupta R/o Rajeev Colony Dawood Pur, Alwar  
Mahendra Saini, Shantikunj, Alwar  
Ratan Lal, Tajpur Road, Near Perfect School Alwar  
Bacchu Singh S/o Padam Singh, 60' Road Dawood pur Alwar  
Bhupendra S/o Sh.Hukum R/o Kala Kuwa, Housing Board Harijan Basti, Alwar  
Umesh S/o Sh.Ghanshyam R/o Tripoliya, Alwar

1. Pravinder S/o Sh.Pappi R/o Tripoliya In the specific context of Alwar, the environmental and social impacts of the proposed subprojects under Tranche 1 in Alwar were discussed.
2. Domestic environmental specialist of ADB TA team and an EA representative, who is also the in-charge of Alwar town, made the detailed presentation to the stakeholders (copy of presentation is enclosed herewith). Draft resettlement framework (RF) and summary initial environmental examination (SIEE) documents of RUSDIP, translated in the local language – Hindi, were displayed in the Notice Board of AMC and also distributed during presentation to the interested parties. The copies of documents are also made available to all the interested parties through the AMC. It may be noted that the EA has already distributed these documents to the affected persons (APs) and projected implementation agencies, the PHED, AMC and UIT in March 2007.
3. The comments, suggestions of the stakeholders are presented below:
  - Forty-one stakeholders attended this meeting, which was chaired by the elected Vice-chairperson of Alwar Municipal Council.
  - The meeting started with a briefing by the Commissioner of Alwar Municipal Council.
  - Domestic environmental specialist of ADB TA team then made a detailed presentation on (i) objective and benefits of RUSDIP, (ii) proposed subprojects in Alwar in Tranche 1, (iii) mandatory environmental and social assessment requirements of subprojects, i.e. Government Regulations and as

well as ADB policies on Environment, involuntary Resettlement and Indigenous People – salient features of these three key safeguard policies were presented, (iii) key social safeguard features in the program to avoid social impacts, (iv) draft resettlement framework (v) IR impacts of Tranche 1 subprojects in Alwar, (vi) environmental subproject selection criteria to minimize the negative environmental impacts of subproject implementation and, lastly, (vii) identified environmental impacts and mitigation measures through sample subproject IEEs.

- All the stakeholders were supportive of the project and indicated their willingness to participate in the program to make it successful.
- Stakeholders were of the view that these subprojects provide benefits to all the people by improving water supply, sewerage, roads and solid waste management infrastructure.
- Most of the stakeholders indicated that solid waste at present is not managed properly. Waste is collected partially and disposed haphazardly all over, making Alwar unhealthy. During rains the solid waste joins natural streams. Therefore, all were of the view that solid waste management subproject will improve the environmental and aesthetical values of the city.
- The proposed Lterana ROB will improve the traffic movement.
- People were impressed by the ADB Policy that the “absence of formal legal title to land is not a bar to ADB policy entitlement”. A public representative shared his views with all stating that he lost his land in a Government Project. He was not compensated properly affecting his economic development. He requested the EA to consider the market rate of replacement value of the land to be acquired.
- The EA appraised that RUSDP is designed to minimize the IR impacts. In unavoidable cases, the LA and R & R will be handled through the Resettlement Framework (RF) of RUSDP. Stakeholders were satisfied that all possible IR issues are included in RF, however, indicated to the EA that this shall be implemented in letter and spirit.
- Few stakeholders raised issue that why increase in water supply through development new bore wells was not considered in the Tranche 1. Stakeholders were of the view that water supply is insufficient and therefore requires immediate improvement. The EA indicated that looking into various issues raised by a study conducted by the Central Ground Water Board (CGWB) and decline in groundwater levels, further increase in groundwater extraction is likely to lead to various adverse environmental impacts. And therefore it will be beneficial to have a comprehensive groundwater modeling study before implementing the subproject. The study is proposed in Tranche 1. The EA also indicated that water supply improvement would however be done in the Tranche 1 by reducing the leaks in the system.
- A NGO representative indicated EA should involve NGOs in project implementation actively to which EA responded positively.
- Few stakeholders requested for the copy of RF and SIEE (in Hindi). EA is provided the copies through Alwar Municipal Council.

**Alwar**

Suban S/o Sh.Hariya Khan R/o near DM residency, Alwar

Sabu S/o Sh.Nasrooddin R/o Varispur , Ramgardh, Alwar

Udhay Singh S/o Sh.Ishwar Singh, R/o Kathumar, Alwar

Sateesh S/o Sh. Jal Singh Meena R/o Naina pur Alwar

Gyan Chand S/o Sh. Chote Lal R/o Bhim Nagar, Alwar

**Summary of outcome:**

The various issues related to the proposed project of supplying, laying, jointing of various main and arterial sewer network connecting to outfall, along with the road restoration and all necessary manholes appurtenances etc. have been discussed at various locations like Shantikunj, near D M Residency Tripolia, Mainapur, etc with the local people. The local people were of the view that they are aware about the work which RUIDP and other agencies are doing. The people were in favour of laying of sewer network and manholes as they face various problems associated with improper sanitation in their areas. Unhygienic conditions arise due to lack of sewer network which can ultimately pose a threat to the well being of them. So, they want that this work should start as soon as possible as during rainy season it produces foul smell etc.