Environmental Assessment Document

Initial Environmental Examination: Bundi Water Supply Subproject
Project Number:
August 2008

India: Rajasthan Urban Sector Development Investment Program

Prepared by Local Self Government Department

ABBREVIATION

ADB	-	Asian Development Bank
CWR	-	Clear Water Reservoir
DSC	-	Design and Supervision Consultancy
EIA	-	Environmental Impact Assessment
EA	-	Executing Agency
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
km	-	kilometer
LPCD	-	litre per capita per day
LPS	-	litre per second
LSGD	-	Local Self-Government Department
m	-	meters
MFF	-	Multitranche Financing Facility
mg/L	-	milligrams per liter
MLD	-	million litre per day
MoEF	-	Ministry of Environment and Forests
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
ToR	-	Terms of Reference
UA	-	Urban Agglomeration
UIDSSMT	-	Urban Infrastructure Development Scheme for Small and Medium Towns
WTP	-	Water Treatment Plant

WEIGHT AND MEASURES

lakh	–	100,000 (one hundred thousand)
crore	–	10,000,000 (ten million)

CONTENTS

APPENDIX

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. RUSDIP Phase II to 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.

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 according to ADB Environment Policy (2002) and Environmental Assessment Guidelines (2003).

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 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: 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 categorises 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. The only type of infrastructure provided by the RUSDIP that is specified in the EIA Notification is solid waste management, where EC is required for all Common Municipal Solid

Waste Management Facilities (facilities that are shared by more than one town)[1]. EC is thus not required for the water supply subproject that is the subject of this Environmental Examination.

3. Review and Approval Procedure

12. 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 and the national environmental protection agency (MoEF in this case). 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.

C Scope of Study

13. This is the IEE report for the Bundi Water supply 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

14. This is a water supply subproject, 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 subproject is needed because the present water supply infrastructure in Bundi is inadequate for the needs of the growing population.

15. The provision is also unequal, with un-served areas being mainly the slums and newly-developed areas. 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 Bundi and the other urban centres to those expected of modern Asian towns.

B. Location, Size and Implementation Schedule

16. The subproject is located in Bundi, the headquarters town of Bundi District, in the south eastern part of Rajasthan (**Figure 2.1**). **Figure 2.2** shows proposed water supply subproject of Bundi which includes: **Table 2.1** shows the nature and size of the various components of the subproject. There are three main elements: augmentation of the water source and supply; expansion/improvement of the distribution network; and reduction of non-revenue water (NRW). The descriptions shown in **Table 2.1** are based on the present proposals, which are expected to be substantially correct, although certain details may change as development of the subproject progresses.

[1] According to the Rajasthan State Pollution Control Board, the MoEF intends to issue a clarification to the EIA Notification in due course, which will add all landfill facilities and Sewage Treatment Plants to the list of projects specified as requiring EC under the Notification. This has not yet been issued, so the text above indicates the correct legal position at the time of writing

C. Description of the Subproject

1. Service Delivery, and Existing Water Supply Arrangement

17. Water supply of Bundi town is based on the tube wells on the bank of Mangli River. The tube wells are between two *anicuts*[2] on the river Mangli and the standing water between two anicuts continuously recharge the tube wells. Presently good water yield is available from these tube wells. These tube wells are located 9 kilometer (km) from Bundi town. There are two existing 300/400 millimeter (mm) diameter (dia) asbestos cement (AC) pipes rising main from Intake pump house near Mangli River, which are excessively leaking. The pump house consists of two numbers of 0.45 million liters (ML) CWR and from there water is pumped through 6 centrifugal pumps, 2 100-HP, 2 50-HP (dedicated for Jail head work) and 2 30-HP, which are too old and need to be replaced. At present about 9 mld of water is being pumped from this system. There is heavy leakage from the existing rising mains AC pipelines as well as in the distribution system. The estimated water production is 9 million liters per day (MLD). The losses are reported to be high and in the range of 40%. Considering the present production level, the per capita net supply works out to be about 52 liters per capita per day (lpcd) for 2007 estimated population of 103,638, which is much lower than the standard indicated in the Central Public Health and Environmental Engineering Organization (CPHEEO) manual i.e. 135 lpcd.

18. Available water supply to the people of Bundi town is approx. 52 liters per capita per day (lpcd) for 2007 estimated population of 103,638. In addition to the inadequate production, the system suffers from old and leaking distribution lines, inequitable pressure distribution etc. At present, there are total 14,669 connections. Out of this, 14,231 connections are domestic. The rest are commercial and industrial. The connections are metered, however, only 30% are in working condition. Out of the remaining 70%, 40% of water meter need to be replaced and 30% would be serviceable on repair. At present water, is being disinfected through application of bleaching powder, which is rudimentary and inefficient.

19. The existing distribution system is not properly designed. The water supply is being provided in the morning in some sub zone & in some zones in evening due to deficiency in storage. The existing distribution system of Bundi Town is not adequate to cover the entire town therefore in this proposal, expansion of distribution system in new areas and strengthening of existing distribution system has been include in the proposal.

20. The present water supply source of Bundi is from 20 nos. of tube wells constructed on the bank of Mangli River. The River Mangli has sufficient water and continuously recharges the ground water. *Anicut* was constructed by Irrigation Department and the bed of Mangli River acts as a reservoir. As per record, the capacity of the reservoir is about 13 million cubic foot and the flow of the river is 5-6 cubic meter per second (cusec) approximately. The Ground Hydrology available information states that safe yield from the aquifer along Mangli River should be around 27.60 MLD. Considering the above source, the complete rehabilitation of the water supply system has been proposed.

2. Proposed Subproject Description including Detailed Scope

21. The existing situation warrants urgent source augmentation, rehabilitation, improvement of the existing distribution system including storage provision. The subproject is also expected, among others, to reduce the UFW by billing for actual quantity of water supply by applying

[2] Small dams

volumetric rate. The subproject is designed for a net water supply of 135 lpcd with 20% losses for a design population of 2041. The source augmentation is being done by PHED in stages. Also included in the subproject is adequate disinfection arrangement. All civil works are designed to meet 2041 needs while all mechanical and electrical equipment are designed for 2026 requirement.

22. In addition to installation of 16 tube wells, the subproject will construct the downstream facilities and strengthen the existing water supply system for the town to receive and distribute the total 28.72 MLD water supplied from sub-surface on the bank of Mangli River by replacement of pumps at existing intake well near Mangli River. The subproject is also expected to reduce the unaccounted for water (UFW) by billing for the actual quantity of water supplied, since the house connections will be expanded to cover at least 90% of the town population, with either new water meters or a rehabilitated water meters. Disinfection facilities, in the form of chlorinator plants at the CWR in the head works in the town, are also proposed and the distribution network will be expanded and strengthened to fully absorb the additional water supply from the proposed source of Mangli River.

23. Scope and components of the works consist of construction of replacement of pumps at existing intake well, providing and laying of transmission/rising main, construction of CWRs, OHSRs, GLSRs, construction of pump houses including mechanical and electrical works, procurement and installation of bulk water meters and domestic meters, etc., detailed as follows:

- Construction of 16 tube wells on the bank of Mangli River;
- At Mangli Headworks: replacement of 3 pumps (173.89 liter per second (lps)) and construction of a CWR (1.6 ML capacity);
- Providing and laying of rising main of approximately 24.33 km length of 150 mm to 600 mm diameter pipe lines
- Providing and laying of distribution pipeline including replacement of excessively leaking AC pipe carrier mains of about 45 km.;
- Provision of chlorination facilities: at the Head work at Vikash Colony, Jail, Nenua Road and Bhata Vilash;
- Construction of 6 OHSRs: at Mahaveer Nagar (0.6 ML), RIICO (0.6 ML), Amdedkar school (0.9 ML), Jail Campus (0.6 ML), Holi ka khoont (0.6 ML), Malviya Nagar (0.6 ML) and 2 GLSR at Bal Chand Pada (.55 ML), Modi Pada (0.3 ML).;
- Construction of pump houses: at Vikash Nagar with 1 CWR of 0.8 ML including mechanical and electrical work, 6 nos (3+3) pumps of 51.39 lps, 12.83 lps, 12.10 lps;
- Rehabilitation of existing head works and replacement of pumps: at Nainwa head work (8 nos, 4+4, 29.23 lps, 40.97 lps, 75.01 lps, 14.04 lps)
- Rehabilitation of existing head works and replacement of pumps: at Jail head work (6 nos, 3+3, 11.17 lps, 17.44 lps, 27.24 lps)
- Rehabilitation of existing head works and replacement of pumps: at Jail head work (4 nos, 2+2, 15.72 lps, 13.52 lps)
- Installation of 11 nos. bulk flow meters in the head works; and

- Provision of new connection with water meters of about 10,400. & rehabilitation of 4,270 existing meters.

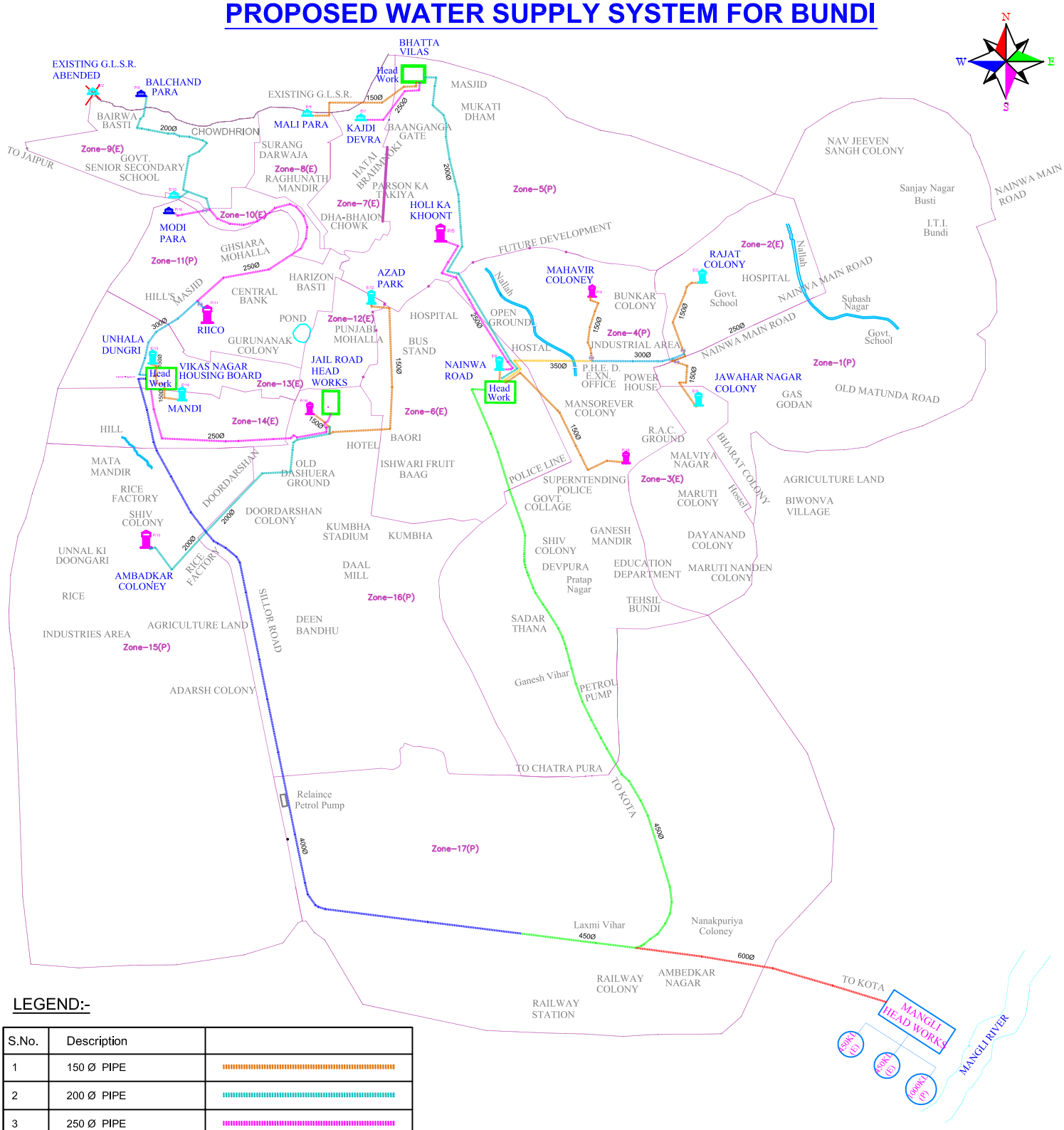
24. A schematic of the proposed water supply system and the proposed layout are shown in **Figure 2.2 and 2.3,** respectively.Water from the 36 (20 nos. existing and 16 nos. proposed) will be collected to the two nos 450 ML existing CWR and 1 no 1600 ML proposed CWR at Mangli head work. Thereafter, the water will be pumped by 3 nos (2+1) pumps of 173.89 lps and 85 m head through 600 mm dia Ductile Iron (DI) pipe up to Station Chowraha, where from one 450 mm dia DI line has to be laid up to Nenua road head work and another 450 mm dia DI line to Vikash Nagar proposed head Work. From Vikash Nagar proposed Head Work, water will be pumped through one feeder to existing service reservoirs at Mandi (0.45 ML), one feeder to existing OHSR at Unhala Doongri (0.4 ML) and one feeder to proposed SRs at RIICO (0.6 ML), existing Modi Para (0.24 ML), proposed Modipara (0.3 ML) and at Balchand Para (0.55 ML). From this Head work, one feeder of 250 mm dia will feed water to Jail road Head work by gravity and from there water will be further pumped to existing OHSR at Azad Park (0.5 ML) and two proposed OHSR at Jail Campus (0.6 ML) and Ambedkar school (0.9 ML). From Station Chowraha, one feeder of 450 dia will feed to the Nainwa road Head work from where water will be further pumped to 3 nos. existing OHSR at Nainwa road (0.45 ML), Jawahar nagar (0.35 ML) and Rajat colony (0.525 ML) and 4 nos. proposed OHSRs at Holi ka khoont (0.6 ML), Mahaveer colony (0.6 ML) and Malviya nagar (0.6 ML). From this Head Work water will be further pumped to Bhatta vilash Head Work from where water will be further pumped to two nos of existing GLSRs at Malipada and Kaji Deora. From reservoirs water will be distributed to the households through the rehabilitated or newly constructed distribution network. 100 % consumer metering will be carried out for the design population of 2011. New connection of 4,700 nos is proposed under the investment program and rehabilitation of existing meters of 4,270 nos. is proposed. The bulk meters will be provided at all supply points to measure the quantity of water supply and to enable system monitoring. The complete rehabilitation of the existing system will increase the efficiency of the system and reduce the proportionate O& M cost.

25. Description and current quality of the Mangli River is attached as **Appendix 4.**

Figure 2.1: Map Showing the Location of the Project

Rajasthan Urban Sector Development Investment Program ADB TA 4814-IND	Govt of Rajasthan Asian Development Bank
Bundi Regional Map	

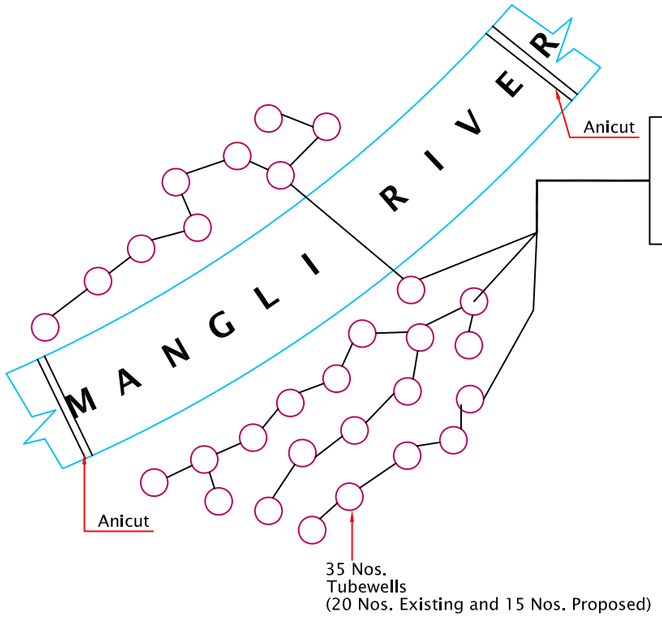
PROPOSED WATER SUPPLY SYSTEM FOR BUNDI



LEGEND:-

S.No.	Description	
1	150 Ø PIPE	
2	200 Ø PIPE	
3	250 Ø PIPE	
4	300 Ø PIPE	
5	350 Ø PIPE	
6	400 Ø PIPE	
7	450 Ø PIPE	
8	600 Ø PIPE	
9	PUMP	
10	EXISTING ESR	
11	PROPOSED ESR	
12	EXISTING GLSR	
11	PROPOSED GLSR	
12	Sulice Valve	

Schematic Flow Diagram For Proposed Water Supply Styem For Bundi Town



Mangli Head Work

600Ø-DI K9-6200M

450Ø-DI K9-920M

450Ø-DI K9-2020M

Nainwa Head Work

250Ø-DI K9-970M

Holi Ka Khoont

200Ø-DI K9-2020M

Bhatta Vilas

150Ø-CI LA-840M

E-8 (GLSR) MALIPARA

250Ø-CI LA-420M

E-7 (GLSR) KAJDIDEVRA

150Ø-DI K9-410M

Mahavir Nagar

350Ø-DI K9-670M

Junction Mahavir Nagar

300Ø-DI K9-485M

Junction Rajat Colony

150Ø-DI K9-510M

E-2 (ESR) Rajat Colony

150Ø-DI K9-45M

Nainwa Road (ESR) E-6

150Ø-DI K9-470M

E-3 (ESR) Jawahar Colony

150Ø-DI K9-1105M

Malviya Nagar P-18 (ESR)

400Ø-DI K9-4050M

Vikas Nagar Head Works

150Ø-DI K9-140M

E-13 (ESR) Unhala Dungri

150Ø-DI K9-250M

Mandi E-14 (ESR)

300Ø-DI K9-800M

RIICO Campus P-11 (ESR)

Modi Para E,P10 (GLSR)

250Ø-DI K9-1550M

200Ø-CI LA-1125M

Balchand Para P-9 (GLSR)

250Ø-DI K9-1260M

Jail Road Head Works

150Ø-DI K9-75M

Jail Campus P-16 (ESR)

150Ø-DI K9-850M

Azad Park E-12 (ESR)

200Ø-DI K9-1550M

Ambedkar School P-15 (ESR)

E = EXISTING
P = PROPOSED
EXISTING
PROPOSED

PIPE Ø - TYPE
CLASS - LENGTH

E = EXISTING
P = PROPOSED

Table 2.1: Improvements in Water Supply Infrastructure Proposed In Bundi

Infrastructure	Function	Description	Location
1. Source and Supply Augmentation			
Intake	To collect and transfer raw water from surface water source to raw water reservoir/water treatment plant (WTP)	Construction of 16 tube wells of 250 mm and 300 mm dia	At Mangli River
Rising main	To collect treated water from WTP/CWR to the OHSR	pipe diameter: 200 to 700 mm length: 25 km	1. Mangli river to Jail Tank head work and Nanuwa road head work. 2. By-pass to proposed CWR at Vikash colony. 3. Proposed CWR at Vikash colony to OHSRs at different location.
2. Expansion of Distribution Network			
Distribution mains	Supply water to newly developed area	Provision for 45 km distribution pipe line of 80 to 250 mm dia.	Deopura, Chhatrapura, Chittargarh road, undalo ki Dungri, Bivanwa Road, Rajat colony, Nenuwa Road.
Clear Water Reservoirs	Storage of treated water for pumping to OHSRs	2 reinforced cement concrete (RCC) CWRs	Mangli head work and Vikash nagar
Overhead and ground level reservoirs	Increase water supply to regulate water supply	6 RCC OHSRs 2 GLSR	OHSRs: Mahaveer Nagar (0.6 ML) , RIICO (0.6 ML), Amdedkar school (0.9 ML), Jail Campus (0.6 ML), Holi ka khoont (0.6 ML), Malviya Nagar (0.6 ML) GLSR: Bal Chand Pada (0.55 ML) and Modi Pada (0.3 ML)
Pump replacement/ new pump house	Improve water supply and pressure	1 new pump house and pump replacement at Mangli OHSR	Replacement of pump at Mangli Head work Rehabilitation of existing head works and replacement of pumps at Nainwa head work Rehabilitation of existing head works and replacement of pumps at Jail Headwork
Chlorination installation	Improve quality of water	At four head works	At Head work - Vikash Colony, Jail, Nenua Road and Bhata Vilash;
3. Meters and House Connections			
Repair of house connections	Repair leaks and increase the amount and pressure of water reaching consumers	10,400 house connection to be repaired	
Bulk flow meters	Monitor water flow in the improved network	11 nos.	At head works
Replacement of non-functional water meters	Monitor and regulate water usage by consumers and improve cost recovery	4,270 water meter to be replaced	

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

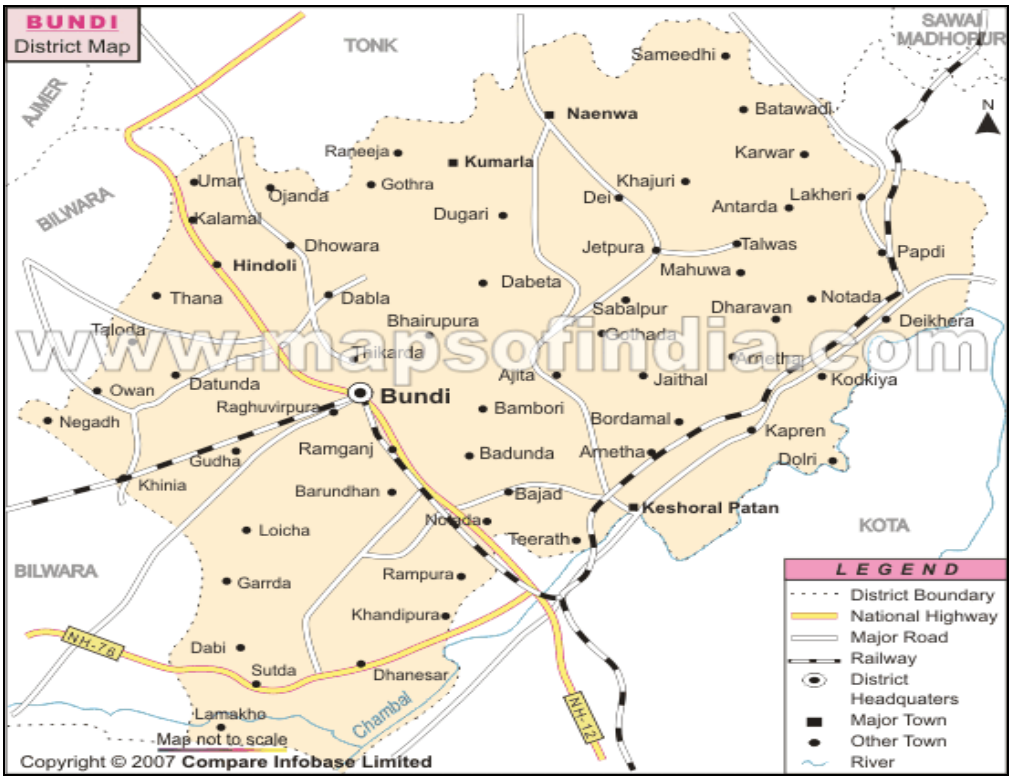
1. Location

26. The Urban Agglomeration (UA) of Bundi district is located in the southeast region of Rajasthan and lies at a distance of 206 km from Jaipur and 36 km away from Kota. It is bound in the north by Tonk, in the west by Bhilwara and on the south-west by Chittorgarh districts. The river Chambal forms the southern and eastern boundaries separating the Bundi and Kota territories. The southern tehsils of Bundi forms a wedge between Bhilwara and Kota and also touches Chittorgarh district.

27. Bundi is a small town with rustic setting that stands on the foothills of the Aravali Mountains. Bundi is very famous for its *baoris* (waterworks or stepwells), *havelis* (Rajasthani houses), temples and *chhatris* (elevated, dome-shaped pavilions) with carved pillars. The mural adorned palaces, the forts and the monuments tell tales about the glorious past of the town. A picturesque lake where the entire town and the palaces get reflected in the lake adds a stunning quality to the place.

28. In the past, a tribe called *Meena* inhabited this region and Bundi derived its name from the tribe' chieftain's name - Bunda Meena. In the 12th century Bundi came under the dominion of the Chauhans and reached its highest glory in the medieval times. The glory of Bundi declined with the Mughal rule and later became an independent state. District map of Bundi is shown in **Figure 3.1.**

Figure 3.1: District Map of Bundi



2. Topography, Natural Hazard and Drought

29. Bundi town lies in low risk zone (II). The area is less prone to earthquakes as it is located on comparatively stable geological plains based on evaluation of the available earthquake zone information. **Figure 3.2** depicts the earthquake zones of Rajasthan. **Figure 3.3** shows natural hazard zones of the Bundi district.

30. Low rainfall coupled with erratic behavior of the monsoon in the State makes Rajasthan the most vulnerable to drought. Based upon the discussion with PHED officials the water table in the town continuously decreases by 2-3 meter on an annual basis combined with significant drawdown conditions.

Figure 3.2: Earthquake Zones of Rajasthan

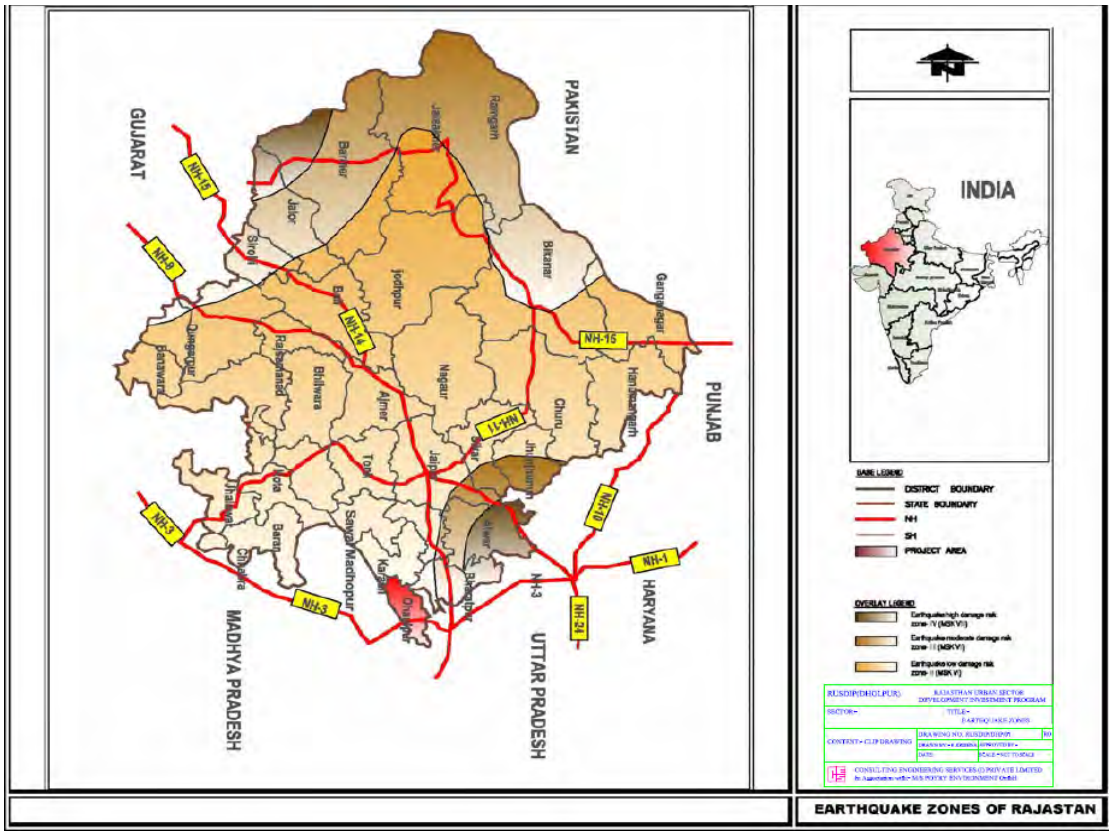
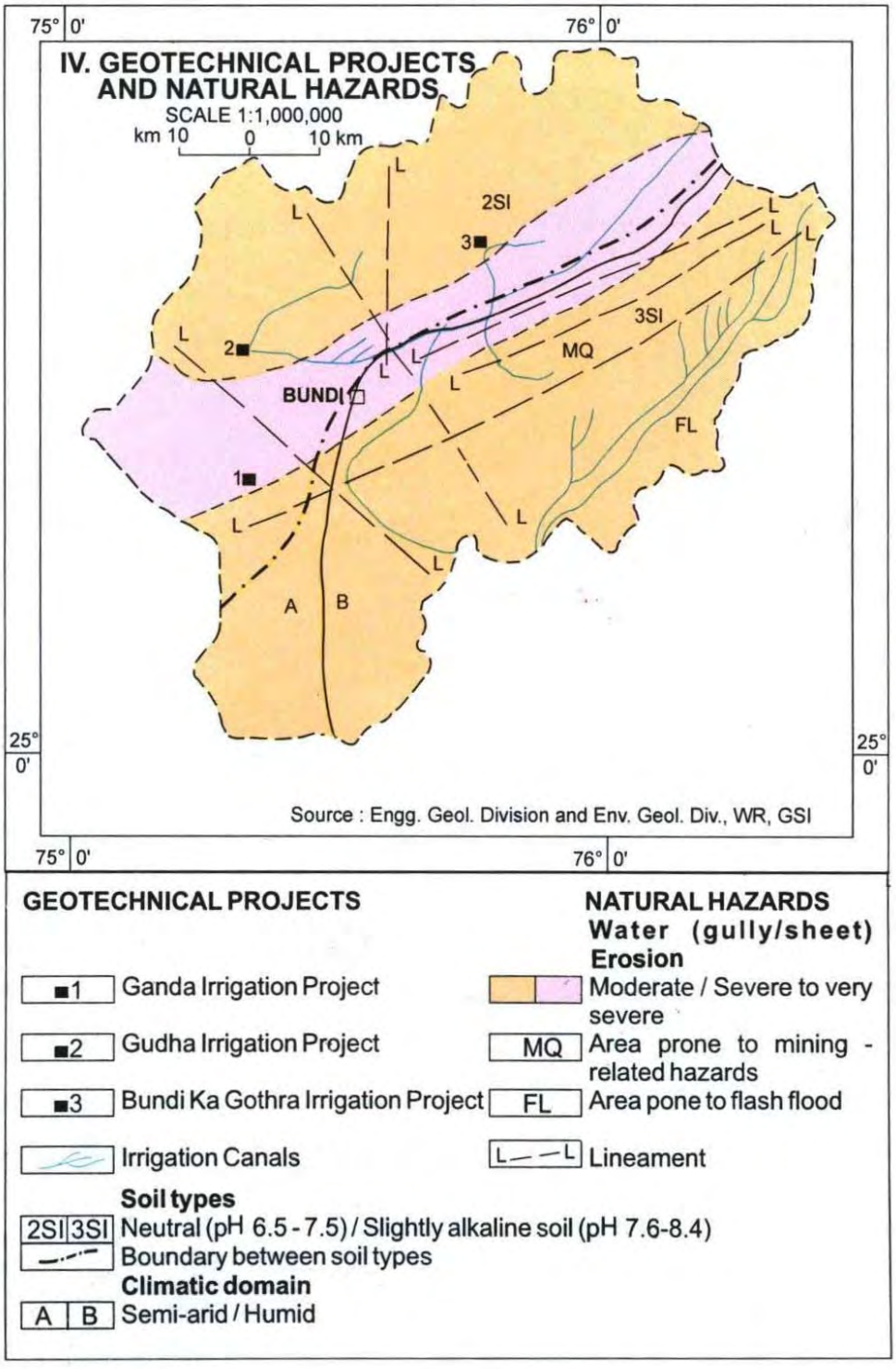


Figure 3.3: Natural Hazard Map of Bundi



Source: GSI Resource map

3. Geology, Geomorphology, Mineral Resources and Soil

31. Limestone is the most important mineral of the district. Deposits have been located near Bundi, Lakheri, and Satur. Limestone occurs sandwiched between the Ganurgarh Shale and the Lower Bhander Sandstone. An indicated reserves of 850 million tons with 42.73% calcium oxide (CaO) has been estimated. Glass sand occurrences are located near Barodia and Satur. Barytes near Umar occurs as small veins at the contact of limestone and schist. Minor occurrence of copper near Barodiya, marble at Umar and iron near Manak Chawk have also been reported. Geology and mineral map of the district is shown in **Figure 3.4** and geomorpholigal map of the district is depicted in **Figure 3.5.**

32. Soil of the region falls within low rainfall zone of 650-1000 mm. The soil is generally black of alluvial origin, clay loam with saline ground water. **Table 3.1** shows nutrient level in the Bundi soil including area coverage of saline and sodic soil. The nutrient status of the Bundi soil is graded as medium to high level.

Table 3.1: Fertility Status – Major Nutrients and Problematic Soils of Bundi District

	Nutrient			Saline Soil (hectares)	Sodic or Alkali (hectares)
	Nitrogen	Phosporus	Potassium		
Status	M	M	H	6009	9229

Source: Vital Agricultural Statistics 2004-05, Directorate of Agriculture, Rajasthan

4. Climate

33. The district is generally dry except during the monsoon or winter rains. Maximum temperature is 42.6 degrees celsius Minimum temperature is 29.7 degrees celsius. Normal annual rainfall in the district is 76.41 cms.

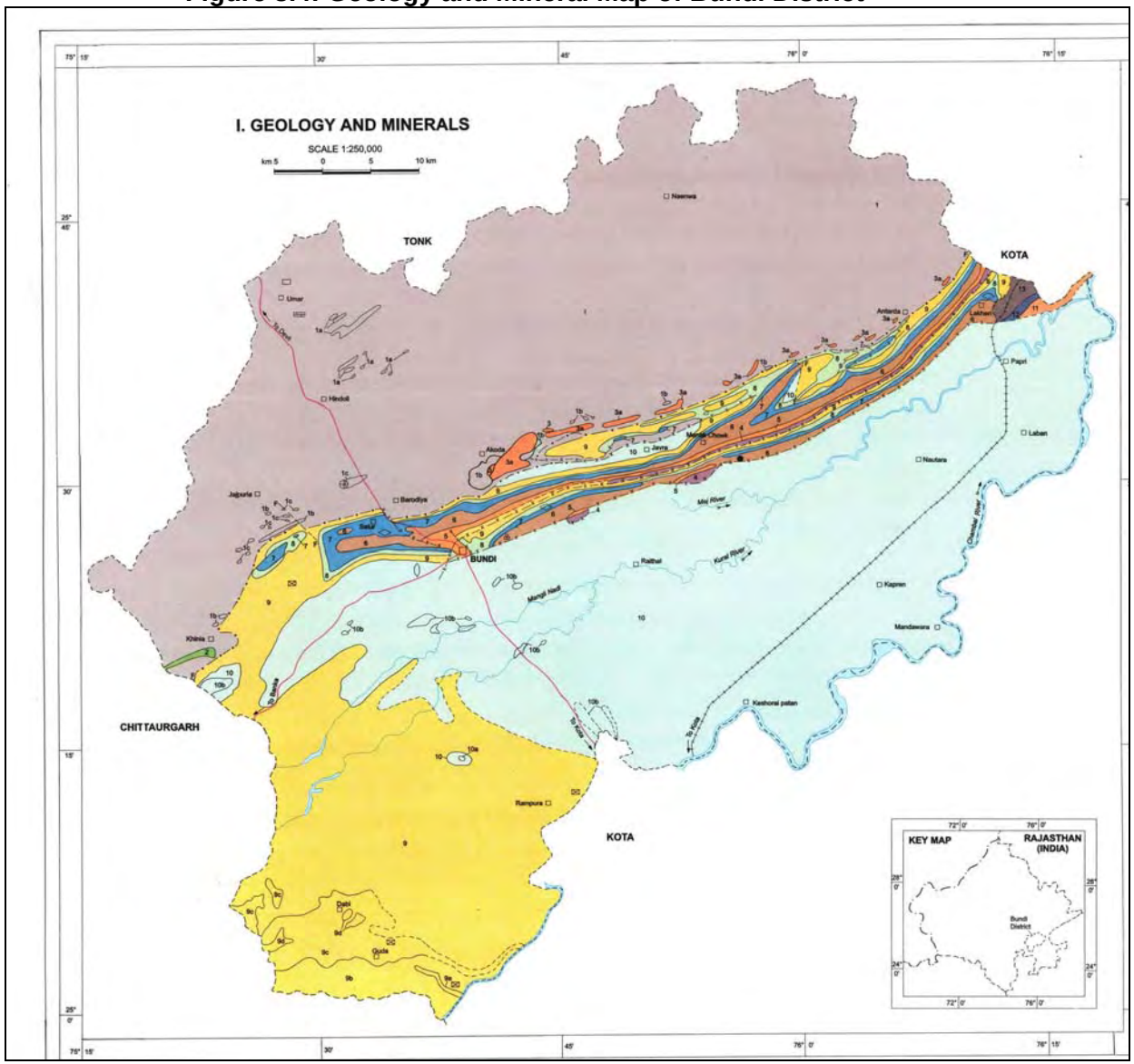
34. The rainfall over Bundi is scanty and is concentrated over four month i.e. from June to September. The rains are erratic and so is the distribution of the rainfall. However agriculture and the animal wealth are dependent on rains to large extent. Seasonal Rainfall data for the recent year (2005-2006) is shown in **Table 3.2. Figure 3.6** shows yearly variation (1997-2007) of rainfall at Bundi.

Table 3.2: Rainfall at Bundi in Recent Years (2005 to 2006)

Months	Rainfall (mm)
June	52
July	213
August	19.8
September	240
October	0
November	0
December	0
January	0
February	0
March	20
April	0
May	4
Monsoon Rainfall	**524.8**
Non monsoon rainfall	**24**
Annual Rainfall	**548.8**

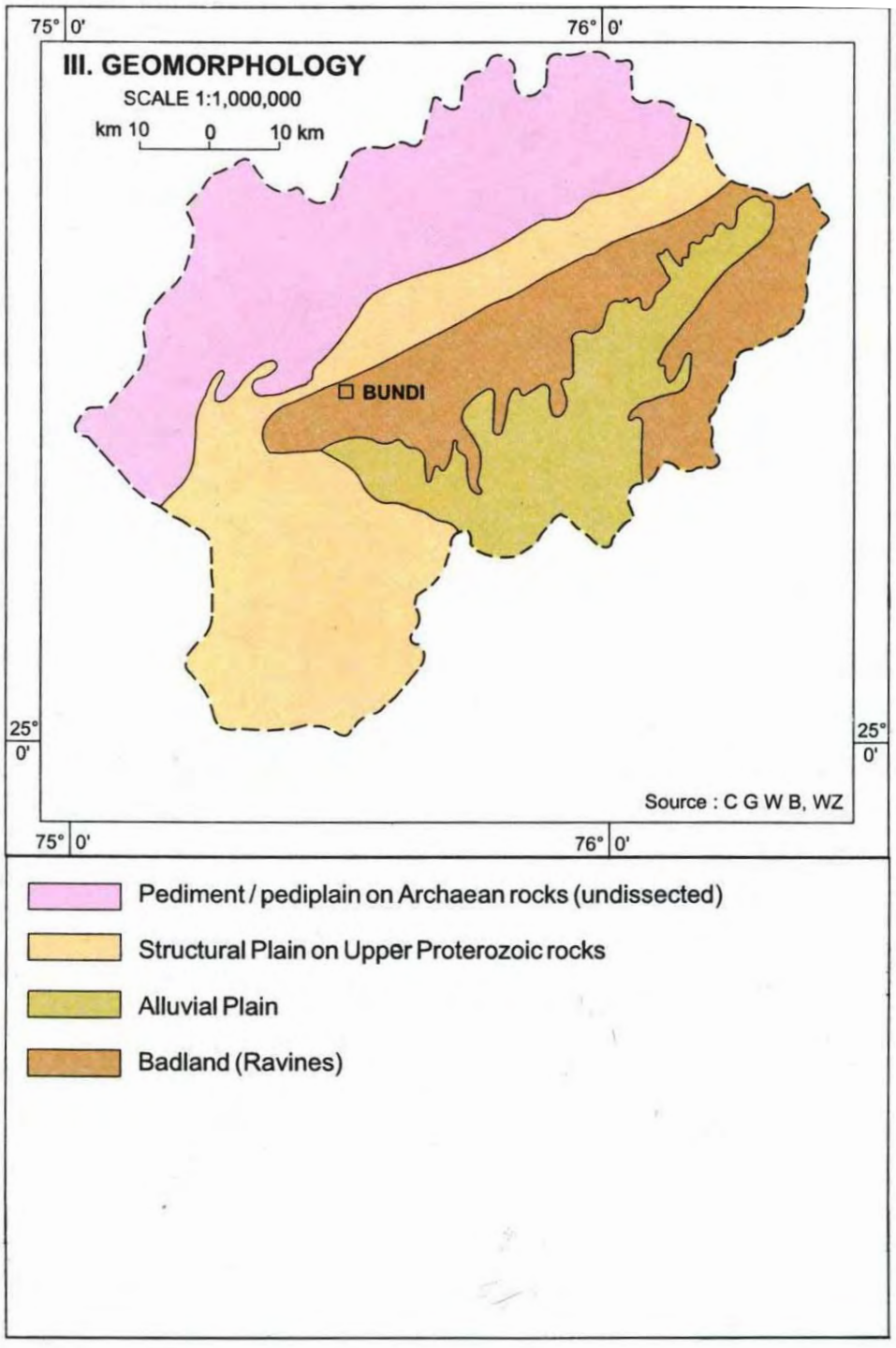
(Source: Irrigation Department, Govt. of Rajasthan)

Figure 3.4: Geology and Mineral Map of Bundi District



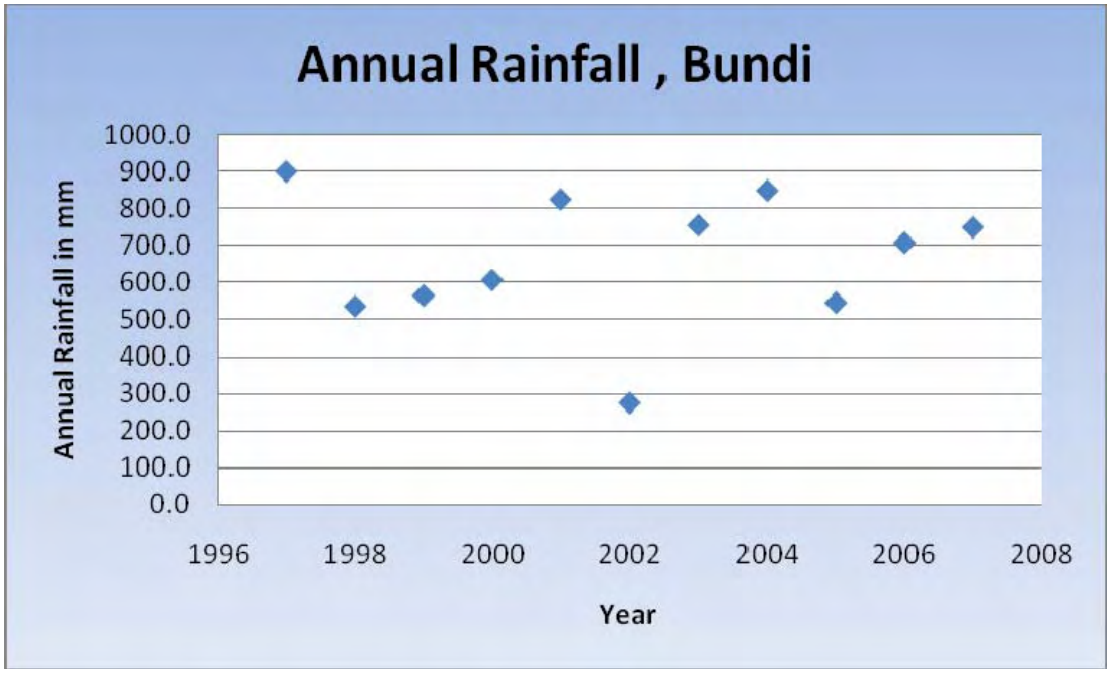
Source: GSI Resource Map

Figure 3.5: Geomorphology of Bundi District



Source: GSI Resource Map

Figure 3.6: Rainfall at Bundi during 1997 to 2007



Source: Deputy Director Hydrology Water Resources, Jaipur

5. Air Quality

35. There are no data on ambient air quality of Bundi town, which is not subject to monitoring by the Rajasthan State Pollution Control Board (RPCB) because there are no major industries located here. Traffic is the significant pollutant in Bundi, so levels of oxides of sulphur and nitrogen are likely to be well within the National Ambient Air Quality Standards (NAAQS). The nearest station is located at Kota (46 km from Bundi). The ambient air quality data is depicted in **Table 3.3.**

Table 3.3: Ambient Air Quality in Kota (Annual Average, 2004; units in µg/m3)

Monitoring Station	Land use	SOx	NOx	RSPM	SPM
Kota Residential, Rural and others area	Residential	7.95	22.85	121	272
NAAQ Standard	*Residential*	*60*	*60*	*60*	*140*
Kota Industrial area	Industrial	9.66	24.21	132	323
NAAQ Standard	*Industrial*	*80*	*80*	*120*	*360*

RSPM: Respirable Suspended Particulate Matter; SPM: Suspended Particulate Matter
Source: Annual Report 2005-2006 Rajasthan State Pollution Control Board

6. Surface Water

36. There is no water quality monitoring station at Bundi. The nearest monitoring station is at the Chambal River which is located 46 km from Bundi. The monitoring is being carried out by RPCB. The data on dissolved oxygen, pH, biological oxygen demand (BOD), and electrical

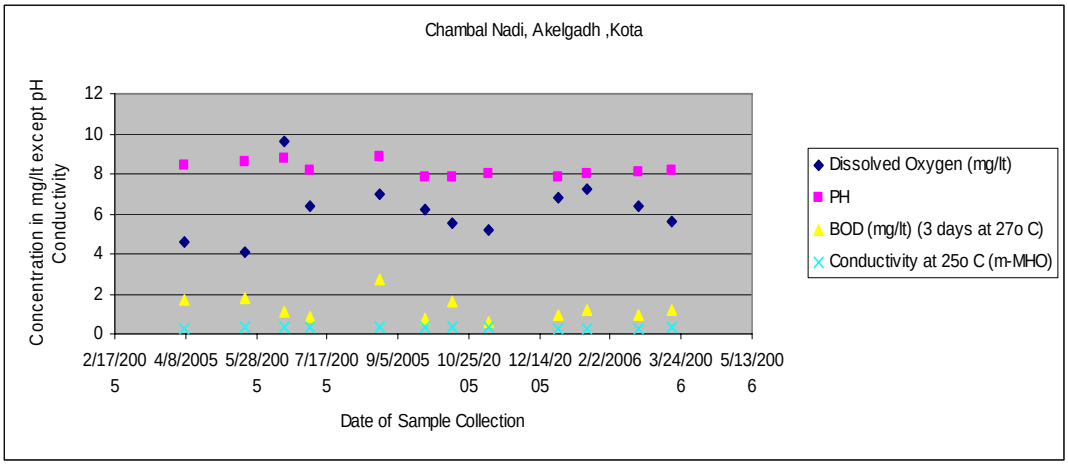
conductivity is given in **Table 3.4**. **Figure 3.7** shows variation of water quality in different locations of Chambal River.

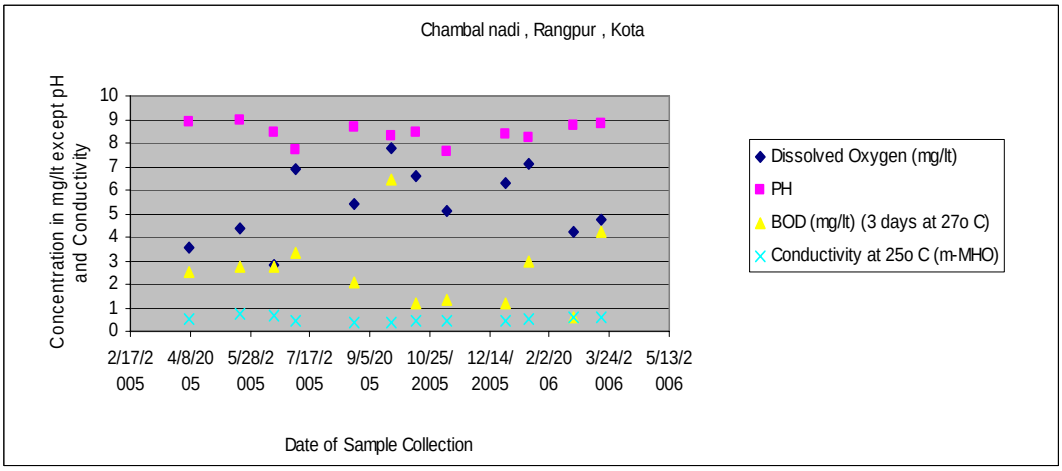
Table 3.4: Chambal River Water Quality at Different Locations

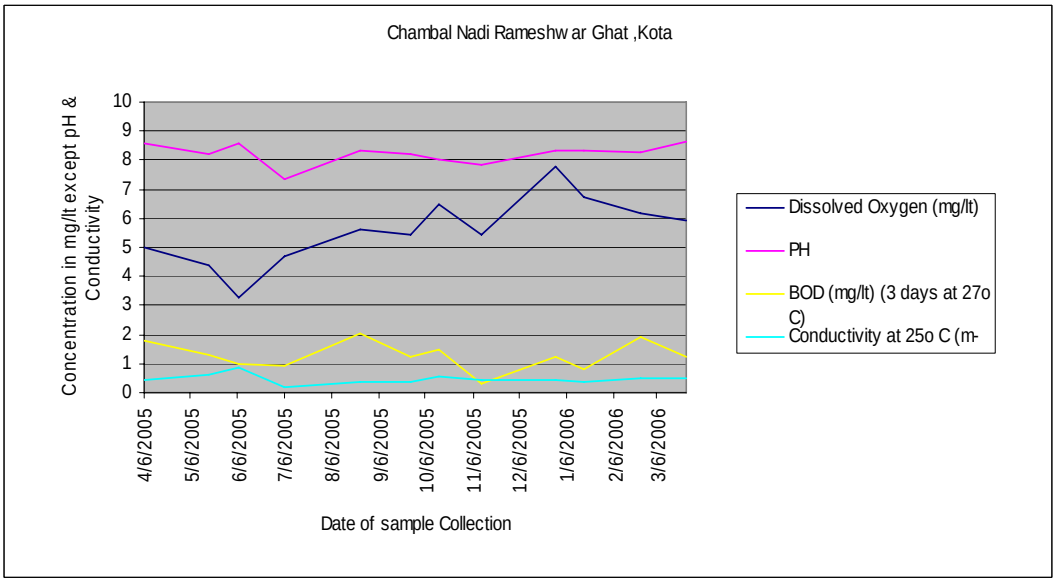
Location	Date of Sample Collection	Dissolved Oxygen (mg/L)	pH	BOD (mg/L) (3 days at 27o C)	Conductivity at 25^{o} C (micro mhos)
Chambal Nadi Akelgarh , Kota	4/7/2005	4.6	8.42	1.66	0.26
	5/20/2005	4.05	8.59	1.76	0.33
	6/17/2005	9.61	8.78	1.09	0.33
	7/5/2005	6.38	8.17	0.88	0.3
	8/23/2005	6.97	8.83	2.69	0.3
	9/24/2005	6.2	7.86	0.74	0.3
	10/13/2005	5.57	7.81	1.58	0.3
	11/8/2005	5.2	8.02	0.6	0.3
	12/27/2005	6.8	7.86	0.95	0.26
	1/16/2006	7.2	8.03	1.2	0.27
Chambal Nadi Rangpur , Kota	4/7/2005	3.59	8.92	2.53	0.51
	5/20/2005	4.4	8.94	2.73	0.75
	6/17/2005	2.82	8.47	2.74	0.68
	7/5/2005	6.89	7.7	3.36	0.47
	8/23/2005	5.38	8.7	2.1	0.4
	9/23/2005	7.75	8.28	6.41	0.35
	10/13/2005	6.62	8.42	1.16	0.42
	11/8/2005	5.12	7.65	1.36	0.45
	12/27/2005	6.3	8.37	1.15	0.44
	1/16/2006	7.1	8.21	3	0.5
	2/22/2006	4.2	8.76	0.6	0.59
	3/17/2006	4.72	8.79	4.24	0.61
Chambal Nadi , Rameshwar Ghat, Kota	4/6/2005	4.97	8.6	1.79	0.46
	5/18/2005	4.4	8.22	1.32	0.63
	6/6/2005	3.26	8.58	0.99	0.84
	7/6/2005	4.7	7.37	0.92	0.17
	8/24/2005	5.63	8.34	2.06	0.35
	9/26/2005	5.46	8.18	1.21	0.34
	10/14/2005	6.51	8.04	1.47	0.53
	11/11/2005	5.44	7.83	0.28	0.46
	12/29/2005	7.8	8.35	1.25	0.42
	1/17/2006	6.7	8.32	0.8	0.35
	2/23/2006	6.2	8.25	1.9	0.48
	3/24/2006	5.92	8.62	1.24	0.51

Source: Annual Report 2005-2006 Rajasthan State Pollution Control Board

Figure 3.7: Variation of water quality parameters



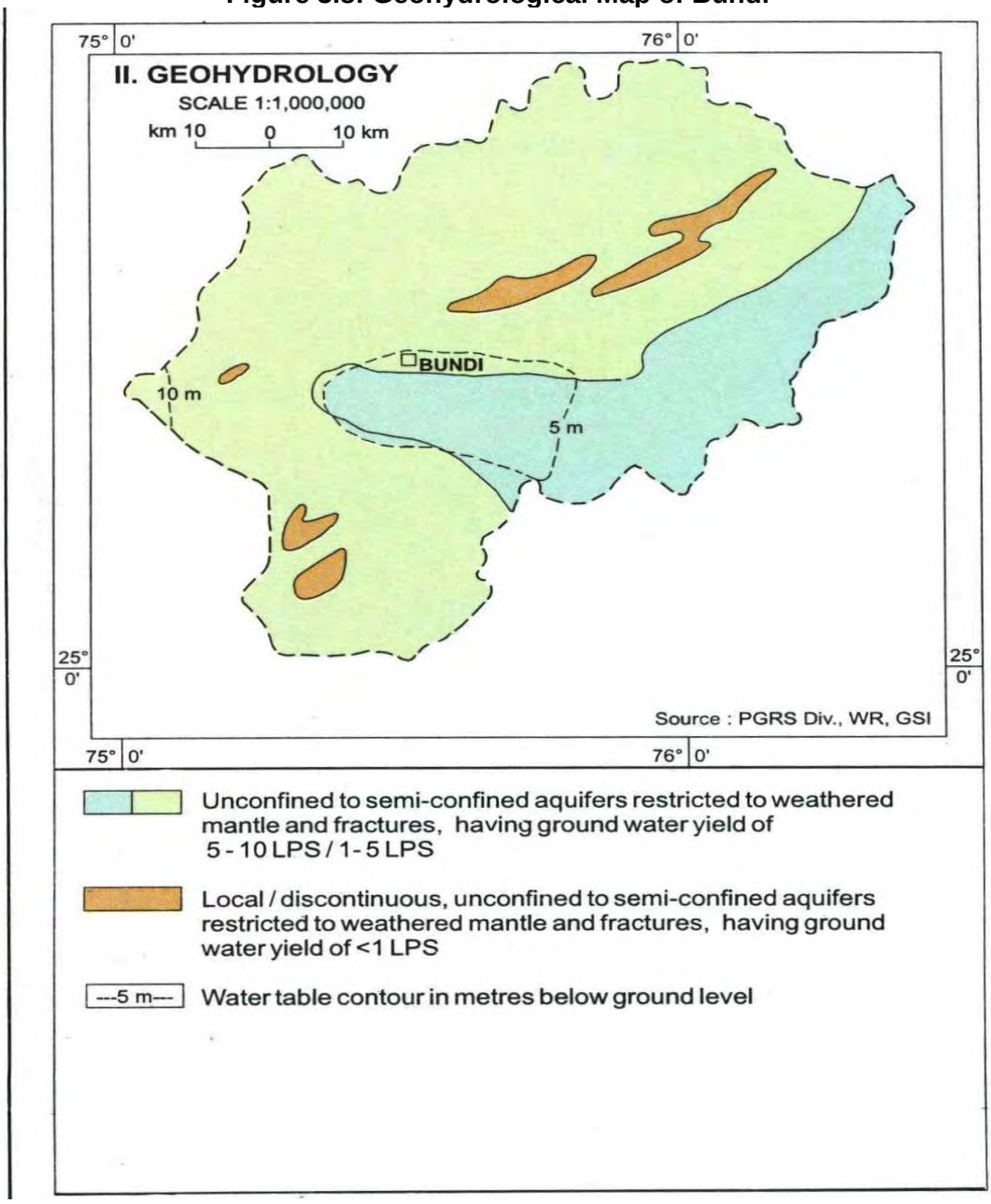




7. Geohydrology and Groundwater

37. Geohydrological map of the Bundi district is shown in **Figure 3.8.** For broadly grouping geological formations from ground water occurrence and movement considerations, the various lithological units have been classified into groups on the basis of their degree of consolidation and related parameters. On an average, 90% of the district area covered with unconfined to semi confined aquifers restricted to weathered mantle and fractures, having ground water yield of 5 to10 liters per second.

Figure 3.8: Geohydrological Map of Bundi



38. There are number of National Hydrographic monitoring stations of Central Ground Water Board in and around Bundi. Fluctuation of ground water level is shown in **Table 3.5.** In most of the cases ground water table ranged between 5 to 20 m below ground level (bgl).

Table 3.5: Number and Percentage of National Hydograph Network Station (Bundi) with Water Fluctuation Range

Period	No of Wells Analysed	Range		0-2 m		2-5 m		5-10 m		10-20m		20-60m		>60 m	
		Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Jan-06	13	0.39	19.18	2	15.38	3	23.08	5	38.46	3	23.08	0	0	0	0
Nov-05	15	1.17	19.44	3	20	6	40	2	13.33	4	26.67	0	0	0	0
Aug-05	14	1.36	18.67	2	14.29	4	28.57	5	35.71	3	21.43	0	0	0	0
May-05	11	3.1	18.68	0	0	2	18.18	5	45.45	4	36.36	0	0	0	0

Source: Ground water year book 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2007)

39. The Central Ground Water Board carried out chemical testing of water from tubewells. The average concentrations of major constituents are shown in **Table 3.6**.

Table 3.6: Ground Water Quality in and around Bundi

Parameters	**Maximum Level**	**Minimum Level**	**Standard of Drinking water (IS: 10500: 1991)**	
			Desirable limit (mg/l)	**Maximum Permissible limit (mg/l)**
pH	8.24	7.71		
EC (micro-mhos/cm at 25 °C)	5550	525		
Cl (mg/l)	1576	57	250	1000
SO_4(mg/l)	737	7	200	400 (if Mg does not exceeds 30 ppm)
NO_3(mg/l)	196	0	-	100
PO_4(mg/l)	0.5	0.1		
Total Hardness(mg/l)	2040	170	300	600
Ca(mg/l)	480	28	75	200
Mg(mg/l)	204	7.3	30	100
Na(mg/l)	552	28	-	-
K(mg/l)	17	0.78	-	-
F(mg/l)	2.5	1.0	1.0	1.5
Fe(mg/l)	10.45	0.15	0.3	1.0
SiO_2(mg/l)	40	13		
TDS (mg/l)	3608	341	500	2000

Note: Total – 10 nos. samples Source: Ground water year book 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2007)

EC = electric conductivity, Cl = chloride, SO_4 = sulfates, NO_3 = nitrates, PO_4 = phosphates, Ca = calcium, Mg = Magnessium, Na = sodium, K = potassium, F = fluoride, Fe = iron, SiO_2 = silicates, TDS = total dissolved solids, mg/l = milligrams per liter

40. Supply water quality as measured by Public Health Dept. is shown below. It is noted that ground water is potable for drinking purpose.

Table 3.7: Present Supply Water Quality at Bundi

Population	Total supply per day (lac liter)	Type of Sources Surface /Ground	Ground	Surface	No. of CWR	No. of SR	F^- Min	F^- Max	TDS Min	TDS Max	NO_3^- Min	NO_3^- Max
65,047	80	Ground	100	0	4	9	0.12	0.46	400	860	2	25

(All values in mg/l unless stated otherwise)
CWR = clear water reservoir; F = fluoride, TDS = total dissolved solids, NO_3 = nitrates, mg/l = milligrams per liter

B. Ecological Resources

41. The urban area in Bundi is surrounded by land that was converted for agricultural use many years ago. There is no remaining natural habitat in the town, where 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 is no protected area nearby the subproject site.

42. There are reserve forest areas in the north and north-east of Bundi, and although protected from building and most other types of activity, these contain little of ecological interest. Vegetation is sparse and comprises mainly domesticated species, and the fauna is also very limited. There are fishes in most of the rivers and irrigation tanks outside the towns, but no aquatic areas are protected; rahu (*Labeo rohita*) and sanwal are the most common fish species.

C Economic Development

43. Occupational Structure: In 1971, the participation ratio of workers was 26.57% which increased to about 27.1 % by 1981. Being the district head quarter, service sector is the most important sector of employment, employing about 37.4 % of total workers. Bundi has also a number of industrial units which are agro-based and about 24.5 % of workers are employed under this sector. Trade and commerce is the other important sector providing employment to about 19.66 % workers.

Table 3.8: Occupational Structure

Occupation	Persons	% of Total Workers
Agriculture	490	5.33
Live Stock ,Forestry, Mining and Quarrying	274	3.00
House Hold Industry	913	9.96
Other than House Hold	1329	14.50
Construction	450	4.90
Trade and Commerce	1802	19.66
Other Services	481	5.25
	3426	37.40
Total	**9165**	**100%**

44. Power Status of the Area: There is no power generation unit at Bundi. The consumption of electricity by different sectors is shown in **Table 3.9**.

Table 3.9: Consumption of Electricity in Million Kwh (2003-04)

District	Domestic	Non-Domestic (Commercial)	Industrial			Public Lighting	Public Water Works
			Small	Medium	Large		
Bundi	28.093	7.033	4.165	3.168	44.947	1.062	7.513

45. Land Use: Municipal area of Bundi encompasses 20.23 sq. km. About one fifth of the land area is urbanized and the rest consists of hills, water bodies and agricultural land. Even within a contiguous urbanized area, only 65% is developed and the remaining are water bodies, agricultural land, and pockets of vacant land. About 44% of developed area is under residential use and 23% under public and semi-public. The high percentage of public and semi-public uses is due to spacious parade and play fields attached to schools. **Table 3.10** shows land use percentage of developed and urbanized areas of Bundi. **Figure 3.9** shows proportion of land use of Bundi developed area. **Figure 3.10** depicts land use map of the entire district.

Table 3.10: Existing land Use of Bundi

Sl.No	Use	Area in Acres	% of Developed Area	% of Urban Area
1	Residential	310	44	28
2	Commercial	60	8.6	5.5
3	Industrial	35	5	3
4	Governmental	20	3	2
5	Recreational	20	3	2
6	Public and Semi public	160	22.8	14.5
7	Circulation	95	13.6	8.5
8	Agricultural	120		10.5
9	Water Body	85		7.5
10	Other Vacant	205		18.5
Total Urbanized Area		1110		100

Figure: 3.9: Land Use Bundi Developed Area

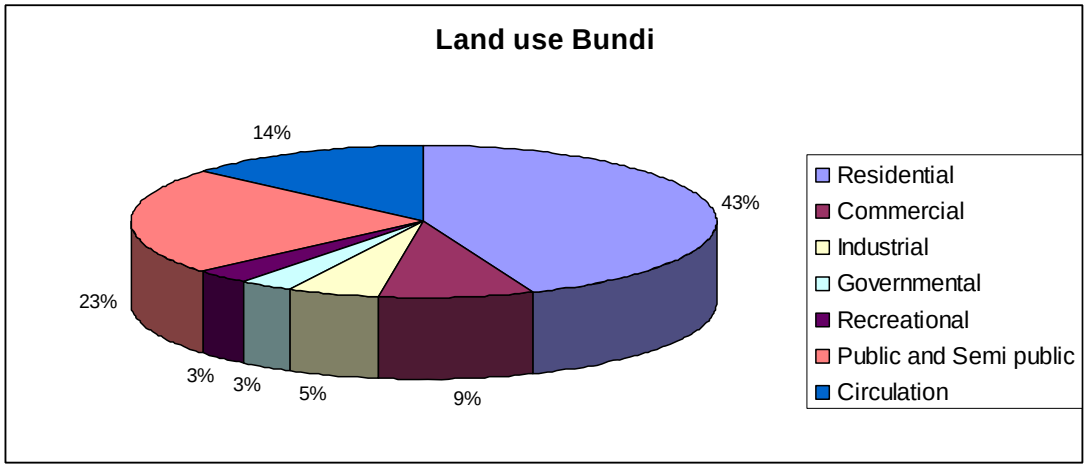
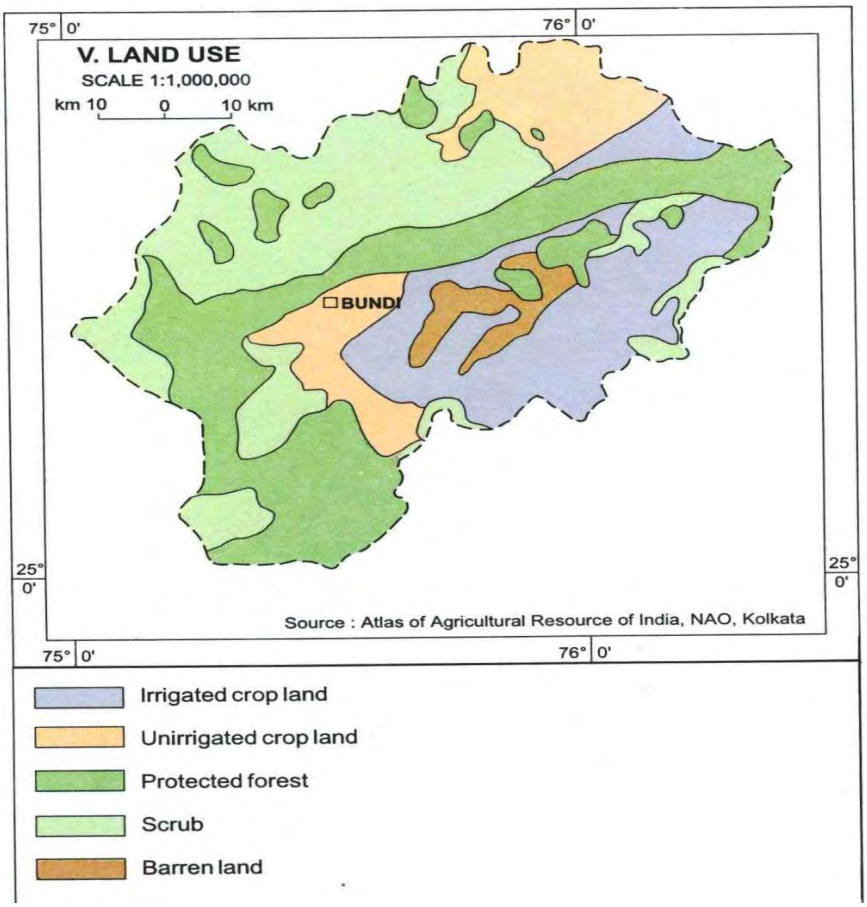


Figure 3.10: Land Use Map of Bundi District



46. Chainage-wise land use in and around the sub –project site is shown in **Appendix-1.** It is noted that along the raising main and distribution areas the major land use is the agriculture. In some cases commercial and open areas are noted. There is no major impact anticipated on residential areas and religious places. Details are discussed in Social impact assessment report.

47. Commerce, Industry and Agriculture: There are few industries located in and around Bundi town, these are as follows:

- Number of Large and Medium Scale Units: 5
- Number of Small Scale Units: 2,211
- No of Industrial Areas: 5 (located in Baswari-Govindpur, Bundi by-pass, Bundi-Nainwa Road, Bundi Chittorgarh, and Indergarh.
- Main Existing Industries: general engineering, oil milling, oil refinery, paper, *poha* making, portland cement manufacturing, rice milling, stone cutting and polishing, and sugar refining

48. In and around the Bundi town area, about 80% of lands used for agricultural purposes. Crop production statistics as depicted in **Table 3.11.** It also indicates that there are more crop production at *Rabi* season in compared to *Kharif* season.

Table 3.11: Crop Production In and Around Bundi

Type of Crops	Under Rabi Crops 2003-04 (Production in tons)	Under Kharif Crops 2003-04 (Production in tons)
Cereals	266,735	116,963
Pulses	11,928	18,652
Food Grains	278,663	135,615
Oilseeds	67,361	70,437
Others	11,287	50,205
Total	**357,311**	**256,257**

Source: Vital Agricultural Statistics 2004-05, Directorate of Agriculture, Rajasthan

49. Water Supply: The present service level of Bundi is less than 135 lpcd. The water supply of Bundi town is sourced partly from tube wells and partly from Mangli river. The major shortcoming of Bundi water supply is inadequate water source and deficiency in storage. 60% of the population is supplied with water through pipes and partly from public stand posts and hand pumps.

50. Sewerage and Sanitation: The municipal drains are mostly open and overflowing into Latic *nalla* causing problems specially during rainy reason. Sullage from households and toilets often flows to drains causing unsanitary conditions. Only 50-60 % of the households reportedly has septic tanks and soaks well as the system of sewerage disposal. The remaining accounted for cases of open defecation which is an unacceptable and unhygienic practice. The raw settled sewage from septic tank is periodically flushed out by sanitary workers of the Municipal Board and discharge to open spaces, agricultural lands in an indiscriminate manner. Slum areas were also not equipped with requisite sanitation resulting in open defecation.

51. Drainage: Due to scanty rains in the region, natural drainage system has not been developed. In Bundi town itself, no natural drainage system exists to drain away the rainwater or wastewater from the town. Presently, there exists a minimal network of storm water drains in the town. The existing network of (roadside) storm water drains with total length of 128 km in Bundi has been identified under three broad categories as follows: (i) open *pucca* (115.2 km) (ii) closed drains (6.4 km), and (iii) open drain *kutchha* (6.96 km):.

52. Industrial Effluents: Industries exist under Rajasthan State Industrial Development & Investment Corporation Ltd (RIICO), which are outside the town area and small amount of effluent disposed scattered in local *nallahs*. As reported by the local municipal council, the responsibility of effluent disposal is under RIICO's own and could not be connected to the proposed sewer network. The individual industry should treat their effluent to bring it to the required standard before final disposal.

53. Solid Waste: 20 tons of solid waste is collected daily. In addition to household (domestic) solid waste, the main waste generation sources in the town are vegetable and fruit markets, commercial and institutional establishments including hotels and eateries, construction activities, and other tourism related activities. The solid waste generated is transported to garbage dumping site. The Municipal Board has engaged one loader and three tractors and four private tractors for collecting and transporting the solid waste material. The capacity of 7 tractors

is approximately 10 cubic meter (m^3). The waste material is lifted by loaders and put on trolley for transportation to disposal site.

54. Transportation: Bundi is well connected to all the cities within Rajasthan. There are buses and tourist taxis available from Jaipur and Kota. **Table 3.12** provides a breakdown of road surface composition in Physical growth of the town has resulted in a corresponding increase in vehicular traffic greater than that of the town's population growth due to improving economic status of the town.

Table 3.12: Road Surface Composition

Surface Type	Total (km)
Concrete	64.83
Black Topped	21.61
Water-Based Macadam	19.49
Others/Earthern	2.16
Total	**108.09**

Source: Bundi Public Works Department

D. Social and Cultural Resources

55. Population**:** The population of Bundi town has increased rapidly during the past 50 years. The town has a population of 22,697 in 1951 which has gone up to the present population of 88,871 (2001 census). Thus the population has increased more than 3.5 times during the periodwith an annual growth rate of 3.34%.The density of population in Bundi town currently at 3,905 persons per square km. The density has rapidly grown in the last 50 years. Projected population of Bundi town is given in **Table 3.14.**

56. Literacy Rate: The current level of literacy in Bundi is placed at 55.57 % (71.68 for Male and 37.79 % for Female) on comparison with the state average of 38.55% (54.99% for male and 20.44% for female), the Bundi town literacy levels are superior.

57. Sex Ratio: The sex ratio for Bundi town has been estimated at 893 per thousand male for the year 2001 census.

Table 3.14: Projected Population

Year	Population
2001	88,871
2011	114,963
2021	149,206
2031	193,546
2041	250,611

58. There are good educational facilities in Bundi district, which serve both townspeople and inhabitants of surrounding villages and towns in the hinterland. There are 933 primary schools, 89 secondary and higher secondary schools, 2 general degree colleges, and 3 industrial training institutes (ITI). **Table 3.15** shows education facility in the district.

Table 3.15: Educational Facility of Bundi District

Educational Institutes	(No.)
Primary Schools	933
Middle Schools	341
Higher Secondary and Secondary Schools	89
Degree Colleges	2
Special Commercial Schools	3
ITI	3

59. There are 1 general hospital, 1 tuberculosis hospital, and 1 primary health center in Bundi town.

Table 3.16: Medical facilities in Bundi urban

	Facilities	Number
1	Hospital and Community Center	1
2	TB Hospital	1
3	Primary Health Sub Center	1
4	Total	3

60. The Bundi district of Rajasthan has been an important tourist destination for both the foreign and domestic tourists. The place offers a unique culture with baoris, palaces & forts, lakes and the beautiful natural surroundings. The apparent tourism potential of this place inspired many to organise fairs and festivals to give a boost to the tourism resources. Efforts were made for vital efforts to streamline tourism and make it an important agent for the growth and development of this area.

61. 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. The Bundi palace, built of locally quarried stone, presents one of the finest examples of Rajput architecture. Intricately carved brackets, pillars and balconies and sculpted elephants are used liberally. Of special interest here are the Diwan-I-Am, Hathi Pol and the Naubat Khana. Also located in the palace is the famous Chitra Shala which provides a colourful glimpse of history - the walls and ceiling of this palace are completely covered with paintings of the Bundi school. Hunting and court scenes, festivals, processions, animal and bird life and scenes from Lord Krishna's life are still in very good condition. Bundi has other palaces and hunting lodges like the Phool Sagar Palace, Sukh Mahal and Shikar Burj. Each palace has its own historical importance Phool Sagar houses a collection of murals: done by the Italian prisoners of war who were held here; Sukh Niwas Palace evokes memories of Rudyard Kipling who not only stayed here but is believe to have found inspiration for his famous work Kim from the scenes that he saw here. Kshar Bagh, though not a palace, is interesting for its locations as well as the carvings on the 66 royal cenotaphs.

62. Bundi is also known for its *baories* or step-wells. Unique to Rajasthan and Gujarat, the step-wells served as water reservoirs for the months of summer when there was a scarcity of drinking water. At one time, there were over 50 such wells in Bundi but most of them have suffered the ravages of time. One very good example still to be found in the heart of the town is called *Raniji-ki-Baori*. It has exquisitely carved pillars and ornate archways - even the simple function of drawing water from the well became a special occasion for the womenfolk, they dressed up in their finery to visit these elaborate structures. On the road to Kota is a splendid

17th century monument - the 84-pillared *chhatri* still in extremely good condition and worth a visit.

63. Bundi has moderate tourist inflows with main attractions being Ratan –Daulat , Chhatra Mahal , Chitra Shala, Char Bhujaji , Jain Temple at Naharji Ka Chauhatta, Laxminath Temple in Sadar Bazar, Damdame ki Maszid. The details tourist approaches to this town during last five years are as below.

Table: 3.17: Tourist inflow at Bundi

Year	Domestic Tourist	Foreigner	Total
1997	2661	421	3082
1998	11333	3818	15151
1999	29293	10342	39635
2000	30433	10568	41001
2001	20911	4334	25245
2002	11811	4000	15811
2003	17041	6916	23957
2004	14296	5516	19812
2005	21582	7866	29448

IV. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: LOCATION AND DESIGN

64. 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.

65. 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 groundwater aquifer was depleted by excessive abstraction this would be an impact of both the location and design, because groundwater may not be depleted if the design had used surface water to augment the supply, and the specific aquifer would not have been depleted if the wellfield was located elsewhere.

66. However in the case, it is being considered that there are no impacts that can said to result from either the design or location of this subproject. This is because:

- Most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localised and not greatly significant;

- Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other excavation. However the routine nature of the impacts means that most can be easily mitigated; and

- In one of the major fields 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.

V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: INFRASTRUCTURE CONSTRUCTION

A. Screening Out Areas of No Significant Impact

67. From the descriptions given in Section III it is clear that implementation of the project will affect quite long tracts of land both inside and outside the town where the distribution main, transmission main and network extensions will be constructed, and also a series of specific locations (eg. the intake and storage reservoir sites), some of which are quite large (clear water reservoir).

68. After screening of the preliminary design data it is expected that the construction work will not cause major negative impacts. This is mainly because:

- Pipelines will be mainly located on unused ground alongside existing roads and can be constructed without causing major disruption to road users and adjacent houses, shops and other businesses;

- New facilities within and outside the town {OSHRs, Clear Water Reservoirs, (CWRs), GLSRs, etc.} will be located on government-owned land that is not occupied or used for any other purpose;

- Most pipeline construction will be conducted by small teams working on short lengths at a time so most impacts will be localised and short in duration; and

- The overall construction programme will be relatively short for a project of this nature, and is expected to be completed in 2 .5 years.

69. 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.

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
Wildlife and rare or endangered species	There is no wildlife or rare or endangered species in the town or on the government owned areas outside the town on which facilities will be built
Coastal resources	Bundi is not located in a coastal area
Population and	Construction will not affect population numbers, location or

communities	composition

70. These environmental factors have thus been screened out presently but will be assessed again before tendering stage.

71. Rapid Environmental Impact Assessment checklist along with mitigation measures is given in **Appendix 2.**

B. Source and Supply Augmentation

1. Construction Method

72. As explained above, augmentation of the water source and supply will involve construction of the following:

- Transmission/raising main with length of 25 km; and
- New Intake – 16 nos. of tube wells

2. Physical Resources

73. Excavation for intake tube well will not generate much waste soil and stone. There will be little physical changes at the construction sites, and this quantity of waste could be dumped without causing further physical impacts (on air quality, topography, soil quality, etc) at the point of disposal. The work will probably be conducted in the dry season, so there is also a lot of potential for the creation of dust.

74. Action will therefore be needed to reduce physical impacts at both the construction and disposal sites, by controlling dust and reducing the amount of material to be dumped. The Contractor should therefore be required to:

- Contact the town authorities to find beneficial uses for as much waste material as 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; and
- Prevent 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.

75. Another physical impact that is often associated with large-scale excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. However, this should not be a problem in this case, given the low rainfall and deep water table in this area, and the fact that the Contractor will almost certainly plan excavation work to avoid the monsoon season.

3. Ecological Resources

76. There are no protected areas or locations of any ecological interest at or near any of the sites affected by these works, so it is unlikely that the construction process will have any ecological impacts. The only concern would be if trees were removed unnecessarily. To avoid

this, the Contractor should be required to plant and maintain three new trees for every one that is removed.

4. Economic Development

77. The intake sites will be located on government owned land, so there should be no need to acquire land from private owners, which might affect the income and assets of owners and tenants. There should also be no effects on other features with economic implications (such as infrastructure, industry and commerce), as there are none of these facilities on these sites.

78. There could however be significant disruption of traffic, business and other activities, if trucks carrying waste material were allowed to enter Bundi town or other built-up areas. It is noted in **Appendix 1** in Section III that some the locations are within the commercial areas. The transportation of waste will be implemented by the Contractor in liaison with the town authorities, and the following additional precautions should thus be adopted to avoid these impacts:

- Planning transportation routes so that heavy vehicles do not enter Bundi town or other built-up areas and do not use narrow local roads, except near delivery sites; and

- Scheduling the transportation of waste to avoid peak traffic periods.

5. Social and Cultural Resources

79. 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 the locations proposed for these facilities are uninhabited and show no obvious signs of having been used to any extent in the past, then it could be that there is a low risk of such impacts at these sites. 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 all proposed sites;

- Selecting alternative sites for any work proposed in areas 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; and

- 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 ensuring its removal or protection in situ.

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

81. 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 this labour force from communities within a radius of say 2 km from each site, if sufficient people are available.

C. Network Improvement

1. Construction Method

82. Expansion of the distribution network will involve construction of:

- Laying of distribution network of 45 km
- Construction of 6 OSHRs and 2 GLSR
- 2 CWRs
- Construction and renovation of 3 nos. pump house
- Chlorination plant located beneath or alongside the storage reservoirs

83. Reduction of non-revenue water will involve:

- Replacement of non-functional water meters
- Repair of house connections
- New bulk meters to be installed on rising main and distribution main from SR

84. These all involve the same kinds of construction and will produce similar effects on the environment, so their impacts are considered together.

85. It is expected that the distribution mains will be buried in trenches adjacent to roads, in the un-used area within the ROW, at the edge of the tarmac. However the distribution mains will be located in roads and streets in the town, where in some places this area is occupied by drains or the edges of shops and houses etc, so to avoid damage to property some trenches may be dug into the edge of the road.

86. Trenches will be dug using a backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed alongside, and the pipes (brought to site on trucks and

stored on unused land nearby) will be placed in the trench by hand or using a small rig for the larger DI pipes. Pipes will be joined by hand, after which sand from local quarries will be shovelled into the trench beneath and around the pipe for support and protection. Soil will then be replaced manually on top of the pipe and compacted by a vibrating compressor. Where trenches are dug into an existing roadway, the bitumen or concrete surface will be broken by hand-held pneumatic drills, after which the trench will be excavated by backhoe, and the appropriate surface will be reapplied on completion.

87. Pipes are normally covered by 1.0 m of soil, and a clearance of 100 mm is left between the pipe and each side of the trench to allow backfilling. Trenches will be smaller for the distribution main (minimum of 1.25 m deep and 0.6 m wide). Old pipes will be replaced by new one after taken out old pipe by digging.

88. New pipes and connections to the distribution main will be provided to house connections, and these will run to individual dwellings in small hand-dug trenches, or on the surface. New consumer meters will be located outside houses, attached to a wall or set onto the ground. In slum areas water will be provided via communal taps from where people will collect their water.

89. CWRs, OSHRs and GLSRs will be built on government-owned land at various locations in the town. The cavity for the ground reservoirs (GR) and foundations for the overhead reservoirs (OR) will be excavated by backhoe, with soil being loaded onto trucks for disposal. Aggregate and concrete will be tipped into each void to create the foundations and floor, after which metal reinforcing rods will be added to create the outline of the walls of the GR and the vertical supporting pillars of the OR. Sections of reinforcing will then be encased in wooden shuttering and concrete will be poured in, and this process will be repeated to gradually create each structure from RCC, including the tank of the OR and the above-ground portion of the GR. Surfaces will be smoothed and finished where necessary by hand.

90. Small brick rooms will be built for the chlorination plant. The foundation will be dug and aggregate and concrete poured in to create the floors, after which the brick walls and roof materials will be added by hand. Chlorine cylinders and other equipment (including flow-meters) will be brought in on trucks and offloaded and attached by hand. A small cavity for the chlorination sump and trenches for pipe-work will also be dug, and the sump will constructed from concrete and brick.

2. Physical Resources

91. Although replacement of parts at the pump house should not have noticeable environmental effects, the remainder of this component involves some quite large-scale excavation, so physical impacts could be significant and will need to be mitigated.

92. This work is similar to the source augmentation component in that construction will involve quite extensive excavation, although in this case it will be spread over various locations, many of which are in the town, so the nature and significance of the impacts could be different.

93. If average trench dimension 1.25 x 0.6 m for the 45 km distribution main, then trench construction will excavate around 33,750 m^3 of material. After construction, approximately 5% of the trench will be occupied by the pipe, 15% by backfilled sand, and 80% by excavated soil replaced on top and side of the pipe. This means that around 5,062 m^3 of sand will be brought to site, 27,000 m^3 of soil will be retained for replacement in the trench, and 6,750 m^3 of waste material will be left over. Additional smaller quantities of waste will be produced by the other excavation work, in particular the ground storage reservoirs. This is less material than produced by excavation of the transmission line and intake but it adds a further to the total waste produced by this subproject, and in this case the impact of dust will be more significant because much of the work will be conducted in inhabited areas. It will thus be very important to limit physical impacts by finding beneficial uses for waste material as recommended above, and to apply additional precautions to limit the production and spread of dust. The Contractor should therefore be required to:

- Source of materials for construction should come from government-approved quarries;
- Contact the town authorities to find beneficial uses for 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;
- Prevent the generation of dust by removing waste soil as soon as it is excavated;
- Plan the work carefully so that sand is only brought to site when it is needed;
- Cover or damp down sand and soil retained on site to reduce dust in windy weather; and
- Use tarpaulins to cover loose material during transportation to and from the site.

94. The other important physical impact associated with excavation (effects on surface and groundwater drainage) should again be negated by the low rainfall and very low water table in this area, and the fact that the Contractor will almost certainly conduct the excavation work in the dry season.

95. Physical impacts will also be reduced by the method of working, whereby the network 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

96. There are no significant ecological resources in the town (protected areas or rare or important species or habitats), so the network improvements should have no ecological impacts. 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

97. Most of this work will be conducted on government owned land in the ROW of roads, where there is no need to acquire land from private owners. It may be necessary however to acquire small amounts of land in places along the transmission main route to avoid bends in the road and allow the pipeline to follow a more direct path. If this is the case, the government will purchase land through the mechanism of the Land Acquisition Act (1894), where prices are established on the basis of recent transactions. ADB policy on Involuntary Resettlement requires that the owners and users of acquired land do not suffer economically as a result of the project, and a separate Resettlement Plan and Resettlement Framework have been prepared to examine these and related issues. This establishes that no more than 10% of the land of any owner or occupant should be acquired, and that in addition to the price of the land, farmers should be compensated for any standing crops or trees they lose.

98. Although most of the work will not require land acquisition it could still have economic impacts, if the presence of trenches, excavated material, workers and machinery discourage customers from visiting shops and businesses, which lose income as a result. These losses should be short in duration as most of the pipeline work should last for only a few days at any one site. Nevertheless the loss of income could still be significant for small traders and other businesses that exist on low profit margins. These impacts should therefore be mitigated by:

- Compensating shopkeepers and other affected businesses for lost income;
- 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; and
- Consulting affected businesspeople and informing them in advance when work will occur.

99. Excavation work could damage existing infrastructure located alongside roads, such as storm drains where present, and the sewer network inside the fort area. 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 citizens (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 pipeline routes (in and outside the town) to avoid any conflict; and
- Integrating construction of the various Bundi subprojects (in particular water supply and sewerage) so that different infrastructure is located on opposite sides of the road where feasible and roads and inhabitants are not subject to repeated disturbance by trenching in the same area at different times for different purposes.

100. Transport is another type of infrastructure that will be affected by some of the work, particularly construction of pipelines in the narrower streets where there is not enough space for excavated soil to be piled off the road. The road itself may also be excavated in places where there is no available land to locate pipelines 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.

101. It is inevitable that there will be an increase in the number of heavy vehicles in the town (particularly trucks removing waste material for disposal), 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; and

- Scheduling the transportation of waste to avoid peak traffic periods, the main tourism season, and other important times.

5. Social and Cultural Resources

102. Similar to the case of source and supply augmentation works, there is a significant risk that the network improvements, which involve further extensive disturbance of the ground surface, could damage undiscovered remains, or even unknown sites. The risks are in fact very much higher in this case, as most of the work will be conducted in Bundi town, which has been inhabited for a long period, and where there is therefore a greater risk of artefacts being discovered. The preventative measures described in Section V 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 or sites 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; and

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

103. The network improvements will also disturb some more modern-day social and cultural resources, such as schools, hospitals, temples, and also sites that are of tourism importance. Impacts could include noise, dust, and interrupted access for pedestrians and vehicles, and if pneumatic drills are used to break the surface of roads, there could be a risk of damage from vibration. Given the historical importance of Bundi and particularly the fort, any such damage or disruption could be highly significant, so very careful mitigation will 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, bringing sand to site only when necessary, covering and watering stockpiles, and covering soil and sand 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); and

- Using modern vehicles and machinery with standard adaptations to reduce noise and exhaust emissions, and ensuring they are maintained to manufacturers' specifications.

104. 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.

105. A different but no less significant impact is the effect on people and communities if water supplies are closed down for extended periods when work is conducted on the network. This would be inconvenient in the short term, and there could be health risks if the water supply was unavailable for several successive days or longer. It will therefore be important to take the necessary measures to avoid such a situation. This will require:

- Detailed planning of the construction program to keep the cessation of water supplies to the minimum possible (in both area and duration);

- Provision of alternative potable water to affected households and businesses for the duration of the shut-down; and

- Liaison with affected persons to inform them of any cessation in advance, and to ensure that they are provided with an alternative supply.

106. There is invariably a safety risk when substantial construction such as 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; and

- Documentation of work-related accident

107. 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 are that:

- No work is proposed on those parts of the existing system that contains AC pipes (ring, carrier and distribution mains), and these will be left in situ undisturbed, so there will be no deliberate excavation of AC pipes; and

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

108. Given the dangerous nature of this material for both workers and citizens, one additional measure should be taken to protect the health of all parties in the event (however unlikely) that AC pipes are encountered. This is that, during design of the water supply system, the design consultant should 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)[3], 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; and

- 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.

109. 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 V.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

[3] 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

difficulties in the host community and issues of health and sanitation in poorly serviced temporary camps.

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

A. Screening out Areas of No Significant Impact

110. Because a water supply system should operate without the need for major repair and maintenance (see below), there are several environmental sectors which should be unaffected once the system becomes operational. 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 discussed further.

Table 6.1: Fields in which Operation and Maintenance of the Completed Water Supply System Is Not Expected To Have Significant Impacts

Field	Rationale
Climate	Extraction and use of water from river will not affect climate
Fisheries & aquatic biology	Intake of water do not support a significant aquatic flora or fauna
Wildlife, forests, rare species, protected areas	There are none of these features in or outside the town
Coastal resources	Bundi is not located in a coastal area
Industries	The water supplied by the new system will not be for industrial use

B. Operation and Maintenance of the Improved Water Supply System

111. The new source augmentation works should operate with little maintenance beyond routine actions required to keep the pumps and other equipment in working order at the water reservoirs (WR). This will be straightforward, involving regular checking and recording of performance for signs of deterioration, servicing, and replacement of parts, etc. Small manpower will be employed to operate and maintain the WR site and intake.

112. The main requirement for maintenance of the transmission main and distribution system will be for the detection and repair of leaks. The generally flat topography and the usage of good quality DI and MDPE/uPVC pipes should mean that pipeline breaks are very rare, and that leaks are mainly limited to joints between pipes. The repair of household connections and the provision of new connections to slums and developing areas to increase the number of people supplied should reduce the incidence of illegal connections, which are often a major source of leaks.

113. The bulk meters installed at storage reservoirs and pumping stations will allow amounts of water flowing through individual parts of the network to be monitored, which will pinpoint areas where there are leaks, and/or where water is being taken from the system illegally. A small Leak Detection Team will then visit these areas with audio devices to locate individual leaks, which will then be repaired in essentially the same way that the pipes were installed. Trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary. If illegal connections are found these will be removed and the pipe will be re-sealed, or a new connection with a meter will be provided for the household.

114. There will also be some small scale maintenance required at the new OHSR and CWR sites, which will involve the same sort of checking of pumps and other equipment as conducted at the CWR, plus the regular replenishment of chlorination cylinders to maintain water treatment. Two or three men will be employed at each site for this purpose.

115. Supply of chlorine should be ensured for the chlorination plants to work properly. Empty chlorine cylinders should also be disposed in a sound and safe manner.

C. Environmental Impacts and Benefits of the Operating System

1 Physical Resources

116. If trenches are dug to locate and repair leaks or remove and replace lengths of pipe or illegal connections, the work will follow the same procedure that was followed during construction phase. In this case, soil and backfilled sand will be removed to expose the leaking junction or pipe, and if necessary a new pipe will be brought to site and replaced. The trench will then be refilled and re-compacted. This work should be very infrequent, and will affect individual small locations for short periods only (an average of a few hours for most repairs). Physical impacts will therefore be negligible. Work will not be conducted during rainfall so there will be no effect on drainage, and the removed material will be replaced in the trench so there will be no waste.

117. One of the main risks of improving a water supply system through increased abstraction is that the source will be used unsustainably, at a rate that is above the level of natural replenishment, and that the source becomes depleted as a result. That should not be an issue in this case as the water will be extracted from tube wells. It should also be noted that water conservation measures included in the subproject (in particular the replacement of leaking distribution mains and faulty house connections) should significantly reduce system losses, and thus limit the volume needed.

2 Ecological Resources

118. There are no significant ecological resources in or around the town, so any repairs or maintenance work can be conducted without ecological impacts. As there is no significant flora and fauna in or around project site, there should also not be any ecological impacts from the increase in abstraction.

3 Economic Development

119. Although network repairs could result in shops losing some business if the work means that access is difficult for customers, 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 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.

120. The provision of an improved and expanded water supply system is not expected to have direct economic benefits for business or industry, as connections will only be provided to domestic users. However businesses will almost certainly benefit from the expected improvement in the health and wellbeing of their workforce (see below) as this should result in fewer days lost through illness, and overall increased productivity.

4 Social and Cultural Resources

121. 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 network, as all work will be conducted in trenches that have already been disturbed when the infrastructure was installed.

122. Repair work could cause some temporary disruption of activities at locations of social and cultural importance such as schools, hospitals, temples, tourist sites etc, so 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 in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

123. The responsible authorities will employ local contractors to conduct network repairs, 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, and prohibition of the use of AC pipes for any repair or maintenance work.

124. 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. To provide at least some economic benefits to affected communities, persons employed to maintain the ORs and CWR should be residents of the neighbouring areas.

125. The citizens of the town will be the major beneficiaries of the improved water supply, as they will be provided with a constant supply of better quality water, piped into their homes. This should improve the social capital of the town, and 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

126. **Table 7.1** lists the potential adverse impacts of the Bundi water supply 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, who will be responsible, and where and when the mitigation activities will take place. The mitigation programme is shown as the quarter of each year in which each activity will occur, which relates to the project programme described in Section II.B. The final column assesses whether the proposed action will successfully mitigate the impact (shown as 0), and indicates that some of the measures will provide an additional benefit (shown as +).

Table 7.1: Environmental impacts and mitigation for the Bundi Water Supply Subproject (Black = continuous activity; Grey = intermittent)

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	2008				2009				[4]
						D	D	3	4	1	2	3	Op	
Construction: Source Augmentation Works														
Excavation of CWR / intake 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									+
Contamination of aquifer due to accidental seepage of oil/sewage during construction	M	P	Proper disposal / storage of oil and disposal/ discharge of sewage before accidental seepage	Contractor	All sites									
Waste soil could create dust in windy weather	M	T	Remove waste soil as soon as it is excavated	Contractor	All sites									0
			Use tarpaulins to cover dry soil when carried on trucks											0
Trees may be removed at intake and CWR site	M	P	Plant and maintain three trees for every one removed	Contractor	All sites									0
Traffic and activities may be disrupted by trucks carrying waste soil	M	T	Plan routes to avoid Bundi Town and narrow roads	Contractor	From RWR site									0
			Schedule transportation to avoid peak traffic periods											0
Ground disturbance could damage archaeological and historical remains	S	P	Request state and local archaeological authorities to assess archaeological potential of all work sites	DSC	All sites									0
			Select alternatives if sites have medium-high potential	DSC										0
			Include state and town historical authorities as project stakeholders to benefit from their expertise	LSGD										0
			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 work sites	Contractor	All sites									+
						2009				2010				
Construction: Network Improvements						D	D	3	4	1	2	3	Op	
Trenching will produce additional amounts of waste soil	M	P	As above: find beneficial uses in construction or infill	Contractor	All sites									+
Blasting operation may disturb environment	M	P	Blasting must be controlled/avoided	Contractor	Network sites									

Sig = Significance of Impact (NS = Not Significant; M = Moderately Significant; S = Significant). Dur = Duration of Impact (T = Temporary; P = Permanent)
D = Detailed Design period; Op = Period when infrastructure is operating
[4] This column shows impacts remaining after mitigation: 0 = zero impact (impact successfully mitigated); + = positive impact (mitigation provides a benefit)
* Mitigation of these impacts will be provided through a separate Resettlement Plan

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	2008				2009				
						D	D	3	4	1	2	3	Op	[4]
Waste soil and imported sand may create dust	M	T	As above: remove waste quickly, cover/spray stockpiles	Contractor	Network sites									0
			Only bring sand (for backfill) to site when needed											0
			Cover soil and sand when transported on trucks											0
Trees may be removed along pipeline routes	M	P	As above: avoid removing trees, plant 3 for every 1 cut	Contractor	Network									0
Some farm land may need to be acquired where route of transmission main diverges from alongside main road	M	P	*Purchase land as described in Resettlement Framework	LSGD	Where necessary									0
			*Avoid taking >10% of the land of any owner or tenant	DSC										0
			* Compensate farmers in cash for loss of crops and trees	LSGD										0
Shops may lose income if customers' access is impeded	M	T	*Compensate businesses for lost income	LSGD	Network sites									0
			Leave spaces for access between mounds of soil	Contractor										0
			Provide bridges to allow people & vehicles to cross trench	Contractor										0
			Increase workforce in these areas to finish work quickly	Contractor										0
			Inform shopkeepers of work in advance	LSGD										0
Trenching could damage other infrastructure	S	P	Confirm location of infrastructure and avoid these sites	DSC	Network sites									0
			Locate water and sewer pipes on opposite sides of roads	DSC										0
Roads/people may be disturbed by repeated trenching	M	T	Integrate subprojects to conduct trenching at same time	DSC/LGD	Network									0
Traffic will be disrupted if lack of space means that dug soil is placed on road and/or water pipes have to be located in the road itself	M	T	Plan work with town authorities – work when traffic is light	Contractor	Network sites									0
			Ensure police provide traffic diversions when necessary											0
			As above: increase workforce to finish this work quickly											0
Trucks removing waste could disrupt traffic and vibration could damage fragile buildings	M	T	Plan routes to avoid narrow streets, congested roads, important/fragile buildings, key religious & tourism sites	Contractor	Network sites									0
			Plan work to avoid peak traffic, main tourism season	Contractor	Network									0
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									0

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	2008				2009				
						D	D	3	4	1	2	3	Op	[4]
			As above: alternative sites where risk is high/medium	DSC										0
			As above: include state/local authorities as stakeholders	LSGD										0
			As above: apply protocol to protect chance finds	DSC/CC										+
Sites of social/cultural importance (schools, hospitals, temples, tourism sites) may be disturbed by noise, dust, vibration and impeded access	M	T	Identify buildings at risk from vibration damage and avoid using pneumatic drills or heavy vehicles nearby	Contractor	Network sites									0
			As above: remove waste quickly, cover/spray stockpiles, import sand only when needed, cover soil/sand on trucks											0
			As above: increase workforce to finish work quickly											0
			As above: use bridges to allow access (people/vehicles)											0
			Use modern vehicles/machinery & maintain as specified	Contractor	All sites									0
			Consult relevant authorities, custodians of buildings, local people to address issues & avoid work at sensitive times	Contractor	Network sites									0
People will be inconvenienced and their health may be at risk if water supply system is shut down for long period	M	T	Plan work programme to keep shutdown to minimum	DSC	Network sites									0
			Provide alternative water to affected residents	LSGD										0
			Inform communities of any shutdown in advance	LSGD										0
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									0
			- Exclude the public from all construction sites;											0
			- Ensure that workers use Personal Protective Equipment											0
			- Provide Health & Safety training for all personnel;											0
			- Follow documented procedures for all site activities;											0
			- keep accident reports and records											0
Existing water supply system uses AC pipes, a material that can be carcinogenic if inhaled as dust particles	S	T	Design infrastructure to avoid known locations of AC pipes	DSC	All sites									0
			Train construction personnel in dangers of asbestos and how to recognise AC pipes in situ	Contractor	All sites									0
			Develop & apply protocol to protect workers and public if AC pipes are encountered. This should include:	DSC and Contractor	Network sites									0

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	2008				2009				
						D	D	3	4	1	2	3	Op	[4]
			- immediate reporting of any occurrence to management	Contractor										0
			- removal of all persons to a safe distance											0
			- use of appropriate breathing apparatus and protective suits by workers delegated to deal with AC material											0
			- safe removal and long-term disposal of AC material											+
Economic benefits for people employed in workforce	S	T	As above: 50% of workforce from affected communities	Contractor	All sites									+
Operation and Maintenance														
Shops may lose small amounts of income if customers' access is impeded by network repair works	NS	T	As before: inform shopkeepers of work in advance	GA	Network sites									0
			As before: provide walkways and bridges for vehicles	OMC										0
			As before: request police to divert traffic if necessary	OMC										0
Sites of social/cultural importance may be disturbed by noise, dust, vibration, impeded access for short time during network repairs	NS	T	As before: avoid using drills/trucks near fragile buildings	OMC	Network sites									0
			As before: complete work quickly in sensitive areas	OMC										0
			As before: provide walkways/bridges for people/vehicles	OMC										0
			As before: consult authorities and communities, inform them of work in advance, avoid sensitive periods	GA										0
Health and safety of workers & the public could be at risk from repair work and AC pipes of old water supply system	S	T	Prepare and operate H&S Plan with same measures as used in construction phase	OMC	All sites									0
			Apply previously-developed protocol to protect all persons if AC pipes are encountered											0
Local people will benefit if employed by project	S	P	Workers employed to maintain PH, ORs and CWGR should be residents of neighbouring communities	GA	All sites									+

B. Institutional arrangements for project implementation

127. 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.

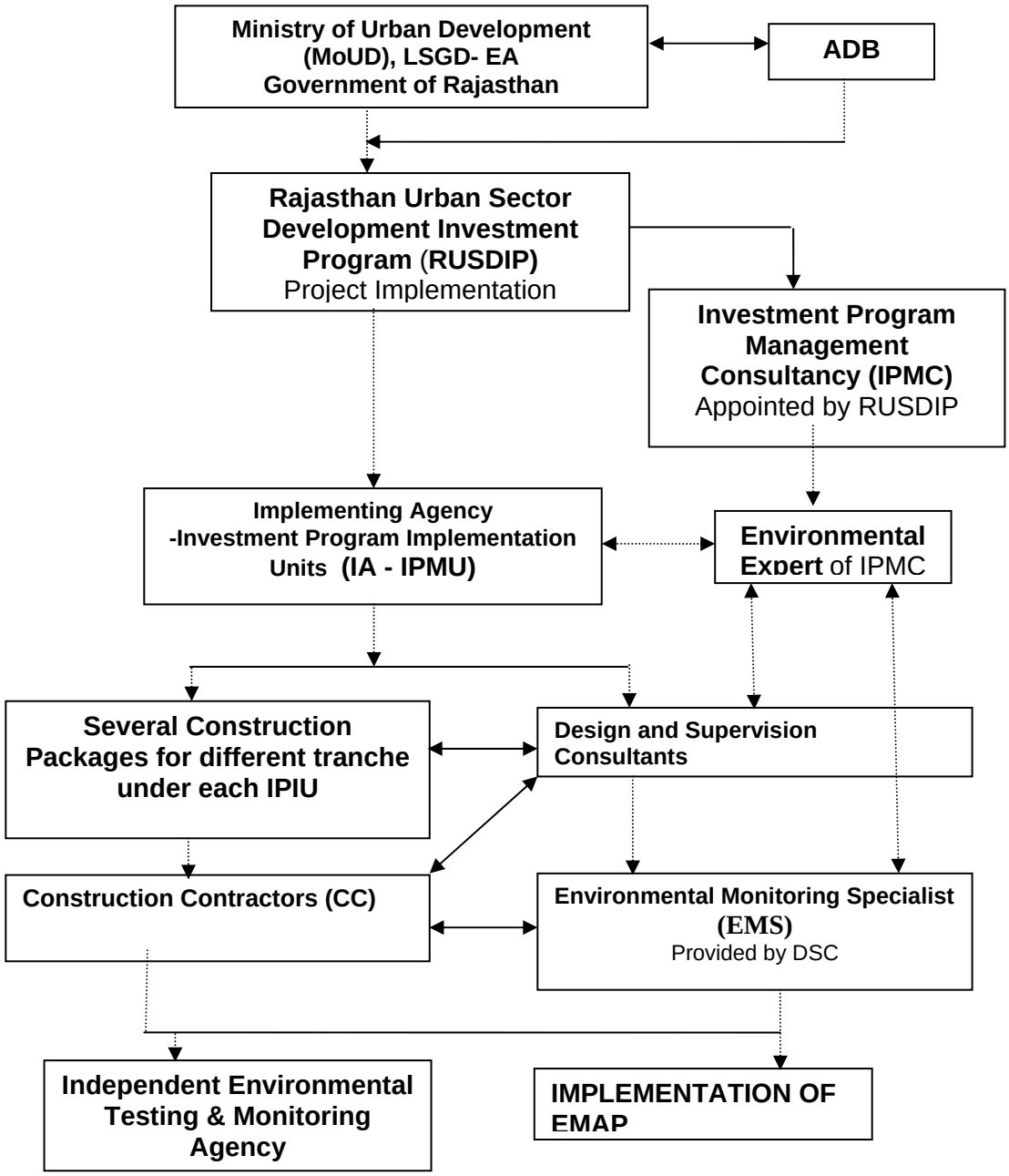
128. Resettlement issues will be coordinated centrally by a Resettlement Specialist within the IPMU/ IPMC, who will ensure consistency of approach between towns. A local Resettlement Specialist will also be appointed to IPIUs of zones in which there are resettlement impacts and they will prepare and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

129. 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.

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

Figure 7.1: Institutional Responsibly- RUSDIP



C. Environmental Monitoring Plan

131. **Table 7.1** shows that most mitigation activities are the responsibility of the Construction Contractors (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.

132. 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[5].

133. **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.

134. **Table 7.1** 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.

135. Given the scale of the investment in providing the infrastructure, LSGD will also wish to conduct monitoring during the operational period to confirm the long-term benefits of the scheme. **Table 7.2** shows that this will cover two elements, which will monitor:

- The chemical and bacteriological quality of water provided by the municipal system;
- The health of the population and the prevalence of diseases of poor sanitation.

[5] 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)

Table 7.2: Environmental Monitoring Plan

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
CONSTRUCTION					
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 dry soil and sand when carried on trucks	All sites	Contractor	Observations on and off site	Weekly	EMS
Cover or damp down soil and sand stockpiled on site	Inhabited areas	Contractor	Site observations	Weekly	EMS
Only bring sand (for backfill) to site when needed	Inhabited areas	Contractor	Site observations; CC records	Weekly	EMS
Leave spaces for access between mounds of soil	Network sites	Contractor	Site observations	Weekly	EMS
Plan truck routes to avoid Bundi Town, narrow or congested roads, important or fragile buildings, religious and tourist sites	All sites	Contractor	Observations off site; CC record	Weekly	EMS
Plan transport of waste to avoid peak traffic and tourist season	All sites	Contractor	Observations on and off site	Weekly	EMS
Plant and maintain three trees for every one removed	All sites	Contractor	Observations on/off site; CC records	Monthly	EMS
*Acquire land as described in Resettlement Framework	Where required	LSGD	Landowner surveys; LSGD record	As needed	IMA[6]
*Avoid taking >10% of the land of any owner or tenant	Where required	DSC	Owner/tenant surveys; DSC records	As needed	IMA
* Compensate farmers in cash for loss of crops and trees	Where required	LSGD	Farmer surveys; LSGD records	As needed	IMA
*Compensate businesses for lost income	Where required	LSGD	Shopkeeper survey; LSGD record	As needed	IMA
Provide bridges to allow people & vehicles to cross trench	Network sites	Contractor	Site observation; resident survey	Weekly	EMS
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
Consult town authority and avoid existing infrastructure	All 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 time	Network sites	DSC/LSGD	Site observation; design reports	Monthly	EMS
Plan work with town authorities – work when traffic is light	Network sites	Contractor	Site observations; CC records	Monthly	EMS
Ensure police provide traffic diversions when necessary	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
Avoid using pneumatic drills near buildings at risk from vibration	All 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

[6] 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
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
Plan work to minimise shutdown of water supply system	All sites	DSC	Design reports; resident surveys	Monthly	EMS
Provide alternative water to affected residents	All sites	LSGD	Site observation; resident survey	Weekly	EMS
Inform communities of any shutdown in advance	All sites	LSGD	Site observation; resident survey	Weekly	EMS
Prepare and implement a site H&S Plan (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 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
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
OPERATION AND MAINTENANCE					
Inform shopkeepers and residents of work in advance	Network sites	GA	Resident surveys	Monthly	
Provide walkways and bridges for vehicles	Network sites	OM Contractor	Site observation; resident survey	Monthly	
Request police to divert traffic if necessary	Network sites	OM Contractor	Site observations	Monthly	
Avoid using drills or trucks near fragile buildings	Network sites	OM Contractor	Site observations	Monthly	
Complete work quickly in sensitive areas	Network sites	OM Contractor	Site observations; OMC records	Monthly	
Consult and inform authorities & people, avoid sensitive periods	Network sites	OM Contractor	Site observation; resident survey	Monthly	
Prepare and operate H&S plan to protect workers and citizens	All sites	OM Contractor	Site observations; OMC records	Monthly	
Apply AC protocol to protect all persons if AC pipes encountered	All sites	OM Contractor	Site observations; OMC records	Monthly	
Employ people who live nearby to maintain CWR, OR and GR	All sites	GA	Employer record; worker survey	Monthly	
LONG-TERM SURVEYS					
Survey of chemical and bacteriological quality of municipal water	WTP and Domestic sites	LSGD	Water quality sampling and analysis	Annual for 5 years	Consulting laboratory
Survey of public health and incidence of water borne disease	Bundi Town	LSGD	Hospital records; resident surveys	Annual for 5 years	Social studies consultant

136. An accredited laboratory will be appointed to monitor the quality of water at the intake and at the point of supply to consumers (in houses and slums), and a domestic social studies consultant will be appointed to monitor public health and the incidence of disease. These surveys will be conducted annually over the first five years of operation of the system, and require the initial collection of baseline data on pre-project conditions, during the construction period.

D. Environmental management and monitoring costs

137. 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 within the CTA and do not need to be estimated separately here. Mitigation that is the responsibility of LSGD will be provided as part of their management of the project, so this also does not need to be duplicated here. Costs of acquiring land and compensating shopkeepers and farmers for loss of income **(Table 7.1)** are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

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

- The environmental monitoring during construction, conducted by the EMS; and
- The long-term post-construction surveys that will be commissioned by LSGD.

139. 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 subproject as a whole (covering design, 2 years of construction and the first five years of operation) is INR 2.5 million, ie US$ 59,524.

Table 7.3: Environmental management and monitoring costs (INR)

Item	Quantity	Unit Cost	Total Cost	Sub-total
1. Implementation of EMP (2 years)				
Domestic Environmental Monitoring Specialist	1 x 3 month	130,000[7]	390,000	
Survey Expenses	Lump sum	120,000	120,000	5,10,000.00
2. Survey of municipal water quality (6 years)				
Domestic Consultant	6 x ½ month	130,000	390,000	
Sample Analysis	6 x 20	4,000[8]	480,000	
Other Expenses	Lump sum	200,000	200,000	10,70,000.00
3. Survey of public health (6 years)				
Domestic Consultant	6 x ½ month	130,000	390,000	
Other Expenses	Lump sum	250,000	250,000	6,40,000.00
4.Environmental mitigation cost including greenery development	Lump sum	300,000	300,000	300,000.00
TOTAL				25,20,000.00

[7] Unit costs of domestic consultants include fee, travel, accommodation and subsistence
[8] Cost of a standard suite of drinking water quality parameters (pH, turbidity, chlorinity, alkalinity, conductivity, TDS, DO, total and faecal coliforms, and selected metals) per sample

E. Associated Facilities

140. There are no upstream associated facilities in this subproject, however, the downstream users of aquifer/river can be considered associated to the facility.

141. Environmentally safe, continuous and reliable water sources and adequate capacity for treatment, transmission, and distribution, as well as properly functioning pumps, reservoirs, and networks are a must for RUIDP to mandate a safe water supply service to the local population. If the water is sourced through the aquifer for drinking water supply, it must be ensured that design extraction/pumping rate must be less than the documented aquifer recharge rate because excessive pumping of aquifers can lower groundwater levels in this water scarce state.

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project Stakeholders

142. 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.

143. 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 the Government of India, Ministry of Finance.

B. Consultation and disclosure to date

144. 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
- Movement of wild animals within the village

145. 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 3**

146. Major concerns are about the local movement of construction vehicle which may affects the day to day activities of the local residents and also some concerns made on the possible emission of dust & noise during the construction phase.

C. Future consultation and disclosure

147. 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; and
  - 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 town 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; and
  - 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.

IX. FINDINGS AND RECOMMENDATIONS

A. Findings

148. 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 lower water costs and from savings in health care costs.

149. 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.

150. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Bundi Water Supply Subproject. Potential negative impacts were identified in relation to both construction and operation of the improved infrastructure, but no impacts were identified as being due to either the project design or location. Mitigation measures have been developed in generic way 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 all pipelines within the ROW of existing roads, to avoid the need to acquire land or relocate people; and
- Locating pipelines on unused land adjacent to roads wherever possible, to avoid damaging roads and disrupting traffic and other activities.

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

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

- Locating all facilities (OR, CWR) on government-owned land to avoid the need for land acquisition and relocation of people; and
- Locating the 45 km distribution main in the ROW alongside a main road, to reduce the acquisition of agricultural land and impacts on livelihoods of farmers and workers.

153. Regardless of these and various other actions taken during the IEE process and in developing the project, 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 and other excavation; because the distribution network is located in an ancient town where there are densely populated areas and sites of historical and tourism interest; and because Rajasthan is an area with a rich history, so there is a high risk that ground disturbance may uncover important remains. Because of these factors the most significant impacts are on the physical environment, the human environment, tourism, and the cultural heritage.

154. 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 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 their mitigation. These include:

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

155. There could also be a need to acquire small amounts of farm land along the route of the distribution main, where it is impracticable for the pipeline to follow bends in the road. Such impacts are also frequently encountered and are dealt with by a combination of the legal process and additional measures required by ADB policy on Involuntary Resettlement. Actions are discussed in a separate Resettlement Plan and Resettlement Framework, and include:

- Acquisition of land through the GOI Land Acquisition Act, through which the market value is paid, based on an analysis of recent transactions;
- Ensuring that no more than 10% of the land of a single owner or tenant is acquired; and
- Providing additional compensation for loss of standing crops and productive trees.

156. 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; and
- Developing a protocol for use in conducting all excavation to ensure that any chance finds are recognised, protected and conserved.

157. The use of AC pipes in the existing water distribution network presents a particular problem, as workers and the public will need to be protected from inhalation of asbestos dust, which can be carcinogenic. This will be addressed by a number of measures, including:

- Limiting network improvements to expansion of the area covered, and leaving the existing AC system (ring, carrier and distribution mains) in situ undisturbed;
- Training staff and workers to raise awareness of the dangers of AC and enable early recognition of such pipes if encountered accidentally; and
- Development of a protocol based on USEPA guidelines, 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).

158. 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; and
- Ensure that people employed in the longer term to maintain and operate the new facilities are residents of nearby communities.

159. 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 program for its implementation.

160. Once the system is operating, most facilities (Intake, OR, CWGR) will operate with routine maintenance, which should not affect the environment. Leaks in the network will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only. It will also be conducted in areas that have already been excavated, so there will be no need to protect archaeological material.

161. The main impacts of the operating water supply system will be beneficial as the citizens of Bundi will be provided with a constant supply of water, which will serve a greater proportion of the population, including slum-dwellers. This will improve the quality of life of people as well as benefiting both individual and public health as the improvements in hygiene should reduce the incidence of disease associated with poor sanitation. This should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.

162. **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 schemes).

163. Mitigation will be assured by a programme 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 monitor the expected improvements in the quality of domestic water and the health of the population.

B. Recommendations

164. There are two 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 Status report (**Table 7.1**) and in the Resettlement Framework for the RUSDIP are implemented in full, as described in these two documents; and

- The Environmental Monitoring Plan proposed in Section VI of this report and the internal and external monitoring proposed in the Resettlement Framework are also implemented in full.

X. CONCLUSIONS

165. The environmental status of the proposed improvements in water supply and distribution infrastructure in Bundi Town has been assessed. Issues related to Involuntary Resettlement

were assessed by a parallel process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the subproject.

166. The overall conclusion of both processes is that providing 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.

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

APPENDIX 1: CHAINAGE WISE LAND USE STATUS - BUNDI WATER SUPPLY

Tab. No. 1. From –MANGLI River to NAINWA H/W

	Chainage wise in Mts.	**Right side**	**Left Side**	Remarks
1	0-500	Milk dairy	Agriculture land	Kota road
2	500-1000	Agriculture land	Agriculture land	Kota road
3	1000-1500	Agriculture land	Agriculture land	Kota road
4	1500-2000	Agriculture land	Agriculture land	Kota road
5	2000-2500	Agriculture land	Agriculture land	Kota road
6	2500-3000	Agriculture land	Agriculture land	Kota road
7	3000-3500	Agriculture land	Soya factory	Kota road
8	3500-4000	Agriculture land	Agriculture land	Kota road
9	4000-4500	Agriculture land	Agriculture land	Kota road
10	4500-5000	Agriculture land	Agriculture land	Kota road
11	5000-5500	Village/house/shop	Village/house/shop	Ramgang balaji village
12	5500-6000	Agriculture land	Agriculture land	Kota road
13	6000-6500	Agriculture land	Agriculture land	Kota road
14	6500-7000	Agriculture land	Agriculture land	Kota road
15	7000-7500	Railway bridge	Agriculture land	Kota road
16	7500-8000	Open flat	Agriculture land	devpura
17	8000-8500	Agriculture land/ colony	House/shop	devpura
18	8500-9000	House/shop/collage	House/shop/office	Kota road devpura
19	9000-10000	House/shop/ground	House/shop/office	Kota road devpura
20	10000-10100	Ranjeet cinema	Court	Circuit house circel
21	10100-10200	Shop/mandir	Shop/market/office	Nainwa road
22	10200-10400	Shop	Lic office/shop/nainwa H/W	Nianwa road

Tab. No. 2. From NAINWA H/ W-to BHATTA VILAS.

	Chainage wise in Mts.	**Right side**	**Left Side**	**Remarks**
23	10400-10600	Hostel	Post office	Meera gate road
24	10600-10800	Open space/shop	Forest office / shop	Meera gate road
25	10800-11000	Shop / house	Shop/ house	Meera gate road
26	11000-11200	Shop / house	Shop/ house	Jait sager road
27	11200-11400	Shop / open space	Shop/ house	Jait sager road
28	11400-11600	Shop / house / open space	Shop/ house	Jait sager road
29	11600-11800	Kabristhan / open space	*Nallah* / open space	Jait sager road
30	11800-12000	Kabristhan / open space	*Nallah* / open space	Jait sager road
31	12000-12200	masjid	*Nallah* / open space	Jait sager road
32	12200-12400	*Nallah* / open space	*Nallah* / open space	Jait sager road
33	12400-12600	Bhata villas H/ W	Open space	Jait sager road

Tab. No. 3. From CIRCUIT HOUSE to JAIL ROAD

	Chainage wise in Mts.	Right side	Left Side	Remarks
34	0-200	Ground	**House**	Civil line road
35	200-300	Govt. school	House / shop	Civil line road
36	300-600	House / shop	Dawarika hotel / shop	Khoja gate road
37	600-800	House / shop / office	House / shop / office	Lanka gate road
38	800-900	House / icici bank	Open space / shop / house	Lanka gate road
39	900-1000	Jail road H / W	Open space	Lanka gate road

Tab. No. 4. From AMBEDKAR CIRCLE –to VODKAS NAGAR (HB ESR Location)

	Chainage wise in Mts.	Right side	Left Side	Remarks
40	0-100	Shop / house	Shop / house	Mandi road
41	100-200	Shop / house	Shop / house / Mandi	Mandi road
42	200-400	Shop / house / Mandi	Shop / house / Mandi	Mandi road
43	400-700	Shop / house / Mandi	Open space	Mandi road
44	700-800	House / shop / open space	Open space	Mandi to NH – 12 Jaipur road
45	800-900	House / park (ESR)	Open space / shop	Vikas Nagar housing board

Tab. No. 5. From AAZAD PARK to NAVAL SAGAR

	Chainage wise in Mts.	Right side	Left Side	Remarks
1.	0-300	Shop / market / open space	Majid / gurudawara	Near to NH-12
2.	300-600	Shop / house	Open space near proposed ESR	Near to NH-12
3.	600-900	House / open space	Open space	Near to NH-12
4.	900-1300	Open space	Open space	Near to NH-12
5	1300-1500	Naval sagar	Open space	Balchand para road
6	1500-1700	park	school	Balchand para road
7	1700-1800	kund	Proposed H / W location	Balchand para road

APPENDIX 2: RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECK LIST

Country/Project Title : Bundi Water Supply

Sector Division: BND/WS/01

Item	Screening Questions	Yes/No	Remarks
A	Is the project area …		
	• Densely populated	Yes	The proposed mains/distribution lines will be laid in the densely populated area, which is unavoidable. Adequate provisions will be taken during the constructional phase in those areas. Also the proposed project will satisfy the need of the consumers. Construction of CWRs and OHSRs at government land only.
	• Heavy with development activities	Yes	Land use along the proposed alignment is similar to that of any small urban area.
	• Adjacent to or within to any environmentally sensitive area		
	▪ Cultural heritage site	No	Some of cultural assets in the form of religious places or historically important sites present in the project area are Taragarh fort, Bundi palace and Raniji-ki-baoli. However, these cultural heritage sites may not come within the project influence area and also utmost care will be provided to the nearby areas during constructional phase with adequate protection measures and by effectively implementing Environmental Management Plan.
	▪ Protected area	No	There is no protected area in the proposed alignment
	▪ Wetland	No	There are no designated wetlands present in the project area.
	▪ Mangrove	No	There are no mangroves present near to the project area.
	▪ Estuarine	No	There is no estuarine area present near to the project area.
	▪ Buffer zone of protected area	No	The proposed project area doesn't come near any buffer zone of protected area.
	▪ Special area of protecting biodiversity	No	The proposed project doesn't falls within any special area for protecting biodiversity.
	▪ Bay	No	Not applicable
B	**Potential Environmental Impacts** Will the project cause…		
	• Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture and soil runoff?	No	The sourcing of raw water is by bore wells.
	• Impairment of historical/cultural monuments/areas and loss/damage to these sites?	No	There is no cause of impairment to historical/cultural monuments/areas and loss /damage to these sites. Some of cultural assets in the form of religious places or historically important sites

Item	Screening Questions	Yes/No	Remarks
			present in the project area are Taragarh fort, Bundi palace and Raniji-ki-baoli. However, these cultural heritage sites may not come within the project influence area and also utmost care will be provided to the nearby areas during constructional phase with adequate protection measures and by effectively implementing Environmental Management Plan
	• Hazard of land subsidence caused by excessive ground water pumping	No	Stable rock at 30 mts and pumping is at 60-90 mts.
	• Social conflicts arising from displacement communities?	No	Construction of CWRs and OHSRs at government land only. There is no requirement for land acquisition.
	• Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?	No	The source is groundwater
	• Delivery of unsafe water to distribution system?	No	Periodic monitoring reports will be submitted.
	• Inadequate protection of intake works or wells, leading to pollution of water supply?	No	Adequate measures are included in the system design to ensure the protection.
	• Over pumping of groundwater leading to salinisation and ground subsidence?	No	The sourcing is proposed near the bank of Mangli river.
	• Excessive algal growth in storage reservoir	Yes	It can be mitigated by giving post chlorination.
	• Increase of production of sewage beyond capabilities of community facilities?	Yes	Also sewerage scheme is planned based on the water supply.
	Inadequate disposal of sludge from water treatment plants?	No	Not applicable in this system
	• Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities.	Yes	Adequate buffer zones as per MoEF guidelines will be provided.
	• Impairments associated with transmission lines and access roads?	No	All necessary approvals will be collected from the line departments.
	• Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	No	Chlorination will be done by chlorinator and adequate safety measures are included in the design for chlorine handling.
	• Dislocation of involuntary resettlement of people	No	Construction of CWRs and OHSRs at government land only. Since all the components are proposed to be built inside the existing head works/ existing ESR area, there is no requirement for land acquisition. Demarcation of the area within the existing to be done.
	• Social conflicts between construction workers from other areas and community workers?	No	Only temporary settlement will be made. There is no permanent settlement and total project period is 30 months.

Item	Screening Questions	Yes/No	Remarks
	• Noise and dust from construction activities	Yes	There may be a moderate generation of noise and dust from construction activities, which will be mitigated by providing adequate measures during the constructional phase.
	• Increased road traffic due to interference of construction activities?	Yes	There may be a moderate increase of traffic during the construction activities, which cannot be avoided. Also adequate measures will be taken to avoid traffic disturbances during the constructional phase.
	• Continuing soil erosion/silt runoff from construction operations?	No	There is no considerable runoff could be caused during the constructional activities.
	• Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in the distribution systems.	No	Proper training modules and maintaining of spares is insisted in the system design.
	• Delivery of water to distribution system, which is corrosive due inadequate attention to feeding of corrective chemicals	No	Only DI and PVC pipes are proposed which are non-corrosive in nature.
	• Accidental leakage of chlorine gas?	No	Chlorination will be done by chlorinator and adequate safety measures are included in the design for chlorine handling.
	• Excessive abstraction of water affecting downstream water users	Yes	Required water modelling studies will be conducted
	• Competing uses of water	No	Only for domestic uses
	• Increased sewage flow due to increased water supply	Yes	Also sewerage scheme is planned based on the water supply.
	• Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	No	There is no generation of sludge

APPENDIX 3: PUBLIC CONSULTATION- ENVIRONMENT - WATER SUPPLY - BUNDI

WATER SUPPLY - BUNDI

1. PUBLIC CONSULTATION- ENVIRONMENT

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 within the village

Date & time of Consultation 12. 05.08, 9 AM

Location : Jail Road Head works

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Not Associated
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years. Also In case of heavy rain
7	Drainage and sewerage problem facing	Yes
8	Present drinking water problem – quantity and quality	Insufficient quantity
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available
11	Access road to project site	Paved Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes, Dust and noise problem
14	Setting up worker camp site within the project locality	Near town
15	Safety of residents during construction phase and plying of vehicle for construction activities	May some problem can be created.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Water available sufficient quantity/ road should be repair after work.
17	Requirement of enhancement of other facilities	No
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Shyam Sunder

WATER SUPPLY - BUNDI

2. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation 10. 05.08, 4.30 PM

Location : Nainwa Head works.

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years.
7	Drainage and sewerage problem facing	Yes
8	Present drinking water problem – quantity and quality	Potable drinking water quantity is less
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labor available easily
11	Access road to project site	B.B.M Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes. Dust and noise problem
14	Setting up worker camp site within the project locality	Easily available
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is located in highly populated area, hence adequate safety is required.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Public tap required/ road should be repair after construction work.
17	Requirement of enhancement of other facilities	No
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED
Mr. Anil Kumar, Local Resident

WATER SUPPLY - BUNDI

3. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation 12. 05.08, 2.10 PM

Location : Shiv Colony, Kota Road, Bundi.

.Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years.
7	Drainage and sewerage problem facing	Yes
8	Present drinking water problem – quantity and quality	Potable drinking water quantity is less and quality also not appreciable.
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labor available easily
11	Access road to project site	WBM Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	No.
14	Setting up worker camp site within the / project locality	Space can be provided for temporary camps.
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is not located in highly populated area.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Public tap required/ road should be repair after construction work.
17	Requirement of enhancement of other facilities	No
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Billu Mali

S/o Hiralal mali

Shiv colony

WATER SUPPLY - BUNDI

4. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 12. 05.08, 1.30 PM

Location : Moti Nagar, police Line Road.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Beneficiary. Can provide labours.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 8-9 years.
7	Drainage and sewerage problem facing	Yes
8	Present drinking water problem – quantity and quality	Drinking water problems without adequate quantity and desired quality.
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available easily
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	No.
14	Setting up worker camp site within the project locality	Easily can Setup temporary camps
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is not located in highly populated area.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Public tap required/ road should be repair after construction work.
17	Requirement of enhancement of other facilities	No
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Desh Bandhu Dhadhich

S/o Mr. Laxmi Shankar

Moti Nagar

WATER SUPPLY - BUNDI

5. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 12. 05.08, 12:45 PM
Location : Near Devpura, Kota Road.

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	No.
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 7-8 years.
7	Drainage and sewerage problem facing	No
8	Present drinking water problem – quantity and quality	Drinking water problems without adequate quantity and desired quality.
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available easily
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	No. but adequate protection is required.
14	Setting up worker camp site within the project locality	Space available for site camp.
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is not located in highly populated area.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Water available sufficient quantity and road should be repair after work.
17	Requirement of enhancement of other facilities	No
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	NA

NAME AND POSITION OF PERSONS CONSULTED
Mr. Mahaveer Meghwal,
S/o Mr. Prabhu Dayal,
Devpura

WATER SUPPLY - BUNDI

6. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 12. 05.08, 12.30 PM

Location : Devpura

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

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Local resident
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years.
7	Drainage and sewerage problem facing	No problems faced.
8	Present drinking water problem – quantity and quality	Drinking water problems without adequate quantity.
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available easily
11	Access road to project site	BT Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	No. but adequate safety for local residents is required.
14	Setting up worker camp site within the project locality	Yes. Can Setup temporary camps
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is located in highly populated area. Adequate safety is essential.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Public tap required/ road should be repair after construction work.
17	Requirement of enhancement of other facilities	NA
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Mukesh Jain

S/o Mr. Mahaveer Jain,

Near Devpura Road.

WATER SUPPLY - BUNDI

7. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 10. 05.08, 12.30 PM
Location : Mangli River Head Works.

.Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Not associated
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years.
7	Drainage and sewerage problem facing	No problems faced.
8	Present drinking water problem – quantity and quality	Poor quality of tube well water without sufficient quantity.
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	No
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	No. but adequate safety for local residents is required.
14	Setting up worker camp site within the project locality	Yes. Easily can Setup temporary camps for labours.
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is located in highly populated area. Adequate safety is essential.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Public tap required on roadside for drinking purpose.
17	Requirement of enhancement of other facilities	NA
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Dilip Das
Local resident.

WATER SUPPLY - BUNDI

8. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 11.15 AM

Location : Jail road.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Local resident
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 5-6 years.
7	Drainage and sewerage problem facing	No problems faced.
8	Present drinking water problem – quantity and quality	Drinking water problems without adequate quantity and the quality is poor.
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available easily
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes. Adequate safety for local residents is required.
14	Setting up worker camp site within the project locality	Yes. Can Setup temporary camps
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is located in highly populated area. Adequate safety is essential.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Road should tap to be repair after construction work.
17	Requirement of enhancement of other facilities	NA
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Babulai Qi
Local resident

WATER SUPPLY - BUNDI

9. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 11.00 AM
Location : Jail road.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Local resident
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years.
7	Drainage and sewerage problem facing	Yes. Facing some problems
8	Present drinking water problem – quantity and quality	Drinking water problems without adequate quantity and the quality is poor.
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available easily
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes. Adequate safety for local residents is required.
14	Setting up worker camp site within the project locality	Yes. Can Setup temporary camps
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is located in highly populated area. Adequate safety is essential.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Public tap required on roadside for drinking purpose.
17	Requirement of enhancement of other facilities	NA
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Mahesh Gautam
Local resident

WATER SUPPLY - BUNDI

10. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 10.20 AM

Location : Nainwa Road.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Local resident
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 5-6 years.
7	Drainage and sewerage problem facing	Yes. Some problems faced.
8	Present drinking water problem – quantity and quality	Drinking water problems without adequate quantity and during summer season facing many problems
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available easily
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No knowledge
13	Dust and noise pollution and disturbances during construction work	Yes. Adequate safety for local residents is required.
14	Setting up worker camp site within the project locality	Yes. Can Setup temporary camps
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is located in highly populated area. Adequate safety is essential.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Road should be repair after construction work.
17	Requirement of enhancement of other facilities	NA
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr. Rooplal Ji
Nainwa Road
Local resident

WATER SUPPLY - BUNDI

11. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 10.30 AM
Location : New Colony.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Local resident
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years.
7	Drainage and sewerage problem facing	Yes. Some problems faced.
8	Present drinking water problem – quantity and quality	Drinking water problems without adequate quantity and during summer season facing many problems
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available easily
11	Access road to project site	BT Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes. Adequate safety for local residents is required.
14	Setting up worker camp site within the project locality	Yes. Can Setup temporary camps
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is located in highly populated area. Adequate safety is essential.
16	Conflict among beneficiaries down stream users – water supply project using of river water	Necessary pressure should be maintained in the distribution system and road should be repaired after construction work.
17	Requirement of enhancement of other facilities	NA
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED

Mr.Giriraj Babu
Local resident

WATER SUPPLY - BUNDI

12. PUBLIC CONSULTATION- ENVIRONMENT

Date & time of Consultation : 06. 06.08, 10.50 AM
Location : Nainwa Road Head Works.

Table: Issues of the Public Consultation- Design phase

Sr. No.	Key Issues/Demands	Perception of community
1	Awareness of the project – including coverage area	Yes
2	In what way they may associate with the project	Local resident

Sr. No.	Key Issues/Demands	Perception of community
3	Presence of any forest, wild life or any sensitive / unique environmental components nearby the project area	No
4	Presence of historical/ cultural/ religious sites nearby	No
5	Un favorable climatic condition	No
6	Occurrence of flood	Once in 4-5 years.
7	Drainage and sewerage problem facing	Yes. Some problems faced.
8	Present drinking water problem – quantity and quality	Drinking water problems without adequate quantity and during summer season facing many problems
9	Present solid waste collection and disposal problem	NA
10	Availability of labor during construction time	Local labour available easily
11	Access road to project site	CC Road
12	Perception on tree felling and afforestation	No
13	Dust and noise pollution and disturbances during construction work	Yes. Adequate safety for local residents is required.
14	Setting up worker camp site within the project locality	Yes. Can Setup temporary camps
15	Safety of residents during construction phase and plying of vehicle for construction activities	Site is located in highly populated area. Adequate safety is essential.
16	Conflict among beneficiaries down stream users – water supply project using of river water	1. public tap required at road side 2. road repair after completion 3. water quality should be improved
17	Requirement of enhancement of other facilities	No
18	Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial project after getting proper compensation	Govt. Land

NAME AND POSITION OF PERSONS CONSULTED
Mr. Mukesh
Local resident

APPENDIX 4 Note on Mangli River

MG

...ice of the Executive Engineer Water Resources Project
Division, Bundi

Date :- 2/6/08

...e Support Engineer,
Snan Technical Consultants Pvt. Ltd.
Bundi.

... :- Data required for RUIDP Phase – II Bundi Project.
... - Your letter no. STC/RUSDIP/P3/BD/Sup.Engg./04 dt. 2.6.08

...t reference to the above referred letter it is stated that Mangali river is a ...ver , hence no river gauging (discharge & gauge) is being maintained by ...ent near anicut site. However, the required information as desired by ...on broad knowledge & information . The broad informations are as

...river in month July to June month wise :- However flow data of this ...e not recorded by this office but normally the flows in river remains ...follow :-

(1)	Month July to Oct.	about 10 Cusec
	Nov. to Dec.	about 2 Cusec.
	...n to April	about 5 Cusec
	...y to June	Nil

... depends upon rains & qty.of water flow in Chambal canal. ... the flow in the river from Nov. to April is from regeneration of ...from canal flow)

... of anicut :- The capacity of this anicut is approximately 13.0 mcft.
... of Anicut :- Effective length of this anicut is 60 m.
... pertain to this office.
... of Anicut is 2.50 m.
... pertains to XEN PHED, Bundi.

Executive Engineer,
Water Resources Project
Division Bundi

30-MAY-2008 12:29

Please. Kind Attention - Mr. J.P. Lokwani Sir (RUIDP) FROM STC BUNDI

Construction of pick up wier at Mangli River to upgrade drinking water supply of Bundi City.

TECHNICAL FEATURES

1-	Probable Estimated cost	=	Rs. 35.00 Lacs
2-	Total length of over flow	=	85.00 Meter
3-	Total length of Pick up wier	=	93.00 Meter
	(Key L/s as 5.0 Mtr. and key at L/s as 3.00 Mtr.)		
4-	Height of Pick up wier	=	2.50 Mtr.
5-	Total length of water stretch	=	2700 Mtr.(2.70 Km.)
6-	Average depth of water	=	1.75 Mtr.
7-	Average width of pick up wier	=	80.00 Mtr.
8-	Average bed slope of river	=	1 in 1070 Mtr.
9-	Total Height of wing walls	=	4.00 Mtr.
10-	Probable maximum foundation depth	=	2.00 Mtr.
11-	Proposed sluice (Gate size 2' x 2')	=	1 Nos.
12-	Capacity of reservoir	=	13.00 Mcft.
13-	Daily requirement of drinking water for Bundi town	=	8000 KLD.
14-	Frequency of refilling of reservoir	=	30 days
15-	Benefitted Town	=	Bundi city
16-	Flow of river in month April-May	=	5-6 C.usec

Assistant Engineer
Irrigation Project Sub Div. III
Bundi

Executive Engineer
Irrigation Project Division
Bundi

Appendix 5: Mitigation Measures for Blasting

Minor blasting may required during distribution networking.

Before blasting cartridges are placed properly at required zones. Methodology and precautionary measures are mentioned below.

Preventive mitigation measures during Rock Blasting

Blast operation, especially near residential area is a very sensitive operation and utmost care has to be exercised with sincerity and no relaxation is acceptable under any circumstances. Any minor negligence may cause fatal accident.

First of all, unless it is very essential, blasting should be avoided and very *controlled blasting* should be done.

a) Precautions during use:

i) The explosive should be stored in standard magazines constructed as per IS Code and should not be stored directly under sunlight and should be stored in a shady area.

ii) Only standard and fresh, un-moist fuse coil should be inserted in the detonator and no other material be inserted to avoid sudden blast while inserting. The rate burning of safety fuse must be checked.

iii) In no case damaged or deteriorated accessories and explosions be used which is likely to cause damage life and property because of faulty explosion and of faulty indication.

iv) Explosive must be transported in bags/boxes and never in pockets.

b) Precaution while drilling:

i) Explosive other than charged in the holes must not be kept near the blasting area at any cost.

ii) Just before putting the cartridge, it is very essential that the holes be checked with tamping rod (wooden) so that there is no sensitive material like explosive, cut piece of safety fuse etc. to avoid any sudden blasting while inserting the cartridge.

iii) Dry and fresh cut safety fuse should only be inserted in the detonator and the detonating fuse should be cut immediately from the role when the primer has reached the bottom of the hole.

c) Precaution while tamping the hole:

The following precautions, safety measures must be taken while stemming the holes:

i) While tamping, sharp or pointed particles should never be used

ii) For tamping, metallic rods should never be used at any cost. Always wooden rods be used and the rods should not be sharp and it should be flat, sawing the end.

iii) The fuse/lead wires / detonating fuse should never be damaged by stemming.

d) Precautions while firing with safety fuse:

i) The approved type of crispers for fixing detonator be used on a fuse and it should not be pressed with teeth.

e) Precautions while firing with Electric Detonator:

i) Electric Detonators should never be used during dust storm or near heavy charge of static electricity

f) Precautions before and after firing:

i) Guards with red flags be positioned well before firing on all ends of the blasting zone and no person, animal must be allowed to enter the some before firing and warning while must be given before lighting the fuse or firing the exploder in case of electric firing.

ii) All the persons involved with this operation of blasting like who are drilling holes, doing tamping, charging the holes, the compressor operator, the mechanical parts from the workshop side, Officers or Supervisors looking after the whole work must wear strong helmets and must be aware that blasting will take place shortly. Not only the persons but also the plant and equipment should be kept at far away to as safe place to a safe place and must be covered with ballies and behind the spar of hilly/ rocky terrain.