Environmental Assessment Document

Initial Environmental Examination: Sawai Madhopur Urban Transport and Roads Subproject
Project Number:
August 2008

India: Rajasthan Urban Sector Development Investment Program

Prepared by Local Self Government Department

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

ABBREVIATION

ADB	-	Asian Development Bank
CC	-	Construction Contractors
DSC	-	Design and Supervision Consultancy
EA	-	Executing Agency
EAC	-	Expert Appraisal Committee
FI	-	Financial Intermediary
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
LSGD	-	Local Self-Government Department
m	-	meter
MFF	-	Multi-tranche Financing Facility
MLD	-	Million litre Per day
MoEF	-	Ministry of Environment and Forests
NAAQS	-	National Ambient Air Quality Standards
OD	-	outer diameter
OM	-	Operations Manual
PHED	-	Public Health Engineering Department
PMU	-	Project Management Unit
RCC	-	reinforced cement concrete
ROB	-	road-over-bridge
ROW	-	right-of-way
RPCB	-	Rajasthan State Pollution Control Board
RUIDP	-	Rajasthan Urban Infrastructure Development Project
RUSDIP	-	Rajasthan Urban Sector Development Investment Program
STP	-	Sewerage Treatment Plant
ToR	-	Terms of Reference
UA	-	Urban Agglomeration
UIDSSMT	-	Urban Infrastructure Development Scheme for Small and Medium Towns
USEPA	-	United States Environmental Protection Agency
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 (having 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 categorized 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 categorized as A or B depending on the scale of the project and the nature of its impacts.

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

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

11. 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 ROB 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.

4. Scope of Study

13. This is the IEE report for the Sawai Madhopur urban road and transport subproject. It discusses the generic environmental impacts and mitigation measures relating to the location, design, construction and operation of physical works proposed road-over-bridge (ROB, flyover) under this subproject.

II. DESCRIPTION OF THE PROJECT

A. Type, Category and Need

14. The subproject is located in Sawai Madhopur District. It has been classified by ADB as Category B, because it is not expected to have major negative environmental impacts on the surroundings. 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 to help alleviate road congestion in the town, where the capacity of the network has not expanded to cope with increased traffic demand. It will provide a road-over-bridge (ROB, flyover) on National Highways (NH) 116 (Tonk-Dausa Road) to replace level crossings over the Jaipur–Sawai Madhopur railway through the centre of the town, which currently has to be closed for substantial time in a day to allow the passage of trains (**Figure 2.1**). 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 Sawai Madhopur and the other urban centers to those expected of modern Asian towns.

[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

B. Location, Size and Implementation Schedule

15. Existing transport network of Sawai Madhopur is shown in **Figure 2.2** and strip plan is shown in **Figure 2.3** and **Figure 2.4** shows general arrangement diagram of the ROB. Photographs of the subproject area are attached as **Appendix 1**. NH-116 connects Sawai Madhopur to Tonk and crosses the Broad Gauge single line (Sawai Madhopur – Jaipur) within the municipal area of Sawai Madhopur. To avoid congestion at level crossing, construction of 2-lane ROB with footpath at both sides for pedestrians at T/2-B Railway Crossing and its approaches are necessary.

16. Detailed design will begin in the middle of 2008 and work should be completed by the end of the 2009 or early 2010.

C. Present Road and Traffic Status of Sawai Madhopur

17. Sawai Madhopur comprises a road network of 109 kilometers (km), consisting of 35 km bituminous roads, 54 km cement concrete roads, 10 km wet mix macadam road and 10 km earthen road. Most city roads are maintained by either Municipal Boards (MB) or Public Works Department (PWD). In the past, MB have invested substantially in upgrading roads to cement concrete. The MBs and PWD are responsible for planning, construction and maintenance of the city's transport network while the traffic police is responsible for traffic control and daily traffic management issues.

18. At present, an average of 30 trains are passing through the line, average of 5,900 fast moving vehicles and average of 1,570 slow moving vehicles are passing through the above road. In peak hours, the traffic congestion at level crossing in T/2-B Railway Crossing is chaotic due to closing of gates for passing of trains. In addition, increasing growth of 2 and 3-wheelers, cars, jeeps, and taxis contributes to the congestion.

19. In accordance with Indian Roads Congress (IRC) 62:1976, if the product of Average Daily Traffic (ADT) (fast moving vehicles only) and nos. of trains per day i.e. Average Train Vehicle Unit (ATVU) exceeds 50,000 for last 5 years, the construction of ROB is necessary. For Sawai Madhopur, the calculated Average Train Vehicle Unit (ATVU) is 177,000 units. Per IRC 62:1976, if the product of ADT (fast moving vehicles only) and nos. of trains per day i.e. Average Train Vehicle Unit (ATVU) exceeds 50,000 for last 5 years, the construction of ROB is necessary.

20. Per IRC 86:1984, the capacity of 2-lane road (both way) should be 1,500 Passenger Car Unit (PCU). As per railway norms, minimum vertical clearance should be 7.3 meter (m) for freight corridor. Service roads, footpath space for utility, drains etc. should also be provided. The geometry design, structural design should be done per IRC 86:1984, IRC 6:2000, IRC 18:2000, IRC 21:2000, IRC 37:2001, and IRC 78:2000.

21. A 2-lane ROB including both end approaches/service roads at level crossing location are identified to be implemented under Tranche-II. The subproject, when implemented, will benefit the population of town as well as through traffic of NH-116 with safe travel time & fuel consumption. The proposed subproject will substantiate the growth of traffic & population of Sawai Madhopur for at least 20 years i.e. 2028. The following will be the key outcomes from the subproject: (i) predominant traffic will be served; (ii) improvement in safety and accident management; (iii) time spent in traffic will be decreased; (iv) vehicle fuel consumption will be decreased; and (v) reduction in social and environmental hazards.

D. Subproject Description, Detailed Scope, and Design Criteria

22. Scope and components of the works consist of construction of ROB span, viaduct spans on both side, embankment with Reinforced Earth (RE) wall, service road, footpath, provision of drain & utility space etc. Details of major works are:

i) Construction of one 25- m ROB span;

ii) Construction of five (5) 20-m viaduct spans at Tonk end and eleven (11) 20-m viaduct spans at Sawai Madhopur end;

iii) Construction of 230-m embankment of varying height with both sides with RE wall at Tonk end and 275-m embankment of varying height with both sides RE wall at Sawai Madhopur end;

iv) Construction of service road at both sides of ROB approaches; and

v) Provision of footpath, provision of drain, utility space, crash barrier, Road appurtenances.

23. Topographical survey was conducted and the site visit was made by the experts. After studying the present right-of-way (ROW), the geometry of ROB along with its approaches is planned in such a way that minimum acquisition of land and structures are involved. Both side service roads of minimum 5.5m wide along with 1.5m footpath are also planned to facilitate the existing shops and residential areas. The following design criteria are adopted for planning the geometry of the ROB: (i) design speed has been achieved 45 kph; (ii) skew angle has been reduced to 4 degree; (iii) radius of curvature is 85 m; (iv) vertical clearance is 7.3 m over the railway track; (v) vertical gradient is limited to 3.33%; and (vi) provision of an intermediate stopping sight distance.

24. The salient details of ROB, viaducts, embankment with RE walls, service roads, and other components are presented below.

Table- 2.1:- Details of the Components of the ROB Subproject

	Items	Details
1	ROB portion	1 No.x 25m
2	Viaducts spans on Sawai Madhopur end	11 nos. x 20m
3	Viaducts spans on Tonk end	5 nos. x 20m
4	Approach embankment with reinforced earth retaining walls along Tonk end	230 m
5	Approach embankment with reinforced earth retaining walls along Sawai Madhopur end	275 m
6	Total length of ROB including railway portion, viaducts span and approach embankment etc	1075 m
7	Vertical clearance over the railway tracks	7.3 m
8	Gradient	3.333%
9	Width of Carriageway / Total width of ROB, viaducts and approach embankment	7.5-8.4m/12.0m for main spans incl. ROB 7.5-8.4m/9.5mfor viaducts & Approach embankment with RE walls

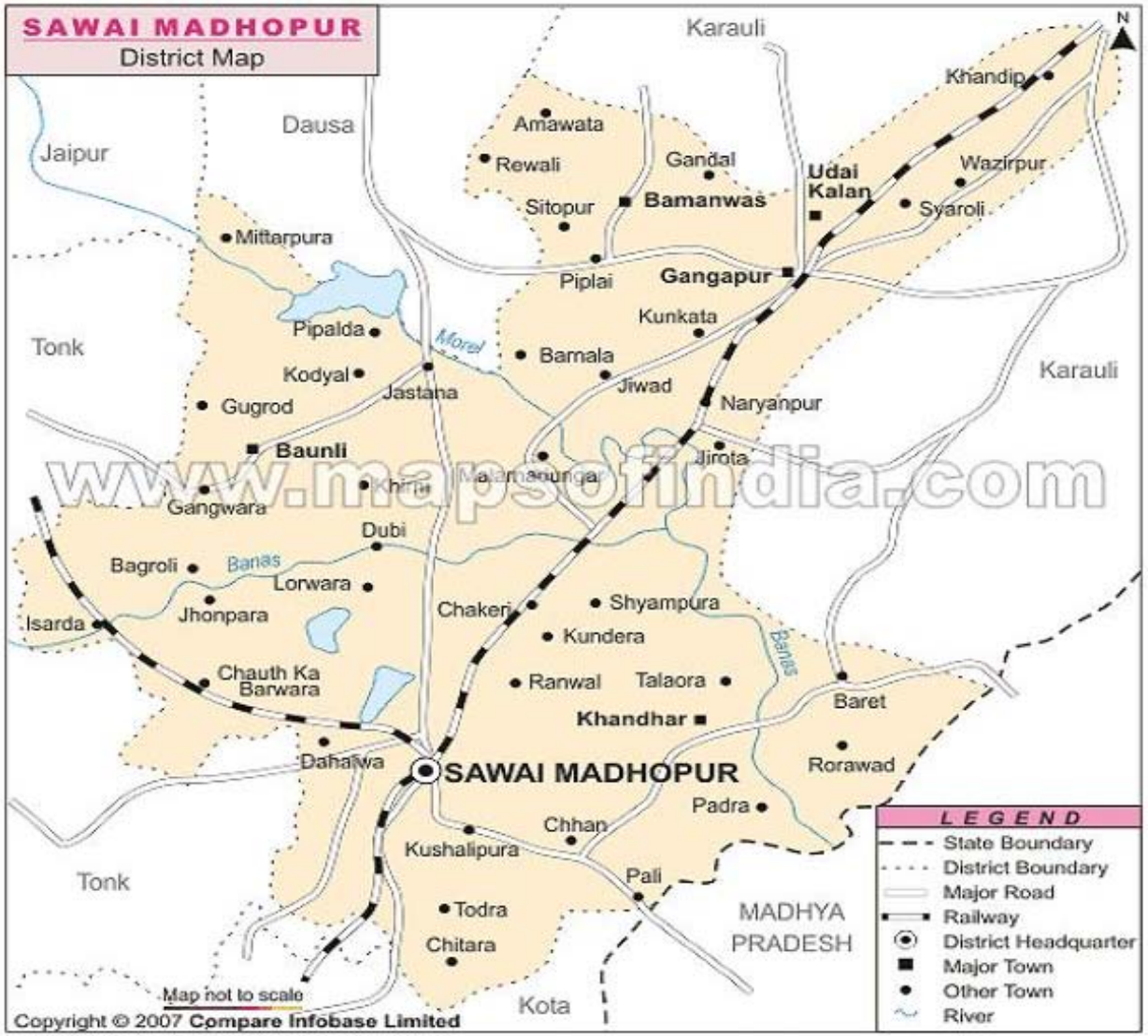
	Items	Details
10	Footpath	1.5 m on either side for main span 0.5 m curb on either side for viaduct span & approach embankments
11	Crash Barriers & Railing	Standard Railing as per Ministry of Road Transport & Highways (MORTH) Drawings.
12	Approaches	Approach embankment beyond viaduct spans with reinforced Earth retaining walls
13	Specification for Embankment Earth fill Sub-grade 500 mm G.S.B. WMM DBM SDBC	 Soil should have fines of 75 micron not exceeding 10%. Sub- grade fill should have CBR of 8% 300mm 300mm 115mm(65+50) 25mm
14	Wearing coat over concrete decking	40 mm B.C + 25 mm mastic asphalt.
15	Structural details of Railway portion & viaduct spans. (i) Railway Portion (Super-structure) Pre-stress Concrete (PSC) Pre-cast T- Beam and reinforced cement concrete (RCC) cast in-situ Deck slab (ii) Via duct spans (Super-structure) PSC Pre-cast T- Beam and RCC cast in-situ Deck slab (iii) Sub-structure for Railway Portion and viaduct spans (iv) Foundations (v) Reference IRC Codes (vi) Seismic Zone (vii) Bearings (viii) Expansion joints	 25.0m span 17nos.x20 m span Solid Circular Type Piers with rectangular pier cap 1000mm, dia piles of 24m depth with 1500mm thick pile cap. a) IRC – 5 – 1998 b) IRC – 6 – 2000 c) IRC – 18 – 2000 d) IRC – 21 – 2000 e) IRC – 37 - 2001 f) IRC – 78 – 2000 ZONE - II Elastomeric Bearings. Strip seal expansion joints
16	Service Roads	7.5m to 5.5m wide service roads along with 1.5m footpath are proposed on all along the length of ROBs on either side except railway track portion.
17	Electrification	Provision has been made electrification of during night time to facilitate proper movement of traffic.
18	Shifting of utilities	Electric Post and Telephone Post have to be shifted to suitable location.
19	Felling of trees	There are 51 trees within the proposed ROB

	Items	Details
		corridor out of these **8-10 trees will be cut**
20	Diversion road	Not required
21	Drainage	Drainage spouts, drain pipes to be provided in ROB, viaduct & RE wall portion and box/pipe drains to be provided below footpath

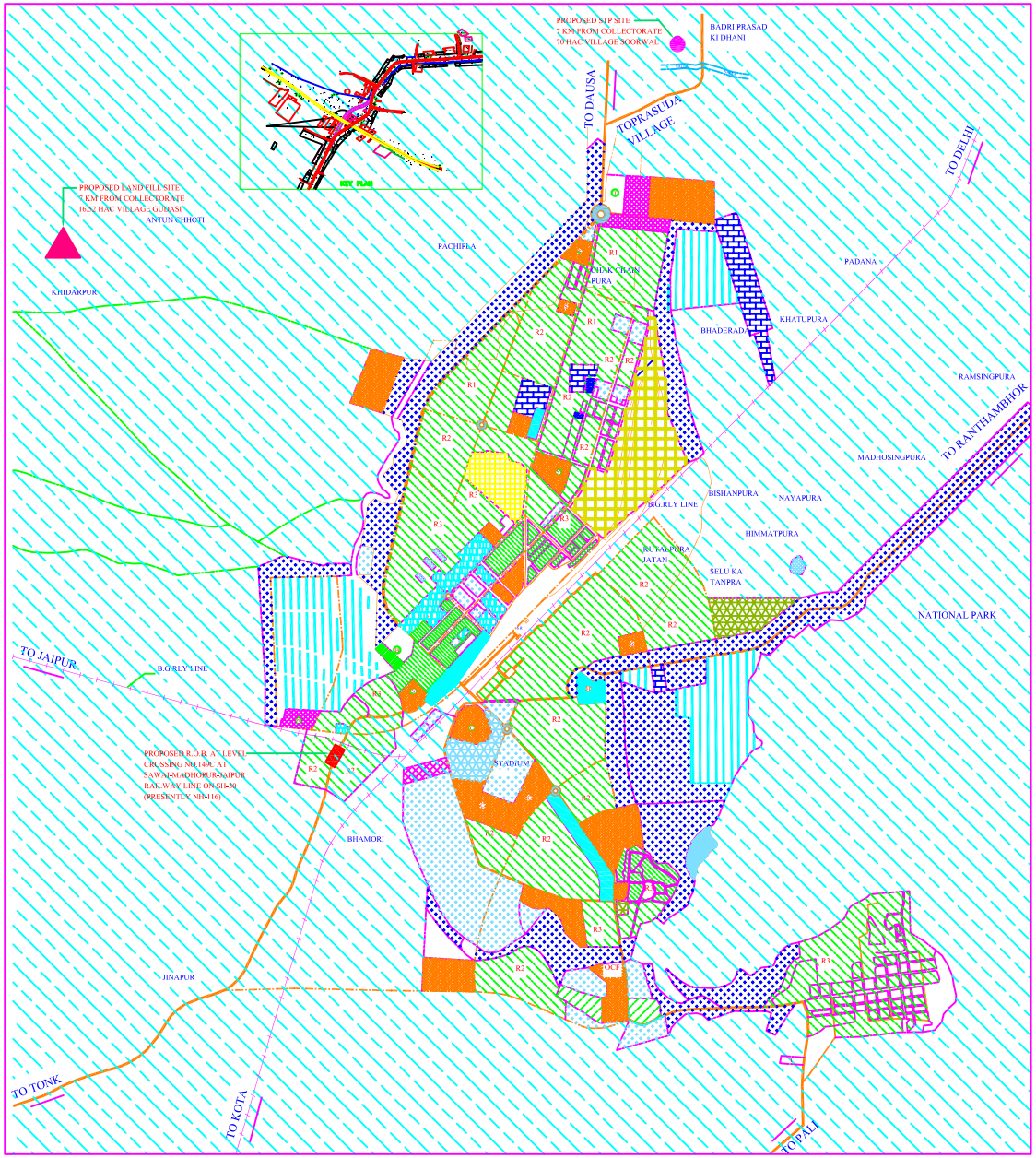
ROB = road over bridge, m = meter, nos = numbers, GSB = Granular Sub -base, WMM = Wet Mix Macadam, DBM Dense Bituminous Macadam, SDBC = Semi-dense Bituminous Carpet, BC = Bituminous concrete, RE = reinforced earth, RCC = reinforced cement concrete, and RC = Indian Reference Code

25. The main structure of the ROB will be constructed from pre-fabricated blocks of reinforced cement concrete (RCC), each around 10 x 10 x 1 m, supported 8 m above ground level on a series of RCC pillars, located beneath each block unit.

26. The approach roads will be raised to the level of the ROB on two sloping embankments, to be constructed over the existing roadways. The embankments will be formed from a series of RCC box units, around 10 m wide and 30 m long, with gradually increasing heights to raise the road from ground level to the 7.5 m height of the ROB. The RCC upper surface will be covered with layers of Macadam to form the road, and RCC safety barriers will be fitted at the sides.



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



LEGEND:

RESIDENTIAL
- R1 LOW DENSITY
- R2 MEDIUM DENSITY
- R3 MEDIUM HIGH DENSITY

COMMERCIAL
- RETAIL BUSINESS AND GENERAL COMMERCIAL
- COMMUNITY CENTRES/HOTEL
- WHOLE SALE BUSINESS
- WAREHOUSEING AND GODOWNS
- TOURIST FACILITIES

INDUSTRIAL
- SMALL AND MEDIUM SCALE
- LARGE SCALE

GOVERNMENTAL
- GOVERNMENT AND SEMI-GOVERNMENT OFFICES
- GOVERNMENT RESERVED AREAS

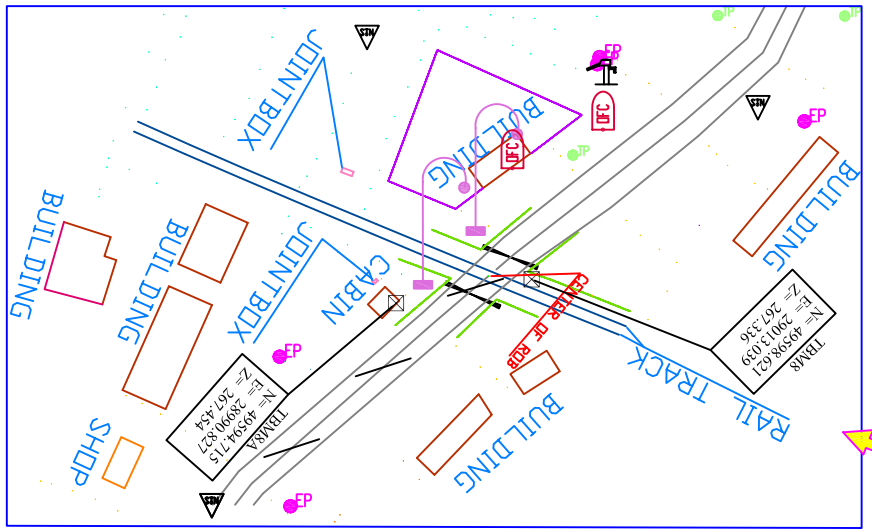
RECREATIONAL
- PARKS, OPEN SPACES AND PLAYGROUNDS
- SEMI-PUBLIC RECREATION
- RESERVVATIONS, ENVIROMENTAL, PLANTATION BELT

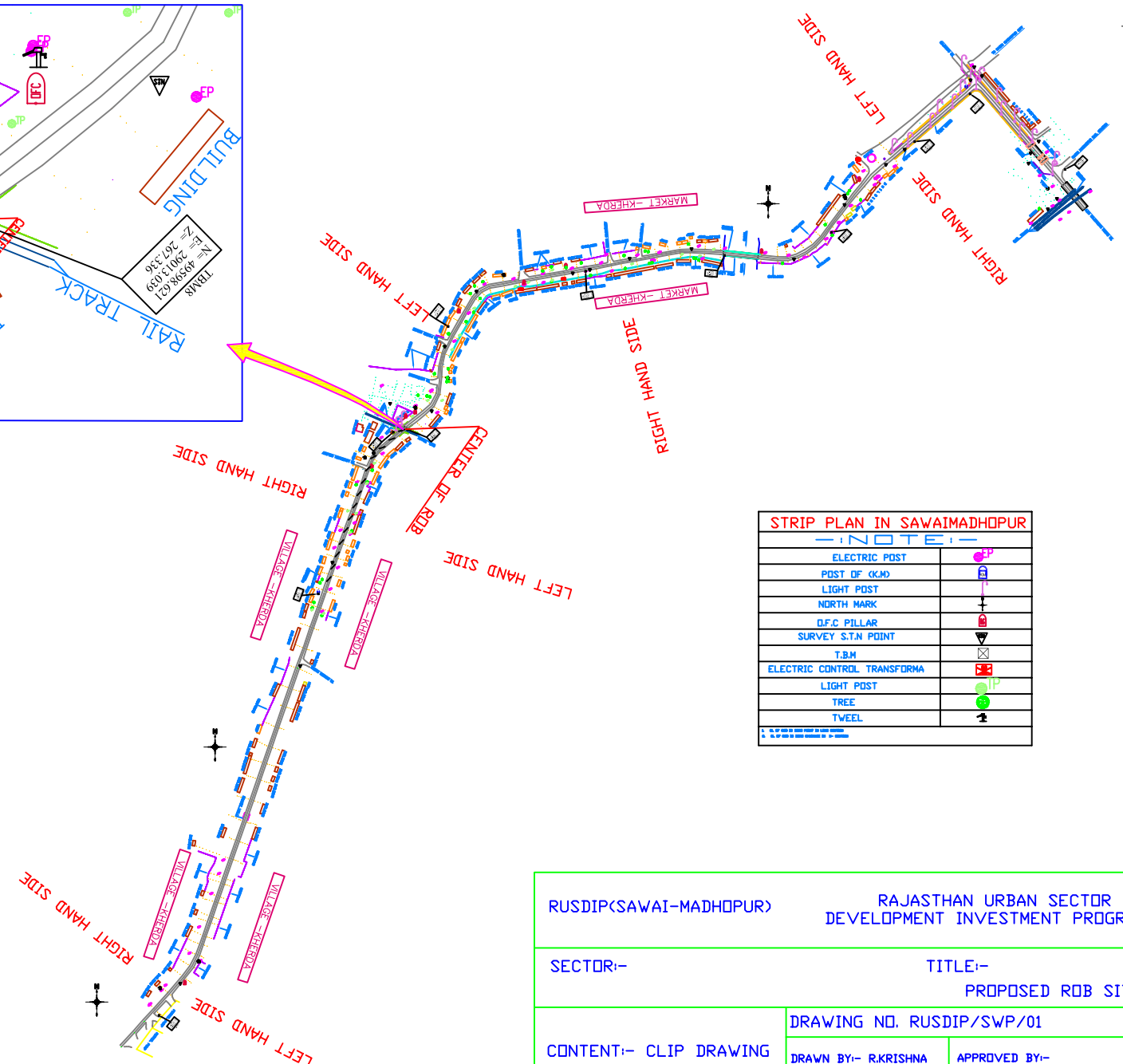
PUBLIC AND SEMI-PUBLIC
- COLLEGES-C AND SECONDARY SCHOOLS-S
- OTHER EDUCATIONAL INSTITUTIONS
- HOSPITALS AND DISPENSARIES HOSPITAL-H VETERINARY-V
- SOCIAL, CULTURAL AND RELIGIOUS INSTITUTIONS
- OTHER COMMUNITY FACILITIES
- PUBLIC UTILITIES
- CREMATION AND BURIAL GROUNDS

AGRICULTURAL
- NURSERIES, ORCHARDS, DAIRY
- AGRICULTURAL RESEARCH FARM
- PERIPHERAL CONTROL BELT

CIRCULATION
- RAILWAY STATION AND YARD
- TANKS AND NALAHS
- STATE HIGHWAY AND OTHER ARTERIAL ROADS
- SUB ARTERIAL ROADS

RUSDIP(SAWAI-MADHOPUR)	RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM
SECTOR:-	TITLE:- LAND USE PLAN
CONTENT:- CLIP DRAWING	DRAWING NO. RUSDIP/SWP/01 R0
	DRAWN BY:- R.KRISHNA APPROVED BY:-
	DATE:- MAR-2008 SCALE:- NOT TO SCALE





STRIP PLAN IN SAWAIMADHOPUR

— NOTE: —

ELECTRIC POST	EP
POST OF (K.M)	
LIGHT POST	
NORTH MARK	
O.F.C PILLAR	
SURVEY S.T.N POINT	
T.B.M	
ELECTRIC CONTROL TRANSFORMA	
LIGHT POST	
TREE	
TWEEL	

RUSDIP(SAWAI-MADHOPUR)

RAJASTHAN URBAN SECTOR DEVELOPMENT INVESTMENT PROGRAM

SECTOR:-

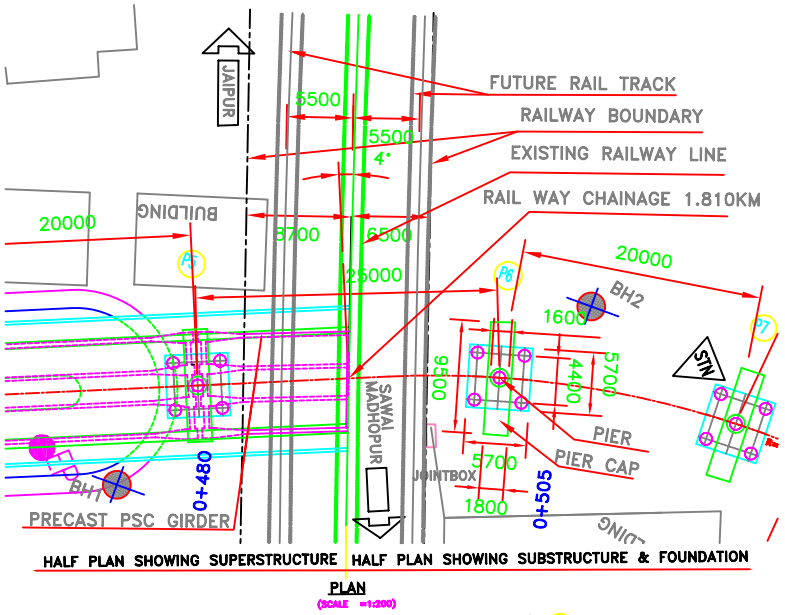
TITLE:-
PROPOSED ROB SITE

CONTENT:- CLIP DRAWING

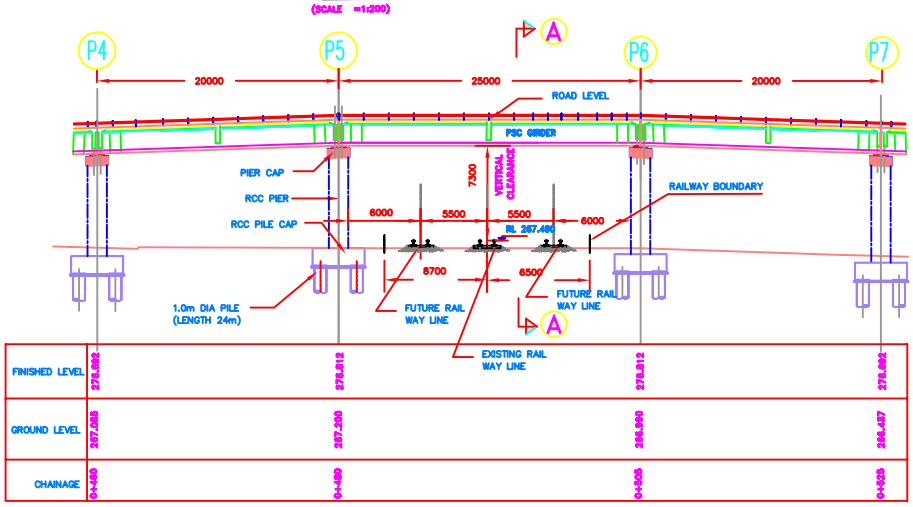
DRAWING NO. RUSDIP/SWP/01 | R0

DRAWN BY:- R.KRISHNA | APPROVED BY:-

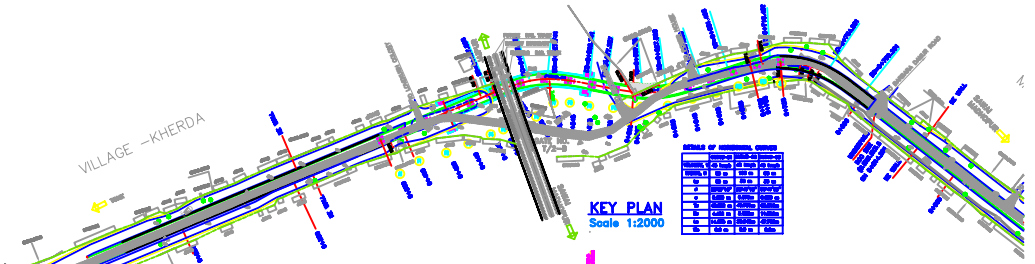
DATE:- MAR-2008 | SCALE:-NOT TO SCALE

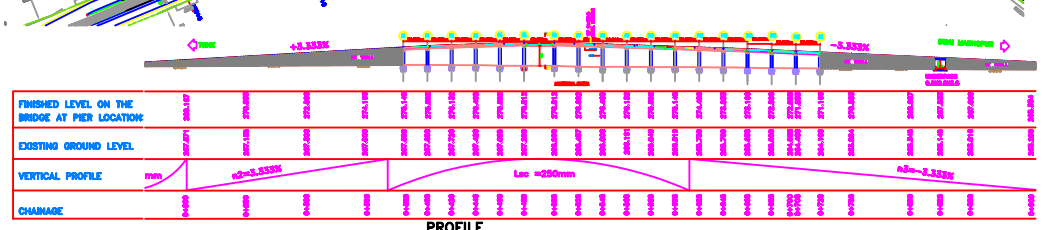


PLAN
(SCALE =1:200)



ELEVATION OF ROB
(SCALE – HORIZONTAL=1:200)





PROFILE
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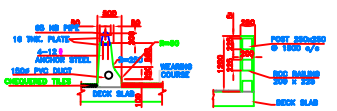
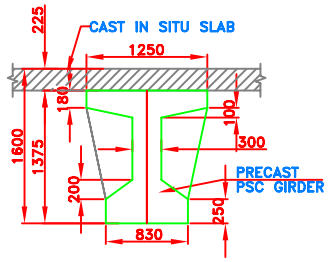
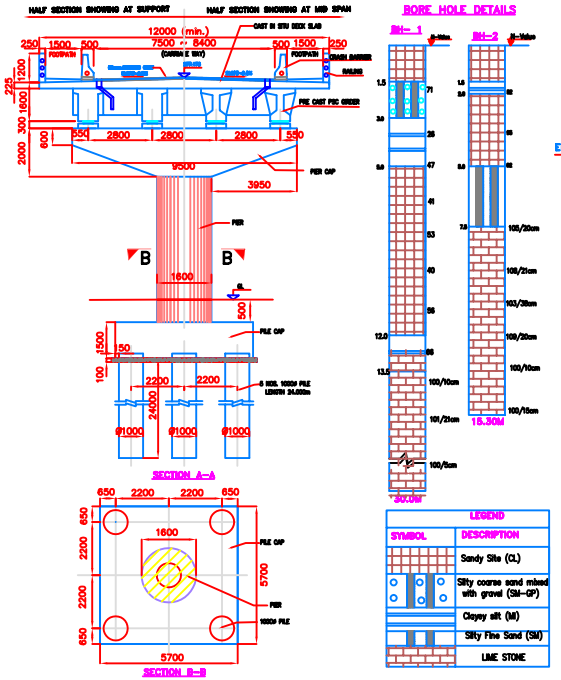
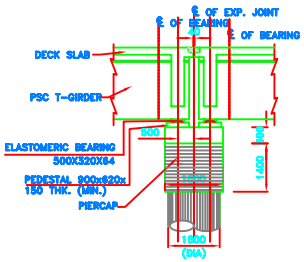
(SCALE – VERTICAL=1:200)





SECTION OF PSC GIRDER AT MID SPAN
(SCALE 1:25)





SUMMARY SHEET

1	LENGTH OF RAIL WAY PORTION	25.000m
2	OVERALL WIDTH OF ROB	12.000m (min)
3	CLEAR ROAD WAY	7.5m ~ 8.4m
4	DESIGN SPEED	45 Kmph
5	RAIL TOP LEVEL	267.490
6	SOFFIT LEVEL	275.022
7	FOUNDATION TYPE	PILE(1.0m dia) FOUNDATION
8	TYPE OF SUBSTRUCTURE	R.C.C.(SOLID CIRCULAR PIER)
9	TYPE OF SUPER STRUCTURE	P.S.C I GIRDER & CAST–IN–SITU DECK
10	TYPE OF BEARING	ELASTOMETRIC BEARING
11	DESIGN LOADING	IRC CLASS OF LOADING (1)TWO LANES OF CLASS 'A' LOADING OR (2)SINGLE LANE TOR OR TRACKED VEHICLES
12	SEISMIC ZONE/FACTOR	ZONE–II
13	SKEW ANGLE	4.0 DEGREE
14	WEARING COAT	65mm THK BITUMINOUS WEARING COAT (40 BC + 25 MASTIC

NOTES:–

1. ALL DIMENSION ARE IN MILLIMETRE, LEVELS ARE IN METRE AND CHAINAGES ARE IN KILOMETRE, UNLESS OTHERWISE MENTIONED. ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
2. STRUCTURAL DETAILS AND REINFORCEMENT SHOWN IN THIS DRAWING ARE TENTATIVE AND SHALL BE FINALISED IN DETAIL DESIGN.
3. DURING THE CONSTRUCTION OF BRIDGE, RAILWAY TRACK WILL BE PROTECTED.
4. SKEW ANGLE OF ROB IS 4°.
5. MIN. HEIGHT OF LOWEST MEMBER OF BRIDGE FROM TOP OF RAIL LEVEL SHOULD BE 7.55m AS PER PRESENT CONNECTION NORMS .
6. SANCTION OF CRS SHOULD BE OBTAINED TO START THE CONSTRUCTION OF PROPOSED WORK.
7. DESIGN CRITERIA BE BASED ON THE IRC–CODES OF PRACTICE AS UNDER:–
   (i) IRC : 6 : 1966 SECTION –I GENERAL FEATURE OF DESIGN.
   (ii) IRC : 6 : 2000 SECTION –II LOADS AND STRESSES.
   (iii) IRC : 18 : 2000 – PRESTRESSED CONCRETE ROAD BRIDGE.
   (iv) IRC : 21 : 2000 SECTION –III CEMENT CONCRETE
   (v) IRC : 78 : 2000 FOUNDATION AND SUB STRUCTURE.
8. THE BRIDGE WILL BE DESIGNED FOR IRC LOADING AS UNDER
   (A) ROB SHALL BE DESIGNED FOR TWO LANE CLASS–A LOADING OR SINGLE LANE TOR (WHEELED / TRACKED WHICH EVER IS SEVERE AND GOVERNING.
   (B) FOOTPATH LOADING AS PER CLAUSE – 209 OF IRC:6–2000 WITH A BASIC INTENSITY OF 500 kg/sqm.
9. GRADE OF CONCRETE:–
   P.C.C. – M–20
   PILE, PILE CAP, PIER, PIERCAP, ROC RAILING – M–35.
   PSC GIRDER & RCC DECK, CRASH BARRIER, PEDESTAL – M–45.
10. CLEAR COVER:–
    PILE, PILE CAP – 75mm.
    PSC GIRDER & RCC DECK – 40mm.
    PIER, PIER CAP, PEDESTAL, CRASH BARRIER, RCC RAILING – 50mm.
11. STEEL USED SHALL BE H.Y.S.D. BARS CONFORMING TO ID:1786 OF Fe 415
12. ALL PRESTRESSING STEEL SHALL BE LOW RELAXATION STEEL AS PER ID:14268.
13. ALL SHEATHING DUCT SHALL BE GALVANIZED COLD ROLLED COLD ANNEALED MILD STEEL AS PER IRC: 18–2000.
14. BEARING:– ELASTOMERIC BEARING.
15. STRIP SEAL TYPE EXPANSION JOINT OF APPROVED MAKE AS PER MORT SPECIFICATIONS SHALL BE PROVIDED IN DECK AT EXPANSION GAP.
16. DRAINAGE SPOUT AND WEARING COAT SHALL BE AS PER MORT STANDARD SPECIFICATION.
17. EXISTING L.C. WILL BE CLOSED AFTER COMPLETION OF THE R.O.B AND TRAFFIC SHOULD BE COMMENCED OVER R.O.B
18. ALL THE DIMENSION SHOULD BE VERIFIED AND RECONCILED AT SITE BEFORE EXECUTION OF WORKS.
19. AT THE TIME OF EXECUTION OF FOUNDATION WORKS, EXISTING TRACK SHOULD BE PROTECTED WITH SHEET PILES.
20. LAUNCHING SCHEME OF THE PROPOSED GIRDER OF THE ROB OVER EXISTING RAILWAY TRACKS SHOULD BE SUBMITTED TO DRM RAILWAY FOR THEIR APPROVAL BEFORE EXECUTION OF WORK.
21. WORK SHOULD BE CARRIED OUT BY CONTRACTOR UNDER THE SUPERVISION OF RAILWAY ENGINEER WITH IN THE RAILWAY BOUNDARY LIMITS.
22. TEMP. ENGINEERING MARKINGS WILL BE INSTALLED AS PER RAILWAY NORMS.
23. PROVISION OF CLAMPS IN THE SUPER STRUCTURE FOR SUPPORTING THE A.C. TRACTION WIRE TO BE MADE IN CONSULATION WITH THE CONCERNED AUTHORITIES.
24. REPRESENTATIVE OF TELECOM AND SIGNALLING DEPTT. SHOULD BE MADE AVAILABLE BEFORE COMMENCEMENT OF PROP. WORK IN THE VICINITY OF THE SIGNAL AND TELECOM CABLE.
25. SR. D.E.N SHOULD ENSURE THAT THE NECESSARY PERMISSION HAS BEEN OBTAINED FROM ROAD AUTHORITY FOR DIVERTING THE TRAFFIC TEMPORARILY, PRIOR COMMENCING THE WORK.

GENERAL ARRANGEMENT DRAWING FOR PROPOSED ROB AT SAWAIMADHOPUR
(RAJASTHAN) NEAR LC NO .T/2-B (RAILWAY CH-1.810 Km)

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

27. The Urban Agglomeration (UA) of Sawai Madhopur District is located about 180 km in the north-eastern part of Jaipur along the rolling hills of Vindhyas and Aravali ranges. It is surrounded by Kota, Tonk, and Karauli districts. Its total land area is 504,299 sq. km. The district has been divided into 4 subdivisions: Sawai Madhopur, Bonli, Gangapur Town, and Bamanwas. There are seven tehsil[2] headquarters in this district: Sawai Madhopur, Khandar, Choth Ka Barwara, Bonli, Malarna Dungar, Gangapur Town, and Bamanwas.

28. Sawai Madhopur is well connected by road networks and is connected with Jaipur, Delhi and other important cities. It is about 428 km from Delhi and 167 km from Jaipur. The nearest airport is at Jaipur (190 km). The Delhi-Bombay broad-gauge railway lines pass through Sawai Madhopur, Gangapur and Hindaun towns of the district. A broad-gauge line connecting Jaipur with Sawai Madhopur passes through Isarda, Chauth-Ka-Barwara and Deopura stations. District map of Sawai Madhopur shown in **Figure 3.1.**

2. Topography, Drainage, Natural Hazards, and Droughts

29. Topography: Sawai Madhopur is located at latitude 25°45' north and longitude 75°59' east, at a height of 400 to 600 m above mean sea level.

30. Drainage: In the east of Aravalli ranges the main drainage is towards northeast. The Chambal catchment occupies 21% of the total geographical area.

31. Natural Hazards: **Figure 3.2** depicts the earthquake zones of Rajasthan and the natural hazard zone map of Sawai Madhopur District is shown in **Figure 3.3**. Sawai Madhopur town lies in low damage risk zone II. The area is less prone to earthquakes and based on evaluation of the available earthquake zone information, it is located on relatively stable geological plains. Natural hazard include mainly water erosion which are moderate and severe to very severe. Other hazards include area prone to water logging salination, flash floods and high fluorine concentration in groundwater

32. Drought: Low rainfall coupled with erratic behavior of monsoon in the Rajasthan makes it the most vulnerable to drought. Based on discussions with PHED officials, the drought combined with significant drawdown conditions caused water tables in Sawai Madhopur to continuously decrease by 1 to 2 m annually.

[2] A *tehsil* consists of a city or town that serves as its headquarters, possibly additional towns, and a number of villages. As an entity of local government, it exercises certain fiscal and administrative power over the villages and municipalities within its jurisdiction. It is the ultimate executive agency for land records and related administrative matters. Its chief official is called the *tehsildar* or *talukdar*.

Figure 3.1: District Map of Sawai Madhopur

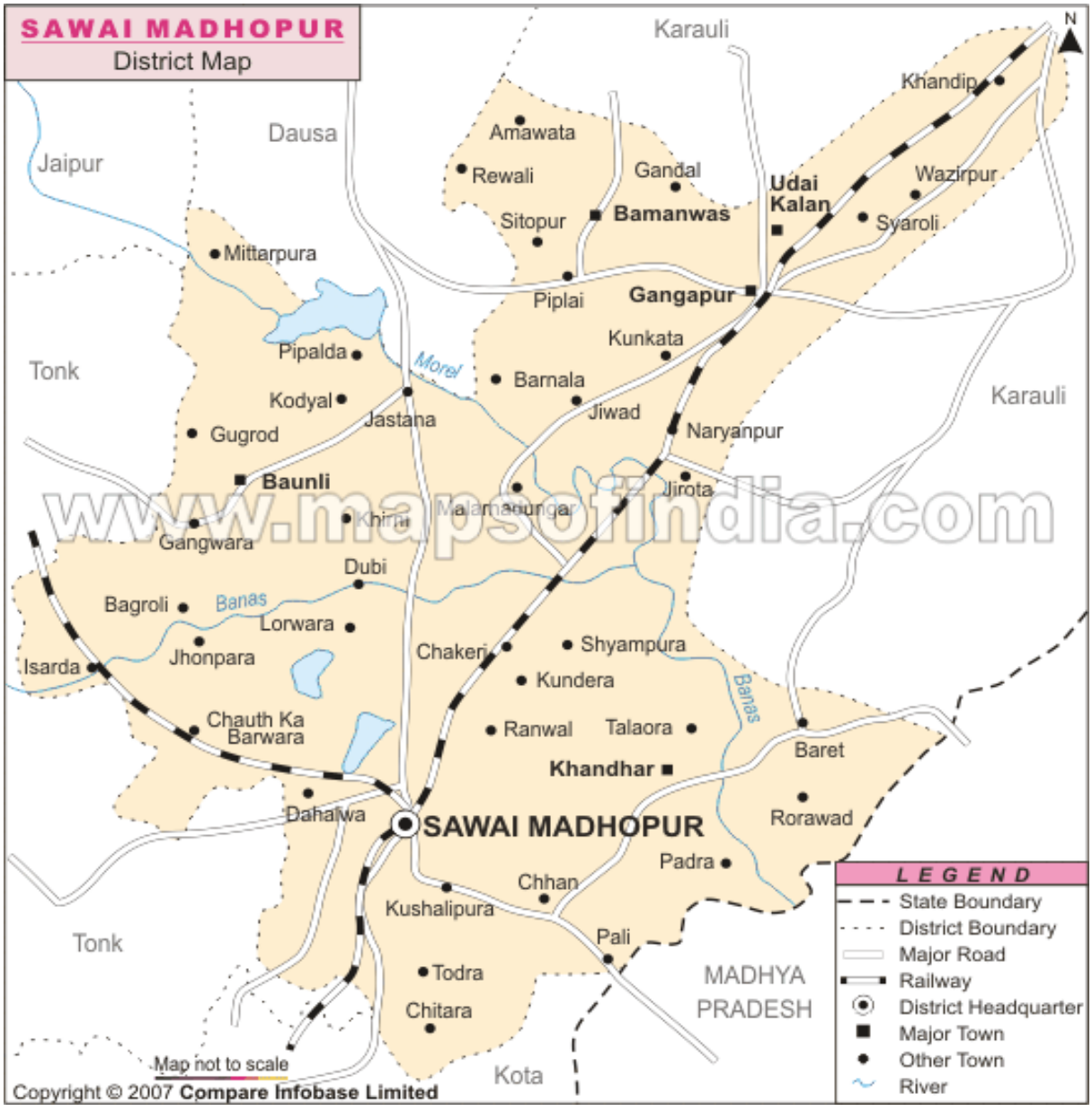


Figure 3.2: Earthquake Zones of Rajasthan

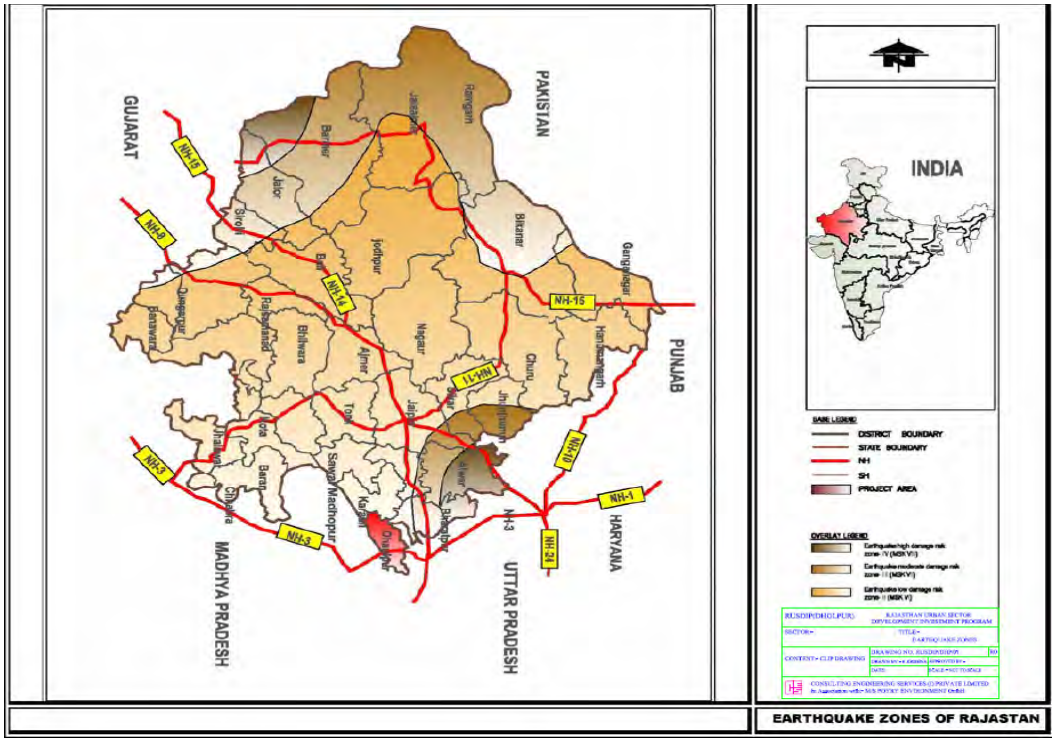
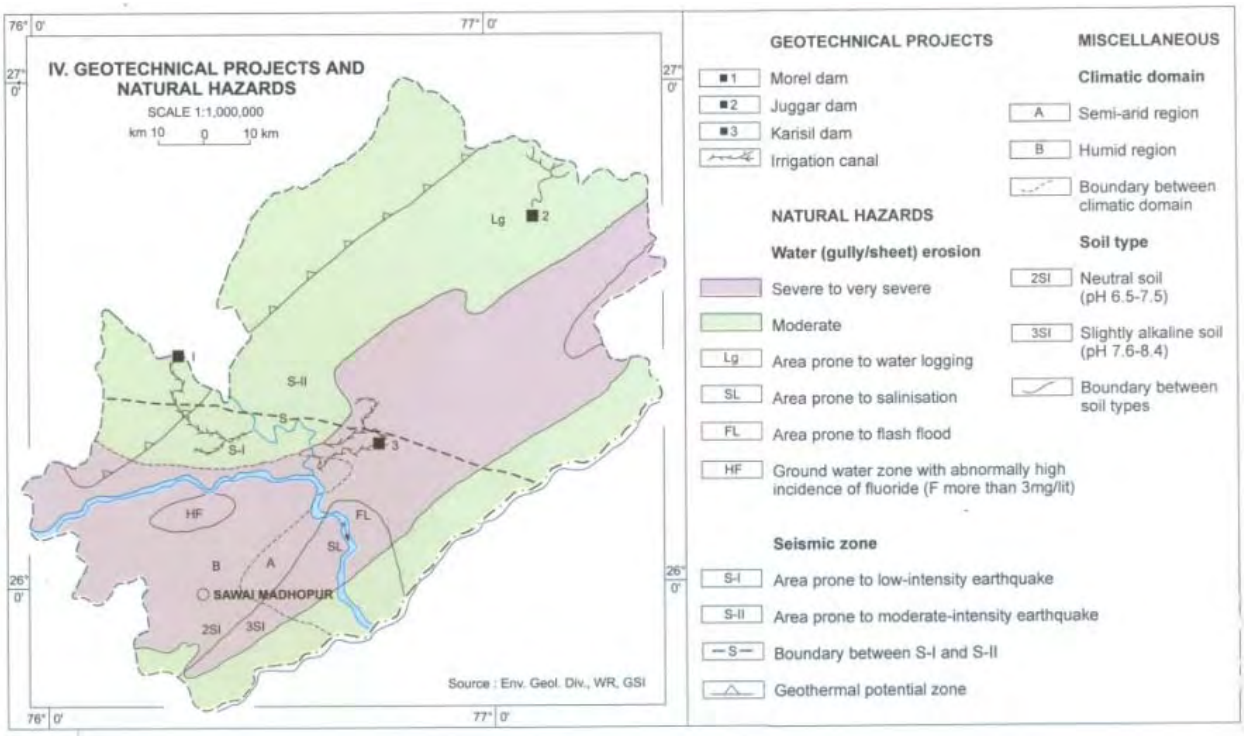


Figure 3.3: Natural Hazard Zone Within Sawai Madhopur District



3. Geology, Geomorphology, Mineral Resources, and Soil

33. The various rocks type exposed in the area belong to Bhilwara, the Delhi, and the Vidhyan Supergroups. The Bhilwara Supergroup represented by the Mangalwar Complex, the Hindoli Group and the Ranthambore group is in decreasing order of antiquity, is exposed in south western part. The northeast-southwest trending linear quartzite ridges between Baunli and Sarsop belong to the Mangalwar Complex. Low grade metamorphites of the Hindoli group indicate shale, slate, phyllite with mirror quartzite which are exposed northwest of Jatwara. The overlaying Ranthambor quartzite occurs east of Jathwara and support luxuriant growth of vegetation and hosts game sanctuary. Several quartzite bands belonging to the Alwar Group (Delhi Supergroup) from strike-ridges between Toda Bhim and Gudha Chandraji in northwestern corner of the district. These are intruded by granite. The Vindhyan Supergroup consist of various types of shale sandstone and limestone is represented by the Bhander, Rewa, Kaimur, Sand, and Satola Groups in increasing order of antiquity. These rocks occupy the eastern half the district and are separated from the older rocks by a major reverse fault, the great Boundary Fault. A major part of these districts is occupied by thick alluvium related to the various river systems.

34. Geomorphologically, the district is classified into nine geomorphic units namely: bad land, sand sheet, alluvial plain, pediment, structural and denudational plateau, and hills and valleys belonging to Vindhyan and pre-Vindhyan hills. Valleys are restricted to the western part of the district whereas those of Vindhayan occurs along a northeast-southeast strip through the middle part of the district. The area classified into three hydrogeological domains of unconsolidated porous Quaternary formation, consolidated fissured formation and hilly area with groundwater potential ranging form less than 1 to 10 liter per second (LPS). (**Figure 3.3).**

35. Mineral Resources: Sizeable reserves of limestone, soapstone, silica sand china clay, and building stones are found in the district. About 100 million tons (Mt) of cement grade Vindhyan limestone occurs near Pahlodi. Additional 100 Mt of limestone are likely to be available from Naroli and Jirota areas. Soapstone, as veins and lenses up to 20 m in width, occurs in within dolomite in the area between Morara and Dholeta over a strike length of 8 km. The significant deposits are located at Rajauli, Garhi and Kampura. Good quality sand occurs near Sapotra, Naroli, Tatwara Railway Station, and near Alanpur. China clay (Kaolin) associated with feldspathic quartzite occurs near Raisana, Basu, Phalodi, and Matasor. The Banjari Mines located at Chauth–ka–Barwara is well known for lead. Small iron ore deposits are located near Karwari and Hindaun. A small bentonite deposit is located near Karauli. Pink and white spotted Bhander sandstone is extensively quarried in Karauli and Hindaun areas and has been used in many historical monuments and modern buildings. **Figure 3.4** shows geology and mineral map of Sawai Madhopur and **Figure 3.5** shows geomorphology of the district.

Figure 3.4: Geology and Mineral Map of Sawai Madhopur District

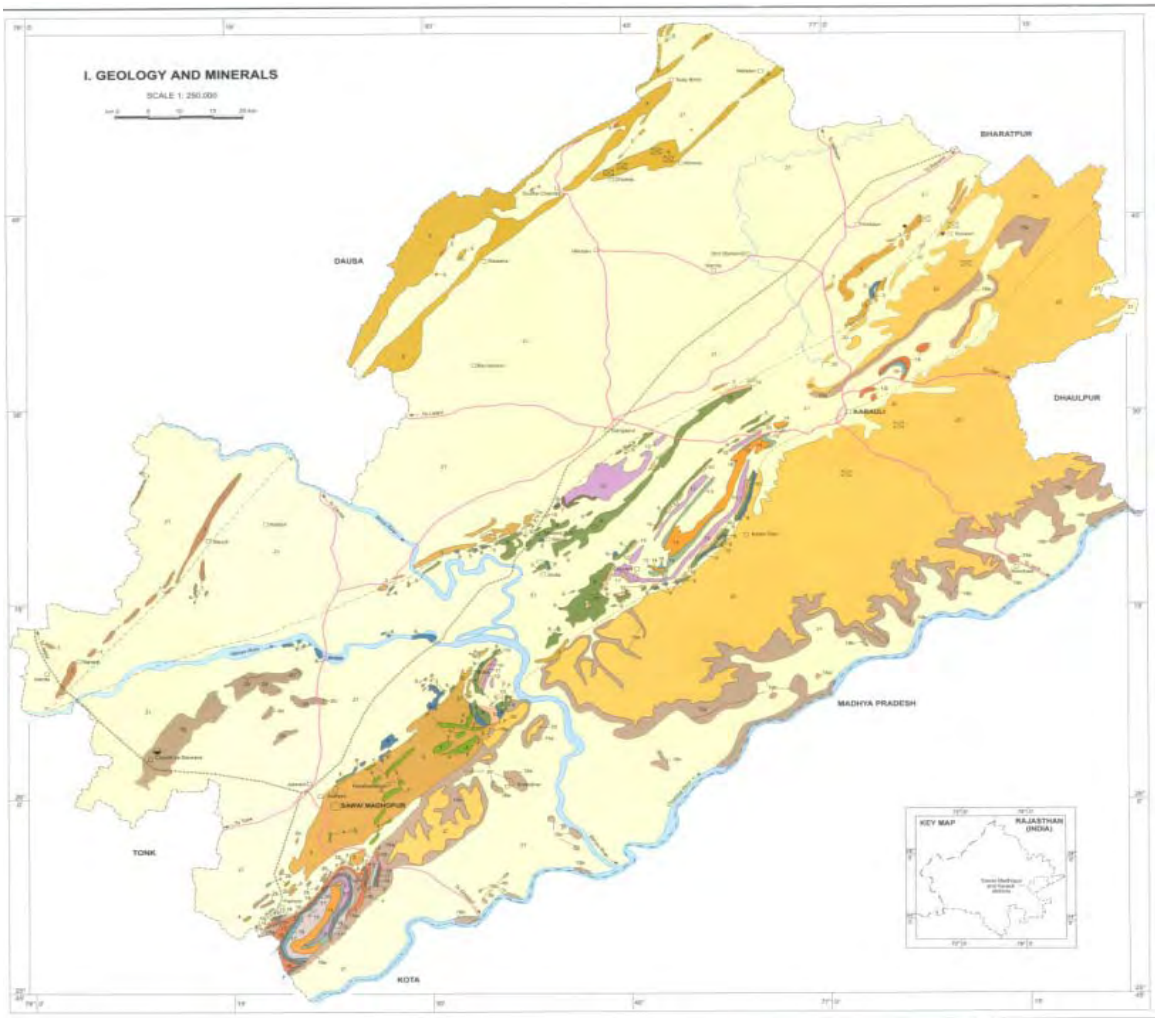
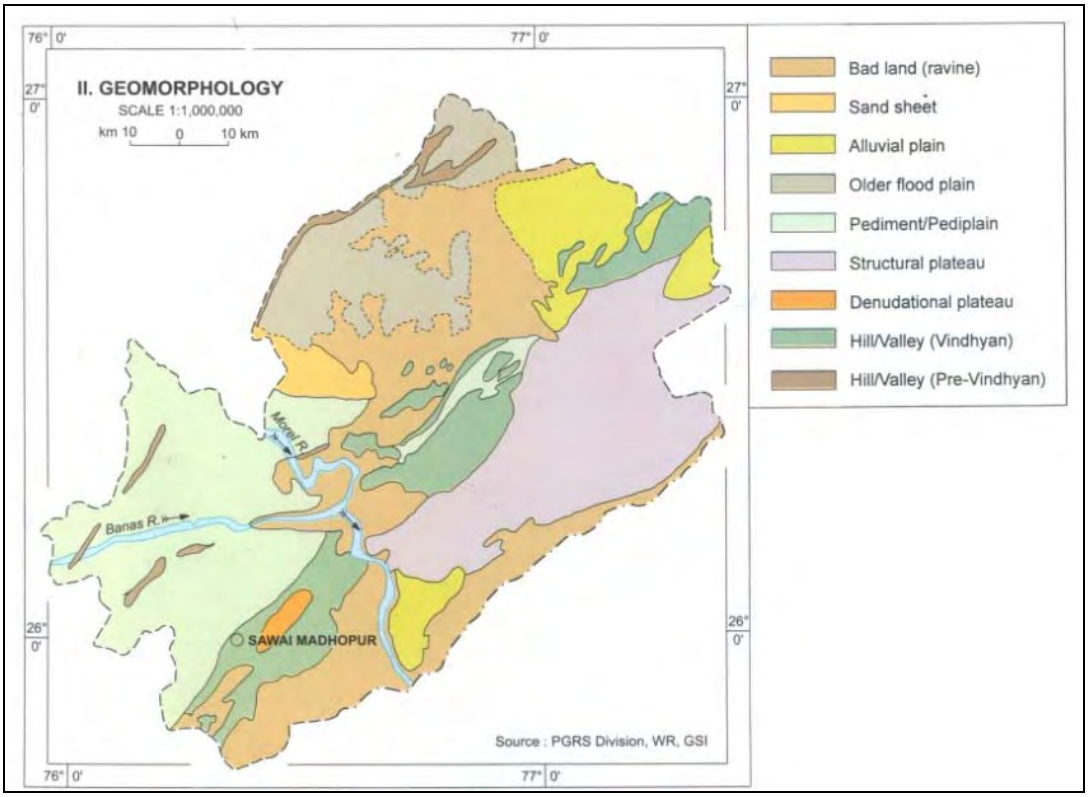


Figure 3.5: Geomorphology of Sawai Madhopur District



36. Soil characteristics: Soil in Sawai Madhopur falls within rainfall zone of 500 to 700 mm. The soil is generally alluvial in nature which prone to water logging. Also nature of recently alluvial calcareous has been observed. **Table 3.1** shows soil nutrient level in Sawai Madhopur including area coverage of saline and sodic soil. The nutrient status of the Sawai Madhopur soil is graded as low to medium level.

Table 3.1: Soil Characteristics in Sawai Madhopur District

	Nutrient			Saline Soil (ha)	Sodic or Alkali (ha)
	N	P	K		
Status	L	M	M	12, 530	20,027

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

4. Climate

37. The climate of Sawai Madhopur is hot and arid with large variation in temperature. The average temperature variation in summers and winters are 45^{o} to 24.94^{o} C and 20.05^{o} C to 4^{o} C respectively. The maximum and minimum temperature recorded is 45^{o} C in summer and 4^{o} C in winter. Dust storms and thunderstorms occur all through the summer and are particularly active in pre-monsoon period. In summer, mean humidity is 60%. The predominant wind direction is from west and south-west.

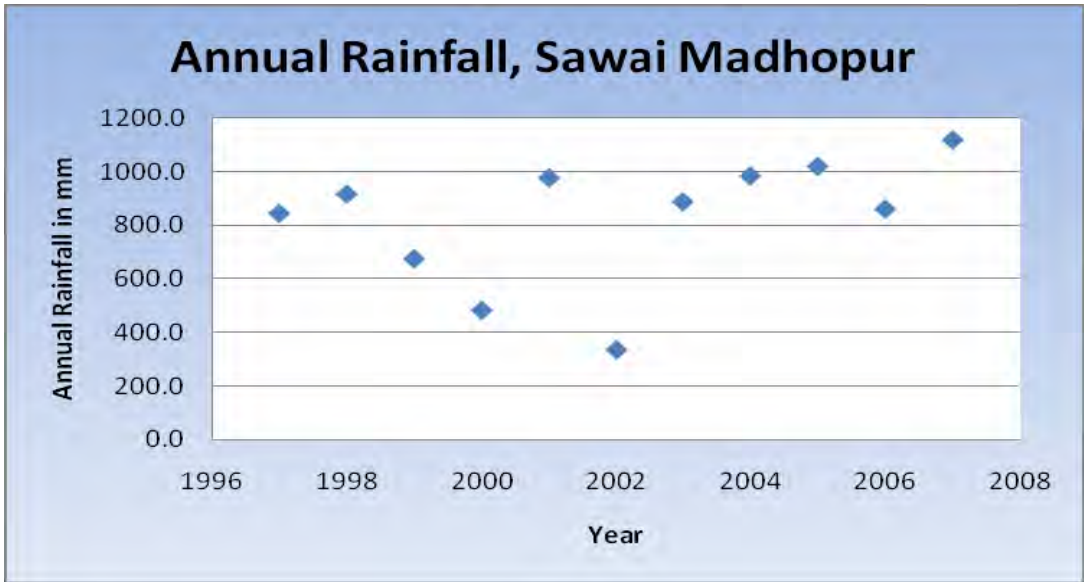
38. The rainfall over Sawai Madhopur is scanty and is concentrated over four month i.e. from June to September. The south-west monsoon is active from July to mid September, recording an annual rainfall of 837.40 mm. The rains are erratic and so is the distribution of the rainfall. Seasonal rainfall data for year 2005 to 2006) is shown in **Table 3.2. Figure 3.6** shows the yearly variation of rainfall at Sawai Madhopur from 1997 to 2007.

Table 3.2: Sawai Madhopur Rainfall Data (2005 to 2006)

Months	Rainfall (mm)
June	220
July	578
August	74
September	107
October	0
November	0
December	0
January	0
February	0
March	8
April	0
May	25
Monsoon Rainfall	979
Non-monsoon Rainfall	33
Annual Rainfall	**1,012**

Source: Irrigation Department, Govt. of Rajasthan

Figure 3.6: Sawai Madhopur Historical Rainfall Data (1997 to 2007)



Source: Investigation Design and Research unit, Water Resources Jaipur

5. Air Quality

39. Vehicles are considered to be the only significant source of air pollution in Sawai Madhopur. The Rajasthan Pollution Control Board (RPCB) does not monitor the ambient air quality of Sawai Madhopur because there are no major industries located in the district therefore no data on ambient air quality is available. The nearest ambient air quality monitoring station is located at Alwar (254 km from Sawai Madhopur). The ambient air quality data is depicted in **Table 3.3.**

Table 3.3: Annual Average Ambient Air Quality in Alwar (2004)

Monitoring Station	Land use	SOx ($\mu g/m^3$)	NOx ($\mu g/m^3$)	RSPM ($\mu g/m^3$)	SPM ($\mu g/m^3$)
Alwar Residential, Rural and others area	Residential	8.1	11.6	175.0	302.0
NAAQ Standard	*Residential*	*60*	*60*	*60*	*140*
Alwar Industrial area	Industrial	7.6	12.4	107.0	182.0
NAAQ Standard	*Industrial*	*80*	*80*	*120*	*360*

SOx = sulphur oxides; NOx = nitrogen oxides; RSPM = respirable suspended particulate matter; SPM = suspended particulate matter
Source: Annual Report 2005-2006 Rajasthan State Pollution Control Board

6. Surface Water

40. The major Sawai Madhopur Rivers include Morel, Chambal and Banas. The Morel River flows through the towns of Mittarpura, Pipalda, Jastana, Shyampura and Rorawad. The tributaries of this river are Dhund, Kankrauli and Kalisil rivers. It has a catchment area of approximately 5,491 sq km. The Chambal River is also known as Charmawati River. Its total length is approximately 376 km. The Banas River originates in the Khamnor Hills of the Aravalli Range in the district of Rajsamand and flows through Isarda, Dubi, Shyampura, Rorawad, Bagroli and Padra towns in Sawai Madhopur then flows through the northeastern region of Mewar meeting Chambal River near the Rameshwar Village. There is no available data for surface water quality. It was observed that surface water quality deteriorates during monsoon due to total suspended solids (TSS) load. Due to high temperature at summer most of the surface water sources become dried.

41. Tributary of Banas River, River Morel originates in the hills near Dharla and Chainpura villages in Bassi Tehsil of Jaipur District. It flows southeast for 29 km, then southwest for 35 km, up to the confluence with river Dhund, and then southeast for 83 km in Jaipur and Sawai Madhopur Districts, before joining Banas river near Hadoli village in Karauli Tehsil of Sawai Madhopur District. Tributaries of river Morel are Dhund, Kankrauli and Kalisil rivers

42. River Kalisil originates in the hills near Rajpura village in Sawai Madhopur District. The river flows generally southwest, partly through hills and partly in the plains of Sawai Madhopur District, for about 48 km, before joining Morel River. Number of small *nallahs* [3]of Sawai Madhopur are joining to River Kalisil.

[3] *Nallahs* are

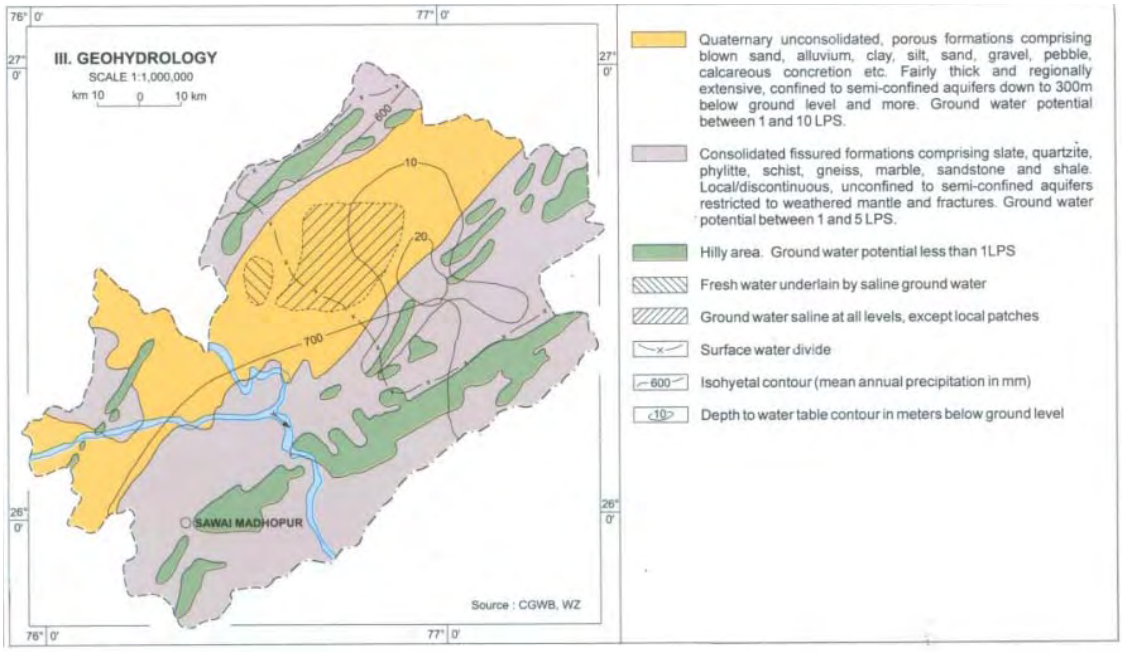
7. Geohydrology and Groundwater

43. The Geohydrological map of Sawai Madhopur is shown in **Figure 3.7.** For broadly grouping geological formations from ground water occurrence and movement considerations, the various lithological units have been classified into two groups on the basis of their degree of consolidation and related parameters. These are,

- Porous Formations – quaternary unconsolidated formations
- Fissured formations – consolidated sedimentary rocks

44. On an average, 40% of the district area (mostly south and eastern part of the district) covered with consolidated fissured formation with some patches of hilly area.

Figure 3.7: Sawai Madhopur Geohydrological Map



45. The Central Ground Water Board (CGWB) established a number of National Hydrographic Monitoring Stations in and around Sawai Madhopur to monitor fluctuations of groundwater level (**Table 3.4**). In most of the cases, groundwater table ranged between 10 to 20 m below ground level (bgl).

Table 3.4: Number and Percentage of National Hydograph Network Stations (Sawai Madhopur) with Water Fluctuation Range

Period	No of wells analysed	Range		0-2m		2-5m		5-10m		10-20m		20-60m		>60m	
		Min	Max	No	%	No	%	No	%	No	%	No	%	No	%
Jan-06	24	1.99	35.77	1	4.17	1	4.17	6	25.0	11	45.83	5	20.83	0	0
Nov05	24	1.03	34.47	1	4.17	4	16.67	5	20.83	9	37.5	5	20.83	0	0
Aug05	24	2.41	33.18	0	0	6	25	6	25	10	41.67	2	8.33	0	0
May05	21	3.65	35.7	0	0	2	9.52	6	28.57	9	42.86	4	19.05	0	0

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

B. Ecological Resources

46. Flora: The principal species found in Sawai Madhopur is Dhok (*Anogeis pendula*) .Some other species sparsely scattered are Raunj (*Acacia leucophloea*), Tendu (*Diospyros melanoxylon*). *Acacia cataechu* Scrub: These scrubs exclusively occur in Deoli blocks of Uniara range in Tonk District. Small patches also occur in Rawanjna Doongar main and Sawai Madhopur 'B' blocks. The growing stock chiefly consists of stunted and crooked Khair (*Accacia catechu*), Raunj (*Acacia lencophloea*) and Krail (*Capparies deciduas*).The undergrowth is scanty and consists of Ber-Jhari (*Zizyphus nummulana*) and Papadhani (*Fluggea viscosa*).

47. Fauna: Sawai Madhopur is rich in wild life. It has a large variety of animals, birds, and fishes. Tigers, leopards or panthers, and wild dogs (Dhole) are also found in this area. Sloth bears are less uncommon here than in many other parts of India where they were once well known. Wild pigs are also plentiful. Among the forest birds are the peafowl, doves, parakeets, owls and other birds of prey. Other birds seen here are egrets, pond herons, grey and purple herons.

48. There are no forest areas near the subproject site. The nearest reserve is the Ranthambore Tiger Reserve which is 7 km away. Ranthambore was established as the Sawai Madhopur Game Sanctuary in 1955 by GoI, and was declared one of the Project Tiger reserves in 1973. In 1984, the adjacent forests were declared the Sawai Man Singh Sanctuary and Keladevi Sanctuary, and in 1991 the tiger reserve was enlarged to include Sawai Man Singh and Keladevi sanctuaries. The park lies at the edge of a plateau, and is bounded to the north by the Banas River and to the south by the Chambal River. There are several lakes in the park. It is named for the historic Ranthambore fortress, which lies within the national park. The park covers an area of 392 sq km, and is famous for its tiger population. Other major wild animals include the tiger, leopard, nilgai, dhole, wild pig, sambar and chital. It is also home to wide variety of trees, plants, birds and reptiles. Ranthambore is also the site for one of the largest Banyan trees in India. No endangered flora and fauna is reported from the site. No works will be done within 500 meter radius of the protected forest area.

C. Economic Development

49. Sawai Madhopur being a desert district generally faces famines & drought. The bulk of population depends upon agriculture & animal husbandry. Being the district headquarter, Sawai Madhopur town is the main regional center for the entire district and is working as service center for providing services like trade and commerce, transport, commercial and other higher level public facilities for the entire district.

50. The economic condition of people in Sawai Madhopur is not satisfactory. As per information in 1998 about 28% population comprised of families below poverty line. These people are mostly labor class working in industries, shops, restaurant, construction, transport and others.

51. Total workers in the districts as per 2001 census are 109,248 out of which 86,836 are main workers and 22,412 are marginal workers and 169,393 are non worker. The work participation rate is 39 %. The occupational structure as per 2001 census is assessed as follows:

Table 3.5: Distribution of Work Force (2001)

Category	Nos.	% of Work Force
1. Main Workers		
Cultivators	3473	4.00
Agriculture Labourer	868	1.00
House Hold Industry	5210	6.00
Other Workers	77284	89.00
Sub-Total	**86,836**	
2. Marginal Workers		
Cultivators	2689	12.00
Agriculture Labourer	1792	8.00
House Hold Industry	2913	13.00
Other Workers	15016	67.00
Sub-Total	**22,412**	
Grand Total	**109248**	

Source: Compiled from District Census Handbook Data, 2001

52. The detailed break-up of occupational structure is not available for 2001 census data. However, the occupational structure data for 1971, 1981, and 1991 are available on the basis of which the estimation for 2001 has been made as shown in the below **Table 3.6.**

Table 3.6: Sawai Madhopur Occupational Structure (1971 to 2001)

Occupation	1971		1991		2001	
	Workers	%	Workers	%	Workers	%
Agriculture, mining and allied activities	1,220	9.80	2,091	10.03	2,466	8.50
Industrial	4,124	33.10	4,997	24.5	8,125	28.00
Construction	400	3.20	1,405	6.9	1,742	6.00
Trade & Commerce	1,958	15.72	4,001	19.6	5,804	20.00
Transport & Communication	1,377	11.05	2,229	10.9	3,046	10.50
Other Services	3,380	27.13	56.83	27.8	7,835	27.00
Total	**12,459**	**100.00**	**20,406**	**100.00**	**29018**	**100.00**

Source: Census of India and Estimates

53. The occupational structure of people in Sawai Madhopur District shows that Sawai Madhopur town is a commercial center as well as service town. A number of district level offices are located in the town and as such about 23% workers are engaged in the service sector. Industrial activity is not very significant due to lack of water supply and power, as well as raw material. Therefore, employment in industrial sector is only 16%. It may be mentioned that Sawai Madhopur is famous for mason and construction workers. They are not only worked at Sawai Madhopur or other neighboring states, but also in Gulf countries. The high percentage of workers of about 11.25% in construction justifies this fact.

54. There is no power generating unit in Sawai Madhopur. The consumption of electricity by different sectors is shown in **Table 3.7**.

Table 3.7: Consumption of Electricity in Sawal Madhopur in KWh (2003 - 2004)

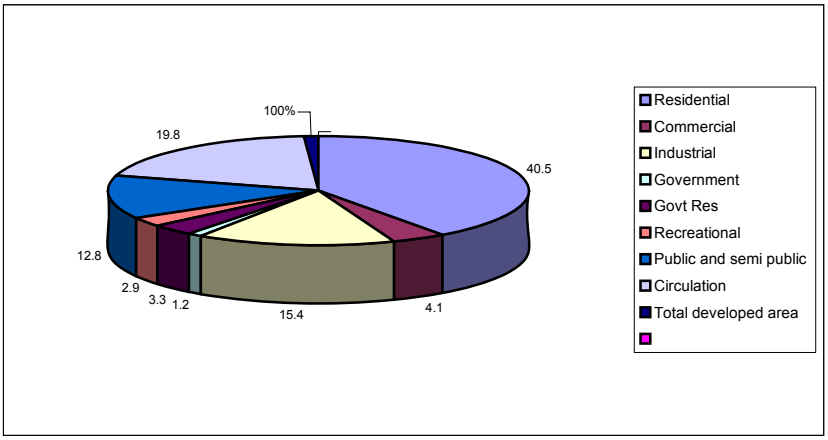
Domestic	Non- Domestic (Commercial)	Industrial	Public Lighting	Public Water Works	District	Domestic
		Small	Medium	Large		
32.948	7.875	4.36	1.7330	1.89	0.596	7.547

55. Land use: Total area within the municipal limits of Sawai Madhopur is 59 sq km or 14,575 acres. Out of which only 1,220 acres is the developed area and the rest consists of water bodies hills, agricultural lands, etc. Out of the total developed area, 40.05 % is under residential use and 12.08 % under public and semi public use. Land under government offices is only 1.2% of the total development area. About 15.04 % of the total development area is under industrial use, which includes large chunk owned by an existing cement factory. **Table 3.8** and **Figure 3.8** shows land use break up of the Sawai Madhopur developed area. Land use of entire district is shown in **Figure 3.9.**

Table 3.8: Existing Land-use, Sawai Madhopur, 1985

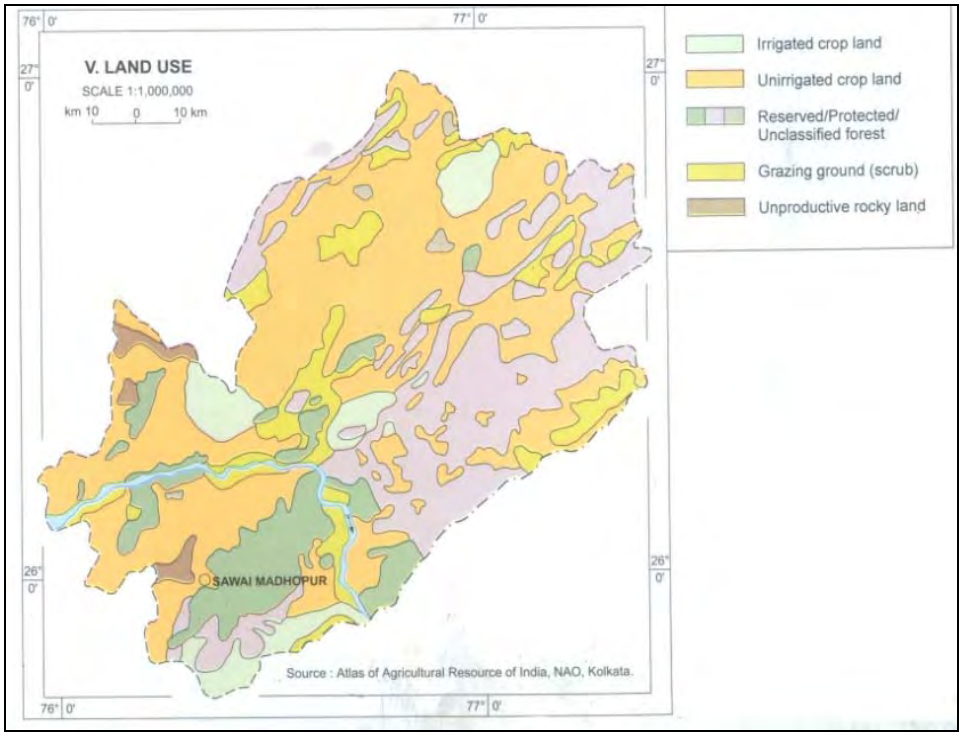
Use	Area in Acres	% of Developed Area
Residential	490	40.5
Commercial	50	4.1
Industrial	195	15.4
Government	15	1.2
Government Reserved Area	40	3.3
Recreational	35	2.9
Public & Semi-public	155	12.8
Circulation	240	19.8
Total Developed Area	**1,220**	100%

Figure 3.8: Existing Land-Use and Percentage of Developed Area (Year)



Source: District Statistics Handbook

Figure 3.9: Land Use of Sawai Madhopur District (1987)



Source: GSI Resource Map

56. Commerce, Industry and Agriculture: The main retail and wholesale business activities are still carried out in the market of the old Sawai Madhopur town. These traditional markets are located in the principal business areas of the town. Originally planned straight roads in this area have become narrower because of the continuous Chabutara-type encroachments in front of the shops, bus stand and the business related to transportation is located along Khandar road.

57. Retail- and transport-oriented businesses are located in the newly development "Bazaria" in the main market street of Sawai Madhopur town. The street is overcrowded and congested because of intermingling of traffic and there are no parking facilities for vehicles.

58. The vegetable and grain market located in the old town is a very congested area. However a new site has been constructed near Alanpur village along main road. The grain storehouses are located at isolated location on Ranthambhore road and College road in old Khasa Kothi building. Food Corporation of India has taken up work of development of godowns which is located in the east of Jaipur Udyog Cement Factory.

59. Industrial Development: Sawai Madhopur town is a fast developing industrial town of Rajasthan mainly because of its nodal location at the junction of Broad Gauge railway lines. The industrial employment has increased from 4,124 in 1971 to 8,125 by 2001. The town has one large scale industrial unit namely, Jaipur Udyog Cement Limited which is located in the north town. There are two planned industrial areas by Rajasthan State Industrial Development & Investment Corporation (RIICO) for small scale industries, Kherda industrial area is located on Tonk road in the west, with an area of 100 acres for 137 plots while the other industrial area is

located on Ranthambhore road in the east with an area of 57 acres for 62 plots .Both industrial areas have been fully developed.

60. In and around the Sawai Madhopur town area, about 60% of the land is used for agricultural purpose. Crop production statistics as shown in **Table 3.9** indicates that total crop production during Rabi season is comparatively more than in Kharif season and that basically due to oilseed production during Rabi season.

Table 3.9: Crop Production In and Around Sawai Madhopur (2003 to 2004)

Type of Crops	Under Rabi Crops (ton)	Under Kharif Crops (ton)
Cereals	133,823	199,069
Pulses	28,825	4,591
Food Grains	162,648	203,660
Oilseeds	138,480	12,265
Others	1,614	10,391
Total	**302,742**	**226,316**

Source: Vital Agricultural Statistics 2004-2005, Directorate of Agriculture, Rajasthan

61. Water Supply: Presently both groundwater and surface water are used as sources for Sawai Madhopur town. There are 63 tubewells and 10 open wells in town. Water is also lifted from Banas River through one existing intake well .Total production from all these sources is 8 MLD. The gross water supply through the piped system is currently estimated 67.79 lpcd and the transmission and distribution losses is 40%. This is much less than the standard norm of 135 lpcd. The water is supplied through various ward-wise service reservoirs. As of 2006, there are 13,846 water connections and most of these are metered.

62. The Central Ground Water Board seasonally carries out chemical testing of water from tube wells. The Drinking Water Standards and results of groundwater testing in Sawai Madhopur are shown in **Table 3.10**.

Table 3.10: Ground Water Quality In and Around Sawai Madhopur District

Parameters	Maximum Level	Minimum Level	Standard of Drinking Water (IS: 10500: 1991)	
			Desirable Limit	Maximum Permissible Limit
pH	8.8	7.2		
EC (micromhos /cm at 25°C)	6,650	580		
Cl (mg/l)	1,775	28	250	1000
SO_4 (mg/l)	585	5	200	400 (if Mg does not exceeds 30 ppm)
NO_3 (mg/l)	250	1	-	100
PO_4 (mg/l)	2	0.11		
Total Hardness (mg/l)	1,380	150	300	600
Ca (mg/l)	340	12	75	200
Mg (mg/l)	145	12	30	100
Na (mg/l)	1,265	12	-	-
K (mg/l)	312	1	-	-

Parameters	Maximum Level	Minimum Level	Standard of Drinking Water (IS: 10500: 1991)	
			Desirable Limit	Maximum Permissible Limit
F (mg/l)	7.0	0.1	1.0	1.5
Fe (mg/l)	3.6	0.03	0.3	1.0
SiO_2 (mg/l)	28	3	-	-
TDS (mg/l)	4,323	377	500	2,000

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
Source: Ground Water Yearbook 2005-06 Rajasthan, Central Ground Water Board, Jaipur (2007)

63. PHED conducts quarterly surface water, groundwater, and water supply quality monitoring prior to distribution to households, industries and other users. The most recent data available is for the monitoring conducted in 2007. The result is shown in **Table 3.11**. It is noted that groundwater contains high levels of fluoride (F), total dissolved solids (TDS), and nitrate (NO_3).

Table 3.11: Present Supply Water Quality at Sawai Madhopur District

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
72.95	Ground	100	0	6	20	0.2	1.6	588	1,351	10	324

CWR = clear water reservoir, SR = service reservoir, F = fluoride, TDS = total dissolved solids, NO_3 = nitrates

64. Sewerage and Sanitation System: Sawai Madhopur town does not have underground sewerage system. Only 50% of the households reportedly have septic tanks and soak-well systems for sewerage disposal. The remaining household practice 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 MB and discharge to open spaces, agricultural lands in an indiscriminate manner. The municipal drains are mostly open and overflowing into the *nalla* causing problems during the rainy season. The water flows to the drains resulting to unsanitary conditions specially in the 14 slum areas identified in the town.

65. Drainage: The topography of Sawai Madhopur town is cup-shaped. Due to scanty rains in the region, natural drainage system has not been so far evolved..In Sawai Madhopur 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 in Sawai Madhopur has been identified under three broad categories as follows: (i) open *pucca* (concrete drains 40 km) (ii) closed *pucca* (48 km) *and* (iii) Kutchha.

66. Industrial Effluents: Small industries exists under RIICO, which are located outside of the town area. There are small amount of effluent generated and disposed in local *nallahs*. As reported by the local Municipal Board, the responsibility of effluent disposal is under RIICO's own and could not be connected to the proposed sewer network. The individual industry must treat their effluent to bring it to the required standard before final disposal.

67. Solid Waste: The municipal solid wastes (MSW) generated in the Sawai Madhopur town (including slum area) mainly consists of domestic refuse, wastes from commercial area, vegetable-fruit market, bio-medical waste, waste from hotels and restaurants, industries etc. The waste collection system being followed is quite primitive, individual households/units throw the garbage on road side/open drains close to their houses and the sweepers collect the garbage in the form of small heaps on road sides. Similarly the open drains are also cleaned periodically and the sludge is heaped adjacent to the drain where it is left for 2-3 days to get dried and lifted. Tractor trolleys then lift these dumps the heaped garbage once or twice a day. In the process, part of the garbage gets dispersed on the road or finds it way into to the open drains or open low lying pits.

68. The MSW generated is transported to garbage dumping site. The Municipality of Sawai Madhopur has engaged one loader, three tractors, and four private tractors for collecting and transporting the solid waste material. The capacity of 7 tractors is approximately 10 cubic meters. The waste material is lifted by loaders and put on trolley for transportation to disposal site. Details of the quantity of garbage collected and disposed of are not available. However based on population density and spatial distribution of income groups in the Sawai Madhopur town, the waste generation has been assessed as 30 tons per day, which is close to approximate quantitative information provided by the Municipal Junior Engineer. Break up of the present (2006) quantity of MSW is given in **Table 3.12.**

Table 3.12: Break Up of Present Waste Collection

Type	Tons
Residential Area (Domestic)	18
Commercial Area	6
Industrial	4
Hospital Area	2
Total	**30**

4. Road Network and Transportation

69. India has a huge network of 3.3 million km of roadways, making it one of the largest road network in the world. This huge network, which includes both paved and unpaved roads, are categorized as expressways or freeways, National Highways (NH), State Highways (SH), major district roads, and rural and other roads. The roads generally are dual carriageways in expressways and highways. **Table 3.13** provides a breakdown of road network in Sawai Madhopur. This 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 3.13 Road Surface Composition (2007)

Surface Type	Total (km)
Concrete	54
Black Topped	3500
Water Bound Macadam	10
Others/Earthen	10
Total	**109.00**

Source: Public Works Department (PWD) Sawai Madhopur

D. Social and Cultural Resources

1. Demography

70. The population of Sawai Madhopur District is more than 1.11 million. The population density is 248 persons per sq km, which is more than the state's population density of 165 persons per sq km. The literacy rate of the district is 57.347%, which is little higher than the state literacy rate (61.03%).

71. Sawai Madhopur Municipal area comprises is 59 sq km and of 36 wards.

Table 3.14 : Ward wise Population of Sawai Madhopur Town, 2001

Ward No	Population			Sex Ratio
	Persons 2001	Male	Female	
1	2409	1257	1152	916
2	3386	1784	1602	898
3	3533	1921	1612	839
4	3830	1988	1842	927
5	2000	1081	919	850
6	1909	1075	834	776
7	3448	1936	1512	781
8	5244	2823	2421	858
9	4120	2211	1909	863
10	5056	2692	2364	878
11	3543	1786	1757	984
12	1348	699	649	928
13	1874	995	879	883
14	2297	1198	1099	917
15	1608	818	790	966
16	3585	1902	1683	885
17	2005	1011	994	983
18	2669	1388	1281	923
19	1924	1005	919	914
20	1764	938	826	881
21	2339	1236	1103	892
22	2488	1300	1188	914
23	2217	1126	1091	969
24	2815	1441	1374	954
25	2613	1354	1259	930
26	2489	1294	1195	923
27	2128	1118	1010	903
28	2543	1327	1216	916

Ward No	Population			Sex Ratio
	Persons 2001	Male	Female	
29	3144	1628	1516	931
30	3021	1596	1425	893
31	2075	1071	1004	937
32	4951	2634	2317	880
33	1897	1036	861	831
34	2862	1581	1281	810
35	2359	1260	1099	872
36	4505	2393	2111	882

Source: Census of India, 2001

2. Health and Educational Facilities

72. There are good educational facilities in Sawai Madhopur District, which serve townspeople, inhabitants of surrounding villages, and towns in the hinterland. There are 688 primary schools, 161 secondary schools and 58 higher secondary schools, plus five general degree colleges and one Industrial Training Institute (ITI).

Table 3.15: Educational facility of Sawai Madhopur District

Primary School Govt.	575
Primary School Private	113
Upper Primary School Govt.	294
Upper Primary School Pvt.	320
Secondary School Govt.	74
Secondary School Pvt.	87
Senior Secondary School Govt.	38
Senior Secondary School Pvt.	20
Navodaya Vidyalaya	1
Kendriya Vidyalaya	2
College	5
I.T.I.	1
Rajeev Gandhi Pathshala	342

Source: Official website of Rajasthan Government

73. As the district headquarters town, Sawai Madhopur is the main centre for health facilities in the area. There is also a district general hospital, 4 community health centers (CHC) and 22 primary health center in the district. The detail of the health facilities is given in **Table 3.16.**

Table 3.16: Health facility Sawai Madhopur District

General Hospital	1 at district headquarter (150 beds)
Community Health Center (CHC)	4 (Gangapur town, Bamnawas, Bonli, Khandar)
Primary Health Center (PHC)	22
Sub Health Centre	194
T.B. Clinic	1
Private Hospital	14

Source: Official Website of Rajasthan Government

3. History, Culture and Tourism

74. The Muslim conquest brought about major changes in the political map of northern India. In Rajasthan, the Chauhan kingdoms of Sapadalaksa and Nodal dis-appeared, Govinda the grandson of Prithviraj Chauhan established himself at Ranthambore and ruled as feudatory of the Sultan of Delhi. Following disturbances after the death of Iltumish, Vagbhatta besieged the fort of Ranthambore. He then ruled from here for 12 years waging continuous battles against the Sultanate. Rao Hamir was yet another figure who carved a niche for himself. In the annals, it is only now and then do we come across men of such heroism. Rana Kumbha captured the Ranthambore Fort the middle of the 15th century. After the death of Aurangzeb, the fort was taken over by the rulers of Jaipur.

75. Sawai Madhopur has moderate tourist inflows with main attractions being Ranthambore National Park, Ranthambore Fort, Ganesh Temple, Kala – Gaura Bhairwa Temple, ChamatkarJi Jain Mandir, Man Sarovar Dam, Chouth Mata Temple, Shiwad Temple, Bhagwatghar Kunda, Ambreshwaram Temple , Rameshwaram, Khandar Fort., Persian inscriptions in a Baori. Sawai Madhopur functions as an ideal weekend resort for inhabitants of the Delhi Metropolis in addition to being a place of interest for foreign tourists.

IV. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES: PLANNING, LOCATION, AND DESIGN

76. ADB Environmental Assessment Guidelines require that an IEE should evaluate impacts due to the (i) planning, location, and design, (ii) construction, and (iii) operation and maintenance of the subproject. Construction and operation are the two activities in which the subproject 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 subproject are identified, and mitigation is devised for any negative impacts.

77. 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 subproject, as they would not occur if an alternative location or design was chosen.

78. However in the case of this subproject it is not considered that there are any impacts that can clearly be identified to result from either the planning, design or location. 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 areas in which there could be significant impacts (archaeological), those impacts are clearly a result of the construction process rather than the subproject 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

79. From the descriptions given in Section II, it is clear that implementation of the subproject should not have major negative impacts because it will affect only one site, at which all construction will be conducted within a relatively small area.

80. Because of this 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	Ranathambore Tiger Reserve and National Park is located in the town (protected areas), so the sewer network construction will be not be allowed within or outside the protected area. Blasting, air, and noise pollution will not be allowed near the areas
Coastal resources	Sawai Madhopur is not located in a coastal area
Development of agriculture, minerals and tourism	There are none of these developments near the site
Population and communities	Construction will not affect population numbers, location or composition

81. These environmental factors have thus been screened out presently but will be assessed again before starting of the work.

82. **Appendix 2** shows Rapid Environmental Impact Assessment checklist (REA) for the said subproject. **Appendix 3** shows number of existing trees within the corridor.

B. Road over Bridge (ROB)

1. Construction method

83. The subproject will involve construction of a ROB that is 7.5 m high, 25-m span and with a total length of 1,075 m (including the railway portion, viaducts span and approach embankments and others).

84. Construction will begin with the removal of the existing road surface by backhoe diggers. A series of RCC box-sections (10 m wide and around 30 m long) will then be built, each slightly higher than the preceding one, to form the approach ramps. Foundations will be dug to about 1 m depth, and metal reinforcing bars will be added to form the floor and sides of each box. Portions of these will be encased in wooden shuttering, and concrete (mixed on site) will be poured in and allowed to set. This will be repeated to gradually create each RCC box, which will then be filled with sand and stone, imported on trucks and tipped into each structure. Once each is filled a layer of RCC will be added to the top, with a slight incline, so that the upper surface rises gradually to the height of the ROB.

85. At the same time the foundations for the bridge piers will be excavated by backhoe diggers, and deeper portions will be dug by a drilling machine. Heavy-duty metal reinforcing rods will be placed into the voids, followed by a concrete and aggregate mix. The reinforcing rods will extend out of the foundations to create the structure of each pier, and these will then be encased in shuttering, into which more concrete will be poured to form each pillar. The pre-cast RCC bridge sections will then be brought in from the manufacturing plant on large vehicles, placed into position by cranes and attached to the piers by heavy-duty bolts and concrete. The pre-cast safety barriers will also be positioned by crane at the edges of the bridge and ramps, after which the tarmac surface will be applied by road-laying machine and roller vehicles, with gravel layers tipped out from trucks.

86. The operation will be conducted by a team of around one hundred work force, roughly 50% unskilled labor and 50% with various skills including truck drivers, vehicle and machine operatives, surveyors, foremen and supervisors, etc. The operation should be completed in around 18 months.

2. Physical Resources

87. Although all work will be conducted at a single, relatively small site, construction will involve a great deal of excavation and earth moving over a period of approximately 6 months, so physical impacts could be quite considerable.

88. During construction time great deal of material, which could cause significant changes in topography, drainage, air quality (dust), soil quality and other features at the extraction site if it were sourced from adjacent land. However these impacts can be avoided relatively easily by utilizing two readily available sources of waste sand and stone, which are:

- Material excavated to create the foundations of the piers that will support the ROB structure (if suitable); and

- Sand and stone materials to be excavated from the construction of the treatment ponds the STP site

89. Using these sources would have the additional benefit of providing a beneficial use for what would otherwise be large quantities of waste material, so it will be very important to coordinate these activities to enable this to be done.

90. Moving such a large quantity of material could cause further physical impacts, including the creation of dust during dry weather and silt-laden runoff during rainfall, both of which would affect people who live and work near the site and reduce the quality of adjacent land. The Contractor will almost certainly plan the work to ensure that all earthworks are conducted during the dry season to avoid the difficult working conditions that prevail during the monsoon, so this will avoid any problems from runoff. It will however be necessary to prevent dust, so the Contractor should be required to:

- Excavate the bridge foundations at the same time as the access ramps are built so that dug material is used immediately, avoiding the need to stockpile on site;

- Damp down exposed soil and any sand stockpiled on site by spraying with water when necessary during dry weather; and

- Use tarpaulins to cover sand and other loose material when transported by truck.

91. Conducting the work in the dry season should avoid any drainage problems from rainfall collecting in the bridge- and ramp- foundations during excavation, and although groundwater often collects in deeper voids, this should also not be a problem at this site because of the very low water table in Sawai Madhopur.

92. The creation of ramps will gradually alter the topography and appearance of the site, and the work to install the pre-cast ROB sections will be especially visible in the local landscape. Visual impacts could be mitigated by erecting wooden fences to screen the site from view, but it is not considered that this will be necessary at this site, which is a congested road and rail junction with a very disrupted and “busy” appearance, that will not be significantly exacerbated by the construction activities.

3. Ecological Resources

93. There are no protected areas in or around subproject site of Sawai Madhopur, and no known areas of ecological interest, and there are 8-10 trees at the site that need to be removed. The work should therefore have minor ecological impacts.

4. Economic Development

94. Although much of this work will be conducted within the ROW of the existing roads and railway, there may be a need to acquire some land at the periphery of the site and for the construction of temporary access roads. This will be obtained through the legal mechanism of the Land Acquisition Act (1894) through which the government purchases the land compulsorily from the owners at a rate that is established on the basis of recent transactions. Land that may need to be acquired includes a small strip of the grounds of an educational establishment (including a boundary wall), and small plots occupied by some traders and a tea stall. ADB policy on Involuntary Resettlement requires that no one should be worse-off as a result of the

subproject, so a Resettlement Plan and Resettlement Framework have been prepared to examine these issues. This establishes that no more than 10 % of the total land of any owner or occupant should be acquired, and that if any business premises have to be removed, the owners or tenants should be provided with:

- Compensation equivalent to the amount of business income lost; and
- Compensation at replacement cost for any income-generating assets (e.g. shop premises) that have to be removed.

95. Certain roadside shops that are not purchased may still lose income because the presence of the construction site will deter customers, and access will be impeded by road closures, the presence of heavy vehicles and machinery, etc. These issues are also dealt with by the Resettlement Plan and Framework, which indicate that these impacts will be mitigated by:

- Keeping road closures to the minimum in terms of frequency, duration and extent;
- Maintaining vehicle and pedestrian access to roadside businesses wherever possible; and
- Providing owners and tenants with financial compensation equivalent to the amount of business income lost.

96. Transportation is the other principal economic activity that will be impeded by this work, as the existing road will be removed at the location of the access ramps and gradually replaced by the new embankments. Trains will also have to travel slowly in the vicinity of the site, and when work is conducted close to the line, the train service may need to be interrupted temporarily. These impacts could be significant given the amount of traffic using this crossing and the frequency of the train service. These impacts will need to be mitigated by careful planning of the construction program, in conjunction with the road, rail and municipal authorities and the police, in order to:

- Maintain safe passage for vehicles and pedestrians throughout the construction period;
- Provide effective, well signposted diversions and alternative routes when required;
- Conduct work that requires the closure of roads and the level crossing at times of low traffic volume;
- Conduct work on or close to the railway line at times when there are fewer trains; and
- Schedule truck deliveries of soil to the site for periods of low traffic volume.

97. Excavation could also damage existing infrastructure (such as water distribution pipes, electricity pylons, etc) located alongside the roads. 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 Council of the nature and location of all existing infrastructure, and planning excavation carefully to avoid any such sites if possible; and

- Integrating construction of the various infrastructure subprojects conducted in Sawai Madhopur (transport, water supply, 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 construction in the same area at different times for different purposes.

5. Social and Cultural Resources

98. 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. In this case the excavation will occur in and around an existing roadway, so it could be that there is a low risk of such impacts. Nevertheless this should be ascertained by consulting the appropriate authorities and steps should be taken according to the nature of the risk. This should involve:

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

- Considering an alternative transportation subproject if the site is found to be of medium or high risk;

- Including state and local archaeological, cultural and historical authorities and interest groups in consultation forums as subproject stakeholders so that their expertise can be made available to the subproject; 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, and calling in the state archaeological authority if a find is suspected, and taking any action they require ensuring its removal or protection in situ.

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

100. Although this is not a major residential area, there are some living quarters in the vicinity of the site, so action should be taken to minimize disturbance as far as possible. This will require:

- Consultation with the local community to inform them of the nature, duration and likely effects of the construction work, and to identify any local concerns so that these can be addressed;

- Involving the community in planning the work programme so that any particularly noisy or otherwise invasive activities can be scheduled to avoid sensitive times;

- Avoiding conducting noise-generating activities at night;

- Implementing the measures described in Section IV.B.2 above to reduce dust;

- Utilizing modern vehicles and machinery with the requisite adaptations to limit noise and exhaust emissions, and ensuring that these are maintained to manufacturers' specifications at all times.

101. 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 appropriate Personal Protective Equipment;

- Health and Safety Training for all site personnel;

- Documented procedures to be followed for all site activities; and

- Documentation of accidents and work-related incidents.

102. An additional, particularly acute health risk derives from the fact that, as mentioned above, the existing water supply system comprises mainly asbestos cement (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 subproject to avoid this, of which the most important is that the locations of all new infrastructure will be planned to avoid locations of existing AC pipes so AC pipes should not be discovered accidentally.

103. Given the dangerous nature of this material for both workers and the public, additional precautions should be taken to protect the health of all parties in the event (however unlikely) that AC pipes are encountered. The design consultant should therefore develop a protocol to be applied in any instance that AC pipes are found, to ensure that appropriate action is taken. This should be based on the approach recommended by the United States Environmental Protection Agency (USEPA)[4], and amongst other things, should involve:

- Training of all personnel (including manual laborers) to enable them to understand the dangers of AC pipes and to be able to recognize them in situ;

[4] 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

- Reporting procedures to inform management immediately if AC pipes are encountered;

- Development and application of a detailed health and safety (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.

104. 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 direct these benefits to the communities directly affected by the work, the Contractor should be required to employ at least 50% of his labor force from communities in the vicinity of the site. This will have the added benefit of avoiding social problems that sometimes occur when workers are imported into host communities, and avoiding environmental and social problems from workers housed in poorly serviced camp accommodation.

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

A. Screening Out Areas of No Significant Impact

105. Because roads and bridges generally operate without the need for major repair and maintenance (see below), there are several environmental factors that should be unaffected once the new ROB begins to function. These are identified in **Table 6.1** below, with an explanation of the reasoning in each case. These factors are thus screened out of the impact assessment and will not be mentioned further.

Table 6.1: Fields in which Operation and Maintenance of the Completed Road Improvement is not Expected to have Significant Impacts

Field	Rationale
Climate	Exhaust gases affect air quality but a new road does not alter climate
Fisheries & aquatic biology	There are no rivers or lakes close to the ROB site
Wildlife, forests, rare species, protected areas	Ranathambore Tiger Reserve and National park are located about 10 km from project site and no activity will be permitted within these protected areas.
Coastal resources	Sawai Madhopur is not located in a coastal area

B. Operation and Maintenance of the New ROB

106. The new ROB will have a design life of 30 years, during which time it should require no major repair or refurbishment, beyond routine maintenance, which will include:

- Small scale ad hoc repairs of surface damage caused by traffic use or accidents;

- Repairs and replacement of damaged safety barriers and signs; and

- Regular unblocking of drains to prevent damage from flooding in the monsoon.

107. The stability and integrity of the bridge should also be monitored periodically to detect any problems and allow remedial action if required.

108. These operations will be the responsibility of the Municipal Highway Department, who will be given training by this program and provided with an operating budget for these purposes.

C. Environmental Impacts and Benefits of the Operating ROB

1. Physical Resources

109. Once the ROB is completed and operating it will improve the physical environment by removing the severe traffic congestion that is such a feature of this location at present, with the resulting concentration of vehicle noise and pollution. This will be replaced by a modern elevated roadway, which allows the maintenance of a smooth flow of traffic into and out of the town and avoids the obstruction created by the former level crossing.

110. The ROB will however elevate the traffic 7.5 m above ground level, making the traffic and the structure significantly more visible than at present. This would not necessarily be a negative visual impact if the scheme included measures to mask the structure and give it a more pleasing appearance, for example by planting large-growing native trees at the periphery which would also provide a natural barrier to noise, dust and exhaust gases so the planting of trees should be incorporated into the scheme.

111. When routine repairs are conducted to the road and ancillary facilities (signage, etc), the work will be very small in scale, and conducted manually by small teams of men with simple equipment (shovels, wheelbarrows, tarmac blender, etc). Even if larger vehicles are used to refurbish larger portions of the road the work will be very short in duration and will not cause significant physical impacts.

112. Although the ROB is located in an area of seismic risk, it will be designed according to standard Indian Engineering Design Codes, which include measures to allow the structure to withstand tremors of the expected magnitude and above. There should therefore be little risk of the structure failing, even if the area is subject to seismic events of greater magnitude than those that have occurred over recent years.

2. Ecological Resources

113. As there are no significant ecological resources in or around the town, the operation of the ROB and the routine maintenance and repair of the road and surroundings will have no ecological impacts. In fact by planting trees near the ROB there would be some small ecological gain from the planting of trees to mask the visual impact of the structure.

3. Economic Development

114. The ROB will improve the infrastructure of the town by providing a more efficient and effective transportation route, and this should have positive impacts on the overall economy by reducing time spent idle in stationary traffic by delivery vehicles, employees and customers. It may also make further positive contributions to the development of particular sectors, for example by making the area more attractive to tourists and allowing the more efficient transportation of agricultural produce and other goods to and from the town.

115. Traffic may be interrupted temporarily if the road or bridge is repaired and maintained, but this work will be very small in scale, infrequent, and short in duration, so there should be no economic or other implications. To maintain the safety of workers and road-users, such work should be coordinated with the local police department so that adequate warning signs and traffic diversions can be set up when necessary.

4. Social and Cultural Resources

116. Effects of the operating ROB on social and cultural resources in the town will be relatively small in scale and intangible in nature, and are thus difficult to assess and quantify.

117. The citizens of the town will benefit from a more effective transportation route as they will spend less time in stationary traffic exposed to noise, pollution and the associated physical and psychological stresses. Since people commuting on this road will save time, they will socially much better off then before. People may also benefit in a small way as it will be easier for people to reach schools, hospitals, temples, museums. People may also benefit from an improvement in the economy of the town, although it would require much larger improvements in transportation and other infrastructure for this to be recordable.

118. Repairs to the road and bridge will not be physically invasive so there will be no risk to historical remains, and as there are no areas or resources of social or cultural importance in the vicinity there will be no risk to such features.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. Summary of Environmental Impacts and Mitigation Measures

119. **Table 7.1** lists the potential adverse impacts of the Sawai Madhopur transportation 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 program is shown as the quarter of each year in which each activity will occur, which relates to the subproject program described in Section II. 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 +).

B. Institutional Arrangements for Project Implementation

120. 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 subproject implementation in the town and provide recommendations to the IPIU where necessary.

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

Figure 7.1: Institutional Responsibly- RUSDIP

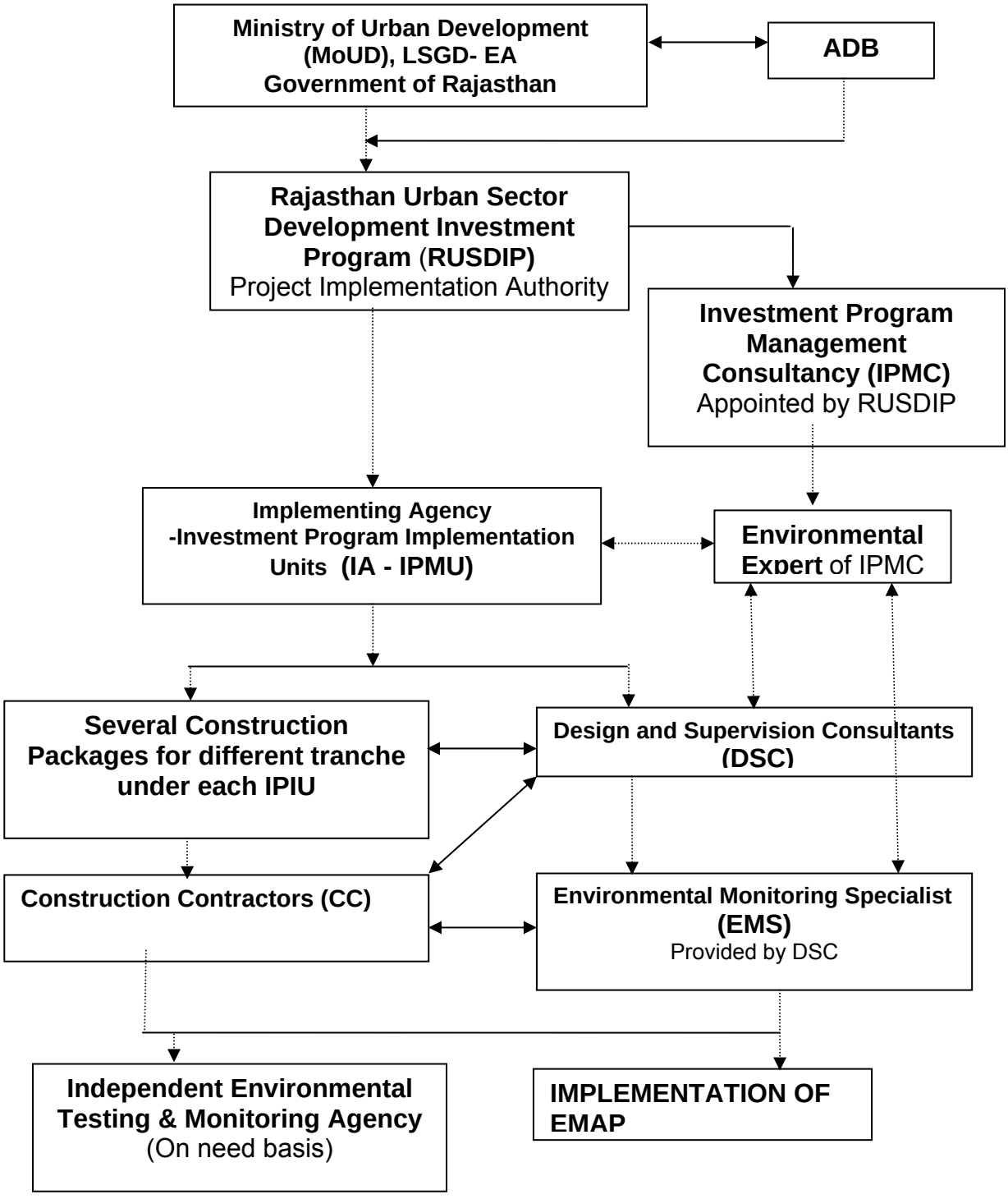


Table 7.1: Environmental Impacts and Mitigation for the Sawai Madhopur Transportation Subproject (Black = continuous activity; Grey = intermittent)

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Responsibility	Location	08	2009				2010			
Construction: Road Over Bridge -						D	1	2	3	4	1	2	Op	[5]
Excavation of material to fill access ramps will change drainage, air & soil quality, topography at extraction site	M	P	Use waste sand and stone from sewerage subproject and material dug to create bridge pier foundations	DSC and Contractor	STP/ROB									+
Transporting sand and building ramps could create dust	M	T	Use tarpaulins to cover sand when carried on trucks	Contractor	On/off site									0
			Spray ramps and soil stockpiles with water in dry weather	Contractor	ROB site									0
Dust could be blown from soil stockpiled on site	M	T	Excavate foundations at same time as ramps are built so that dug soil can be used immediately without stockpiling	Contractor	ROB site									0
Rain may collect in dug areas and wash soil off stockpiles	M	T	Conduct excavation and ground works in dry season	Contractor	ROB site									0
Some owners will lose land needed for the subproject	M	P	*Purchase land as described in Resettlement Framework	LSGD	ROB site									0
			Avoid taking >10% of the total land of any occupant	DSC	ROB site									0
Some business premises may need to be removed	M	P	*Compensate business owners/tenants for lost income	LSGD	ROB site									0
			*Compensate owners for lost income-generating assets											0
Shops that remain may lose income if access is difficult for customers	M	T	*Compensate owners/tenants for lost business income	LSGD	ROB site									0
			Keep road closure to minimum (frequency, duration)	Contractor	ROB site									0
			Maintain vehicle and pedestrian access when possible											0
Road and rail traffic will be disrupted by construction work	M	T	Plan work with road, rail and town authorities and police	DSC and Contractor	ROB site									0
			Keep road and railway closures to a minimum	Contractor	ROB site									0
			Maintain safe passage of vehicles/pedestrians at all times											0
			Provide effective diversions & alternative routes if needed											0
			Conduct work that requires road and railway closure at times when traffic volume is low											0
			Conduct work near railway at times when trains are fewer											0
			Schedule truck sand deliveries for periods of low traffic											0
Existing infrastructure could be damaged by construction	S	P	Determine locations of water pipes, electricity pylons, etc and design scheme to avoid damage	DSC	ROB site									0
			Locate different infrastructure on opposite sides of road											0
Roads/people may be disturbed by repeated excavation	M	T	Integrate subprojects to conduct excavation at same time	DSC/LGD	ROB site									0
Ground disturbance could damage archaeological and historical remains	S	P	Request state and local archaeological authorities to assess archaeological potential of the site	DSC	ROB site									0
			Select alternatives if site has medium-high potential	DSC										0
			Include state and town historical authorities as subproject stakeholders to benefit from their expertise	LSGD										0

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
[5] 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, see Section VII.B

Potential Negative Impacts	Sig	Dur	Mitigation Activities and Method	Respons ibility	Location	08	2009				2010			
Construction: Road Over Bridge -						D	1	2	3	4	1	2	Op	[5]
			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										+
People living nearby may be disturbed by noise, dust	M	T	Inform community of work in advance; address concerns	Contractor	ROB site									0
			Plan work with community; avoid work at sensitive times											0
			Avoid conducting noise-generating activities at night											0
			Reduce dust by spraying soil and covering with tarpaulins											0
			Use modern vehicles/machinery & maintain as specified											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	ROB site									0
			- Exclude the public from site;											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, and if damaged due to digging etc., the material emissions can be carcinogenic if inhaled as dust particles	S	T	Design all infrastructure to avoid locations of AC pipes	DSC	All sites									0
			Train all construction personnel in dangers of AC pipes and how to recognise them in situ	Contractor	All sites									0
			Develop and apply protocol if AC pipes are encountered. This should include:	DSC and Contractor	ROB site									0
			- immediate reporting of any occurrence to management;	Contractor	ROB site									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 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 site	Contractor	ROB site									+
Operation and Maintenance														
New bridge will be more visible than present crossing	M	P	Plant and maintain large growing native trees at periphery	DSC/CC	ROB site									0
Worker safety at risk when conducting road repairs	M	T	Coordinate with police - provide warning signs/diversions	OMC	ROB site									0

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

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

C. Environmental Monitoring Plan

124. **Table 7.1** shows that most mitigation activities are the responsibility of the Construction Contractors 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 subproject proponent, and some actions related to the design that will be implemented by the DSC.

125. 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[6].

126. **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.

127. **Table 7.2** shows the proposed Environmental Monitoring Plan (EMP) for this subproject, which specifies the various monitoring activities to be conducted during all phases. Some of the

[6] 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)

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.

D. Environmental Management and Monitoring Costs

128. Most of the mitigation measures require the CC 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 CC or DSC are included in the budgets for the civil works 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 subproject, so this also does not need to be duplicated here. Costs of acquiring land and compensating businesses for loss of income during the construction period are calculated separately in the budgets for the Resettlement Framework and Resettlement Plans so are also excluded from this analysis.

129. The remaining actions in the EMP are the various environmental monitoring activities to be conducted by the EMS. These have not been budgeted elsewhere, and their costs are shown in **Table 7.3.** The figures show that the total cost of environmental management and monitoring for this subproject as a whole (covering design and construction) is INR 0.69 million, i.e. US$ 16046.

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	150,000	150,000	540,000
2. Environmental mitigation and greenery development	Lump sum	150,000	150,000	150,000
TOTAL				690,000

[7] Unit costs of domestic consultants include fee, travel, accommodation and subsistence

Table 7.2: Environmental Monitoring Plan

Mitigation Activities and Method	Location	Responsible for Mitigation	Monitoring Method	Monitoring Frequency	Responsible for Monitoring
CONSTRUCTION					
Use waste sand/stone from STP ponds and bridge foundations	STP/ROB site	DSC/CC	Site observations; CC records	Monthly	EMS
Use tarpaulins to cover sand when carried on trucks	On/off site	CC	Observations on/off site	Weekly	EMS
Spray soil ramps and stockpiles with water in dry weather	ROB site	CC	Site observations	Weekly	EMS
Excavate foundations at same time as ramps are built	ROB site	CC	Site observations	Monthly	EMS
Conduct excavation and ground works in dry season	ROB site	CC	Site observations	Monthly	EMS
*Purchase land as described in Resettlement Framework	ROB site	LSGD	Landowner surveys; LSGD records	As needed	IMA[8]
Avoid taking >10% of the total land of any occupant	ROB site	DSC	Landowner survey; DSC records	As needed	IMA
*Compensate business owners/tenants for lost income	ROB site	LSGD	Owner/tenant surveys; LSGD records	As needed	IMA
*Compensate owners for lost income-generating assets	ROB site	LSGD	Owner surveys; LSGD records	As needed	IMA
Keep road and rail closure to a minimum frequency and duration	ROB site	CC	Site observations; CC records	Monthly	EMS
Maintain vehicle and pedestrian access when possible	ROB site	CC	Site observations; shopkeeper survey	Weekly	EMS
Plan work with road, rail and town authorities and police	ROB site	DSC/CC	Design reports	Monthly	EMS
Maintain safe passage of vehicles and pedestrians at all times	ROB site	CC	Site observations; CC records	Weekly	EMS
Provide effective diversions and alternative routes if needed	ROB site	CC	Site observations; CC records	Weekly	EMS
Conduct work requiring road/railway closure at times of low traffic	ROB site	CC	Site observations; CC records	Weekly	EMS
Conduct work near railway at times when trains are fewer	ROB site	CC	Site observations; CC records	Weekly	EMS
Schedule sand deliveries by truck for periods of low traffic	ROB site	CC	Site observations; CC records	Weekly	EMS
Determine locations of infrastructure and design scheme to avoid	ROB site	DSC	DSC records; design reports	As needed	EMS
Locate different infrastructure on opposite sides of roads	ROB site	DSC	Site observation; design reports	Monthly	EMS
Integrate subprojects to conduct excavation at same time	ROB site	DSC/LSGD	Site observation; design reports	Monthly	EMS
Request archaeological authorities to assess potential of all sites	ROB site	DSC	DSC records; design reports	As needed	EMS
Select alternatives if sites have medium or high potential	ROB site	DSC	DSC records; design reports	As needed	EMS
Include state and town historical authorities as stakeholders	ROB site	LSGD	LSGD records; meeting records	As needed	EMS
Develop and apply archaeological protocol to protect chance finds	ROB site	DSC/CC	DSC and CC records; site observations	Weekly	EMS
Inform community of work in advance and address their concerns	ROB site	CC	CC records; resident surveys	Monthly	EMS
Plan work with the community; avoid working at sensitive times	ROB site	CC	Resident surveys; site observations	Weekly	EMS
Avoid conducting noise-generating activities at night	ROB site	CC	Resident surveys; site observations	Weekly	EMS
Use modern vehicles and machinery and maintain as specified	ROB site	CC	Site observations; CC records	Monthly	EMS
Prepare and implement a site H&S Plan (safety of workers/public)	ROB site	CC	Site observations; CC records	Monthly	EMS
Exclude public from the site	ROB site	CC	Site observations; CC records	Monthly	EMS

[8] 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
Ensure that workers wear Personal Protective Equipment	ROB site	CC	Site observations; CC records	Monthly	EMS
Provide Health and Safety training for all personnel	ROB site	CC	CC records; worker interviews	Monthly	EMS
Follow documented procedures for all site activities	ROB site	CC	Site observations; CC records	Monthly	EMS
Keep accident reports and records	ROB site	CC	CC records	Monthly	EMS
Design infrastructure to avoid known locations of AC pipes	All sites	DSC	DSC records; design reports	As needed	EMS
Train all personnel in dangers and recognition of AC pipes	All sites	CC	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	CC	Site observations; CC records	Weekly	EMS
Remove all persons to safe distance	All sites	CC	Site observations; CC records	Weekly	EMS
Workers handling AC: wear breathing apparatus; protective suits	All sites	CC	Site observations; CC records	Weekly	EMS
All AC material must be removed and disposed of safely	All sites	CC	Observations on and off site; CC records	As needed	EMS
Employ at least 50% of workforce from communities near sites	ROB site	CC	CC records; worker interviews	Monthly	EMS
OPERATION AND MAINTENANCE					
Plant and maintain large growing native trees at periphery of site	ROB site	DSC/CC	Site observations; CC records	As needed	EMS
Coordinate repairs with police – provide warning signs/diversions	ROB site	OMC	Site observations	As needed	GA

VIII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project Stakeholders

130. Most of the main stakeholders have already been identified preliminary. If any other stakeholders that are identified during subproject 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 facilities will be built;
- 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 artifacts; and
- State and local tourism authorities.

131. Secondary stakeholders are:

- LSGD as the Executing Agency;
- Other government institutions which handle areas or issues affected by the subproject (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

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

- Awareness and extent of the subproject and development components;
- Benefits of subproject for the economic and social upliftment of community;
- Labor availability in the subproject area or requirement of outside labor involvement;
- Local disturbances due to subproject construction work;

- Necessity of tree felling etc. at subproject sites;
- Water logging and drainage problem,, if any;
- Drinking water problem;
- Forest and sensitive area nearby the subproject site; and
- Movement of wild animal, if any

133. Local populations are very much interested on the subproject and they will help subproject authorities in all aspects. Public consultation results specifically on environmental issues are shown in **Appendix 4**

134. The public Consultation and group discussion meeting were conduct by RUIDP on 30 June 2008 after advertising in local newspapers. The objective of the meeting was to appraise the stakeholders about the environmental and social impacts of the proposed program and the safeguards provided in the program to mitigate the same. In the specific context of Sawai Madhopur the environmental and social impacts of the proposed subprojects under Tranche 2 in Sawai Madhopur were discussed.

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

- Proposed ROB subproject is to ensure proper movement of city traffic round the clock;
- Executive agency should give preference to engage internationally reputed contractor like Gammon, HCC, etc as people do not faith about the local contractors in respect of quality of works as well as timely completion of work;
- Livelihood affected households should be given assistance in the mode of cash compensation;
- Local people should be employed by the contractor during construction work;

- Adequate safety measures should be taken during construction work;
- Mobile kiosks/vendors/hawkers have shown willingness to shift in nearby places without taking any compensation and assistance from the EA; and
- Local people have appreciated the ROB proposal of the government and they have ensured that they will cooperate with the EA during project implementation.

C. Future Consultation and Disclosure

136. 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 program, 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 subproject design, construction or operation where appropriate. The program 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; and
  - Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the subproject.
- Consultation during construction:
  - Public meetings with affected communities to discuss and plan work programs 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
- Subproject disclosure:
  - Public information campaigns (via newspaper, TV and radio) to explain the subproject to the wider city population and prepare them for disruption they may experience once the construction programme is underway;
  - Public disclosure meetings at key subproject stages to inform the public of progress and future plans, and to provide copies of summary documents in Hindi; and

- Formal disclosure of completed subproject 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

137. The Sawai Madophur subproject 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. Moreover, urban residents including nearby the rural residents in surrounding hinterland will benefit from improved roads and bridges allowing better access to urban markets and social services provided in the subproject towns. 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.

138. During subproject 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.

139. The process described in this document has assessed the environmental impacts of the ROB proposed under the Sawai Madhopur Urban Transport and Roads 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 subproject design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the outline designs for the infrastructure. These include locating all the facilities within the ROW of existing roads, to avoid the need to acquire land or relocate people.

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

141. A change has also been made to the location of elements of the subproject to further reduce impacts. This is to locate as much of the proposed road improvement within the ROW of the existing roads and rail line to reduce the need to acquire land and avoid relocating people.

142. Regardless of these and various other actions taken during the IEE process and in developing the subproject, there will still be impacts on the environment when the ROB is built and when it is operating. This is mainly because of the relatively large size of the structure, its location at a busy road and rail intersection, and the fact that the work involves some excavation so there could be a risk of uncovering historical remains from the rich cultural history of Rajasthan. Because of these factors the most significant impacts are on the physical environment, the human environment, and the cultural heritage.

143. During the construction phase, impacts mainly arise from the need to import a large quantity of waste soil to fill RCC box-units built to raise the level of the approach roads, and because the work will inevitably cause some disruption to road and rail traffic. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. These include:

- Covering soil during transportation and when stored on site;
- Watering exposed soil during dry and windy weather; and
- Planning work with the appropriate authorities to minimize disruption of road/rail traffic.

144. There could also be a need to acquire a small amount of land at the periphery of the site, which includes a thin strip inside the boundary of some establishments. 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 occupant is acquired; and
- Providing additional compensation for loss of business and income-generating assets.

145. 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 the site, and selecting an alternative subproject if the site is considered to be of medium or high risk;
- Including archaeological, cultural and historical authorities and interest groups as subproject 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.

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

- Avoid all known sites of AC pipes when the locations of new infrastructure are planned in the detailed design stage;
- Train all construction personnel to raise awareness of the dangers of AC and enable early recognition of such pipes if encountered; and

- Develop and apply a protocol to protect workers and the public if AC pipes are encountered (including evacuation of the immediate area, use of protective equipment by workers, and safe removal and disposal of AC material).

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

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

- Plant large-growing trees at the periphery of the site to mask it from view and give it a more natural and pleasing appearance.

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

149. Once the ROB is completed, it will operate with routine maintenance (such as occasional repairs of the road, safety barriers and signs), which will be small-scale, infrequent and short in duration and should not affect the environment. The only mitigation required in this period is to plan any maintenance work with the town authorities and police to ensure adequate precautions are taken to maintain the safety of workers and road users.

150. The main impacts of the operating ROB will be beneficial in improving the infrastructure of the town by providing a more efficient and effective transport route, which should improve the overall economy by reducing time spent idle in traffic by delivery vehicles, employees and customers. The general environment will also be improved at this location as the daily concentration of vehicular noise and pollution from exhaust gases will be removed.

151. **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).

152. Mitigation will be assured by a program of environmental monitoring conducted during both construction and operation to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. This will include observations on and off site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the IPMU.

B. Recommendations

153. There are two straightforward but essential recommendations that need to be followed to ensure that the environmental impacts of the subproject are successfully mitigated. These are that LSGD should ensure that:

- All mitigation, compensation and enhancement measures proposed in this IEE 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.C of this report and the internal and external monitoring proposed in the Resettlement Framework are also implemented in full.

X. CONCLUSIONS

154. The environmental status of the proposed improvements in urban transport and road (ROB) sector in Sawai Madhopur Town has been assessed. Issues related to Involuntary Resettlement were assessed by a process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the subproject.

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

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

APPENDIX 1: Photo Graphs

Proposed ROB Site

Proposed ROB Site

Proposed ROB Site

Proposed ROB Site

APPENDIX 2: Rapid Environmental Assessment (REA) Checklist

Rapid Environmental Assessment (REA) Checklist	**ROADS AND HIGHWAYS**

- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:	RUSIDP
Sector Division	**ROB - Sawai Madhopur**

SCREENING QUESTIONS	**Yes**	**No**	**REMARKS**
A. Project Siting			
Is the project area adjacent to or within any of the following environmentally sensitive area?			
● Cultural heritage site		X	The nearest cultural heritage site is one famous Ganesh temple located more than 9 km from subproject location
● Protected Area		X	The Ranthambore Tiger Reserve and National Park are located more than 7 km from the subproject site
● Wetland		X	There is no wetland system nearby the site
● Mangrove		X	There is no sea shore nearby, thus mangrove population not expected
● Estuarine		X	There is no sea shore nearby
● Buffer zone of protected area		X	From center of the forest area subproject location is more than 12 km
● Special area for protecting biodiversity		X	The Ranthambore Tiger Reserve and National Park are located more than 7 km from the subproject site
● Bay		X	No bay nearby
B. Potential Environmental Impacts			
Will the Project causes ……..			
♦ Encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?	X		The subproject is a ROB and will alter the present road configuration. However it will not encroach on any historical/cultural areas.
♦ Encroachment on precious ecology (e.g. sensitive or protected areas)?	□	X	The subproject is not encroaching any ecological sensitive area. Only 8 to 10 trees will be fell before construction. Necessary permits and approval will be obtained prior to cutting.
♦ Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?	X		The subproject is a ROB not crossing any river. There is no surface water near the subproject site.
♦ Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	X		Increase in soil erosion is expected during construction but this impact is temporary and localized. Construction activities will be done during dry season. Excessive water spraying for dust suppression may also cause soil run-off. Mitigation measures to be provided will be

				included in the Environmental Management Plan (EMP). Conditions are included in the Contractors Contract to ensure EMP are implemented. Construction of labor camp will be as per the guidelines given in EMP
♦	Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	X		Crusher and hot mix plant for the subproject will be installed at least 500m away from the settlement and after getting No Objection Certificate from State Pollution Control Board (SPCB)
♦	Noise and vibration due to blasting and other civil works?	X		No blasting operations will be undertaken. Other activities will be as per the guideline as in EMP for the subproject , so impact will be minimum.
♦	Dislocation or involuntary resettlement of people	X		Some structures will be impacted. Affected persons will be compensated as per Rehabilitation and Resettlement policy of the subproject
♦	Other social concerns relating to inconveniences in living condition in the project areas that may trigger cases of upper respiratory problems and stress?	□	X	Construction of labor camp will be as per the guidelines given in EMP. If guidelines are implemented problem will be minimum.
♦	Hazardous driving conditions where construction interferes with pre-existing roads?	□	X	Traffic transportation plan for construction site will be prepared to minimize such problems
♦	Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	X	□	Construction of labor camp will be as per the guidelines given in EMP. If guidelines are implemented problem will be minimum
♦	Creation of temporary breeding habitats for mosquito vectors of disease?	X	□	Proper sanitation and hygienic condition will be maintained at construction sites, which will minimize the problem.
♦	Dislocation and compulsory resettlement of people living in right-of-way?	X	□	Affected persons will be compensated as per R&R policy of the subproject
♦	Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life?	X	□	Will be included in the Traffic Transportation Plan and in the EMP. Conditions are included in the Contractors Contract to ensure EMP are implemented.
♦	Increased noise and air pollution resulting from traffic volume?	X	□	Included in the EMP. Conditions are included in the Contractors Contract to ensure EMP are implemented.
♦	Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	X	□	Included in the EMP. Conditions are included in the Contractors Contract to ensure EMP is implemented.

APPENDIX 3: Inventory of Existing Trees along the Chainage

Chainage (meter)	Right hand side	Left hand side
0.00 +100.00		
100.00+200.00	2	2
200.00+300.00	2	1
300.00+400.00	1	
400.00+500.00	2	
500.00+600.00		1
600.00+700.00	3	2
700.00+800.00	1	4
800.00+900.00	1	
900.00+1000.00	3	3
1000.00+1100.00	2	1
1100.00+1200.00	2	1
1200.00+1300.00	3	1
1300.00+1400.00		3
1400.00+1500.00	1	3
1500.00+1600.00		1
1600.00+1700.00	3	2
Total	**26**	**25**

APPENDIX 4: Public Consultation- Environment

Sub Project-: ROB (Sawai Madhopur)

Issues discussed

- Awareness and extent of the subproject and development components
- Benefits of Subproject for the economic and social upliftment of community
- Labor availability in the Subproject area or requirement of outside labor involvement
- Local disturbances due to Subproject Construction Work
- Necessity of tree felling etc. at subproject sites
- Water logging and drainage problem if any
- Drinking water problem
- Forest and sensitive area nearby the subproject site
- Movement of wild animal if any

1. Date & time of Consultation- 20.06.08 at 10.30 AM
Location: - Kharida (Near proposed ROB site)

Table: Issues of the Public Consultation- Design phase

Key Issues/Demands	Perception of community
1. Awareness of the subproject – including coverage area	People are aware of the ROB subproject. DSC consultant informed the people about the proposed projects and invest plan on different component of the subproject.
2. In what way they may associate with the subproject	They demand that local people of the area should be engaged during implementation of the same. Local ward members should be informed during the implementation they will provide all types of assistance during implementation
3. Presence of any forest, wild life or any sensitive / unique environmental components nearby the subproject area	During consultation it was found that no as such impact on sensitive area.
4. Presence of historical/ cultural/ religious sites nearby	No historical or religious building comes on the alignment of the ROB
5. Unfavorable climatic condition	May –to- June there is very hot season; otherwise the condition of climate is favorable for work. Local labor is ready to work in any climatic condition
6. Occurrence of flood	Due to poor drainage condition people suffer from water stagnancy in their area especially in the market area and road side areas. No report of Flood in the subproject area.
7. Drainage and sewerage problem facing	Due to poor drainage condition people suffer from water stagnancy in the area and road side areas. No sewerage system in the subproject area exist
8. Present drinking water problem – quantity and quality	People get water supply from PHED. Quantity is not sufficient and quality is not good – hard water with high TDS. To meet the demand local people exploring ground water through hand pumps and wells.
9. Present solid waste collection and disposal problem	Municipality takes care of the Solid waste collection, which is manually & disposed off in disposal site.
10. Availability of labor during construction time	Sufficient will be available in this area.
11. Access road to subproject site	Road available.
12. Perception on tree felling and afforestation	It has been explained that during implementation of the ROB no tree is going to be affected.
13. Dust and noise pollution and disturbances during construction work	People are aware of these problems. It has been explained that as per safeguard policy of the subproject for abatement of pollution, control measures will be required.

	Vehicles movement will be controlled & appropriate measure will be taken to combat the same.
14. Setting up worker camp site within the village/ subproject locality	Construction camp should be located away from the residential place. DSC consultant assured that camp will be located as per EMP of the subproject
15. Safety of residents during construction phase and plying of vehicle for construction activities	People are aware of the problem. It has been explained that as per Safeguard policy of the subproject vehicles movement will be controlled & appropriate measure will be taken to combat the same
16. Conflict among beneficiaries down stream users – water supply subproject using of river water	Not applicable for ROB subproject
17. Requirement of enhancement of other facilities	Yes they want. They want the conservation of the heritage structures
18. Whether local people agreed to sacrifice their lands (cultivable or not) for beneficial subproject after getting proper compensation	Yes, people are ready to sacrifice their lands (cultivable or not) for beneficial subproject after getting proper compensation.
19. Impact of the ROB in their daily life	As the subproject do not require any land acquisition and there is no permanent impact on the livelihood and other way people will get rid of the traffic congestion so they are happy if subproject will be implemented.

NAME AND POSITION OF PERSONS CONSULTED:

Azad bhai: shopkeeper
Sureshji: shopkeeper
Zahid ali: shopkeeper
Vijendra : shopkeeper
Prasji ; shopkeeper
Kamal dikshit : Teacher
Balwant singh : Local Leader
Ram rattan Nama : shopkeeper
Laxman ji : Hawker
Madan salawat; shopkeeper
Abid ansari : shopkeeper
Govind sharma : Teacher
Tarachand sharma : teacher
Rajeshji : shopkeeper
Vimal Thakker : Teacher
Vinod Jain: shopkeeper
Tarachand : Shoe repair shop
Ankit: shopkeeper
Salam : shopkeeper
Chandra Mohan: shopkeeper
Mohanlal : shopkeeper
Virendra Jain : shopkeeper

Summary of out come:

People are well aware about the subproject through different sources. As the subproject do not require any land acquisition and there is no permanent impact on the livelihood and other way people will get rid of the traffic congestion, so they are happy if subproject will be implemented. The subproject doesn't have any negative impact on the community. People are ready to extend all types of support during execution of the subproject. They also want that water supply, sewerage, drainage and solid waste management projects should be taken up as early as possible.