CHAPTER – 1
INTRODUCTION

1.0 PREAMBLE

The word "Environment" is defined to include everything external to man/organism. It covers the region, surroundings, or circumstances in which anything exists. Environment is an important and essential part of the development. It plays an essential role in overall development of the country. Development, which keeps environment with itself, called sustainable development. Today, environment is degrading and exploited in many ways. Thus, the Ministry of Environment & Forest (MoEF) had formulated its policies & rules and made new policies & rules regarding operation of the industries to achieve sustainable development and to prevent slapdash exploitation of natural resources. An Environmental Impact Assessment (EIA) is an assessment of the possible impact-positive or negative-that a proposed project may have on the environment, together consisting of the natural, social and economic aspects Environmental Impact Assessment (EIA) is a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It is said to be the instrument through which the environmental management tries to accomplish its objective. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers.

Mr. Paras Sethi propose to develop River sand mine in, Revenue village Shivpura of Tehsil: Chohtan & District: Barmer, State: Rajasthan having lease area is 54.68 Ha. Total land of mining lease comes under Gair Mumkin Nadi, Nallah (Government land) as per details provided by Department of Mines & Geology, Rajasthan. No Forest land is involved in this area.

1.1 GENERAL INFORMATION ON MINING OF MINERALS

Indian mining industry is characterized by a large number of small operational mines. The number of mines which reported mineral production [excluding minor minerals, petroleum (crude), natural gas and atomic minerals] in India was 2076 in 2011-12 as against 2355 in the previous year. Out of 2076 reporting mines, 354 were located in Andhra Pradesh followed by Gujarat (308), Rajasthan (241), Madhya Pradesh (225), Karnataka (180), Tamil Nadu (156), Odisha (119), Jharkhand (106), Chhattisgarh (99), Maharashtra (86) and Goa (70). These 11 States together accounted for 93.64% of total number of mines in the country in the year 2011-12. Sand mining is a process of the actual removal of sand from the foreshore including rivers, streams and lakes. Sand is mined from beaches and inland dunes and dredged from river bed. The sand is dug up, the valuable minerals are separated in water by using their different density, and the remaining ordinary sand is re-deposited. River sand is vital for human well-being and for sustenance of rivers. River sand is one of the world's most plentiful resources (perhaps as much as 20% of the Earth's crust is sand) and has the ability to replenish itself. As a resource, sand by definition is a loose, incoherent mass of mineral materials and is a product of natural processes. These processes are the disintegration of rocks and corals under the influence of weathering and abrasion. Bajri continued to be most popular and leading construction material in view of being cheap, durable and very easy to handle.

1.2 PURPOSE OF REPORT

Economic, social and environmental change is inherent to development. Whilst development aims to bring about positive change it can lead to conflicts. In the past, the promotion of economic growth as the motor for increased well-being was the main development thrust with little sensitivity to adverse social or environmental impacts.

The environmental impacts of any new or expansion project must be surveyed, forecasted and evaluated by the project proponents in the process of designing the project. These results and findings

are then to be incorporated in the Environmental Impact Assessment (EIA) Report. A Final of Environmental Impact Assessment report has been prepared to comply with the Terms of Reference (TOR) received from MoEF vide letter no. J-11015/217/2013-IA.II (M) dated 14.10.2013, under EIA notification of the MoEF dated 14-9-2006, as amended on 1st Dec 2009 & 4th April 2011 and also the EIA Guidance Manual for Mining of Minerals (Feb, 2010) of MoEF, Govt. of India, for seeking environmental clearance for mining of sand in the applied mining lease area measuring 54.68 Ha.

Legal Framework related to Project

According to clause (e) of Section 3 of the MMDR Act, 1957 and as per Rule 70 of the MCR, 1960; sand is classified as minor mineral based on the end use. Mines and Minerals (Development & Regulation) Act, 1957, under section 15, empowers the State Government to make rules in respect of minor mineral. Mining Leases for the mineral Bajri are granted as provided in Rajasthan Minor Mineral Concession (Amendments) Rules, 2012 notified vide Department Notification No. F.14 (1) Mines/ Gr. II/ 2011 dated 23-05-2012 i.e. RMMCR, 1986.A PIL in the High Court of Rajasthan filed by an NGO, Nature Club of Rajasthan. The order was passed on dated 16 April' 2013 by Hon'ble Court giving directions to State Govt. to finalize the allotment of mining leases of Bajri (river bed sand) in the State within a period of six months as per new rules and adopt procedure for revenue collection under new rules only.A Civil Appeal No. (S) 9703 – 9706 of 2013 between Chief Secretary, Govt. of Rajasthan versus National Green Tribunal Bar Assn. & ORS of SLP (C) No. 34134 of 2013 {State of Rajasthan & ORS. V. Nature Club of Rajasthan (NGO)} and SLP (C) No. 34811/ 2013 {Naveen Sharma Vs. State of Rajasthan & ORS.} dated 25.11.2013 "Till the end of 24thFebruary' 2014, The Letter of Intent holders who have submitted their applications to the Ministry of Environment and Forests for environmenr clearances (numbering 82 only) can carry on mining operations in accordance with the Notification dated 21st June' 2012 of the Mines (Act 2) Department, Government of Rajasthan issued under rule 65A of the Rajasthan Mines and Mineral Concession Rules'1986". Based on above order, Govt. of Rajasthan allowed to continue sand mining permission been granted to work the proposed leases up to 28th February' 2014, which was further extended till 31st March 2014. On 27th March 2014, Hon'ble Supreme Court of India has further extended this duration till further order.

1.3 ENVIRONMENTAL CLEARANCE PROCESS

Stage (1) – Scoping

The proposed project falls under Category –'A' as per the EIA notification of 14th September 2006 and its amendment dated 1st December 2009. Mining Projects of ML area of $\geq$ 50 Ha is classified as "Category- A" projects. The authority for approval of TOR & issue / reject Environmental Clearance (EC) is Ministry of Environment & Forests (MoEF), Government of India (GoI) on the recommendations of Expert Appraisal Committee (EAC). The Environmental Clearance process for mining will comprise a maximum of three stages.

'Scoping' refers to the process by which the EAC determines detailed and comprehensive TOR addressing all relevant environmental concerns for the preparation of an EIA report in respect of the project or activity for which prior environmental clearance is sought. The EAC determines the TOR on the basis of information furnished in the prescribed application Form- 1, including TOR proposed by the applicant.

Stage (2) – Public Consultation

"Public consultation" refers to the process by which the concerns of local affected persons and others who have plausible stake in the environmental impact of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. After completion of the public consultation, the applicant shall address all the material environmental

concerns expressed during this process, and make appropriate changes in the Final EIA and EMP. The final EIA report, so prepared, shall be submitted by the applicant to the concerned regulatory authority for appraisal. The applicant may alternatively submit a supplementary report to Final EIA and EMP addressing all the concerns expressed during the public consultation.

Stage (3) - Appraisal

Detailed scrutiny by the EAC of the application and other documents like the final EIA report, outcome of the public consultations including public hearing proceedings, submitted by the applicant to the regulatory authority concerned for grant of EC.

1.4 COMPLIANCE TO THE TERMS OF REFERENCE (TOR)

The application for TOR of the Proposed River Sand Mining located in Revenue villages, Tehsil: Chohtan & District: Barmer, Rajasthan was submitted on dated 03.07.2013 and the same was considered in the 10th reconstituted committee of the Expert Appraisal Committee (EAC) meeting of MoEF scheduled on 22-23th August, 2013 was accorded vide letter No. J-11015/217/2013-IA.II (M) dated 14.10.2013 Copy of the same is enclosed as Annexure-1.

Compliance to the Terms of Reference (TOR) is given in Table 1.1.

Table 1.1 Compliance Terms of Reference (TOR)

<table>
<tr><th>S. No.</th><th>TOR Condition</th><th>Compliance Status</th></tr>
<tr><td>1</td><td>Year-wise production details since 1994 onwards should be given clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification, 1994 coming into force w.r.t the highest production achieved prior to 1994.</td><td>Neither the project proponent had carried out any mining in ML Area before 1994 nor was he entitled to carry out such operation in the period anterior to the date of issue of letter of intent. In the light of the interim relief by the Hon'ble Apex Court on 25.11.2013 and 27.03.2014 the LOI has executed the mining operation and during period January 2014. The year wise production detils as follows:
<table>
<tr><th>Year</th><th>Production in Tonne</th></tr>
<tr><td>Since 1994 -2013</td><td>--</td></tr>
<tr><td>Jan 2014-March 2014</td><td>3890</td></tr>
<tr><td>April 2014 to March 2015</td><td>0</td></tr>
<tr><td>Total</td><td>3890</td></tr>
</table>
Copy of the supreme court order enclosed as Annexure no. 25.</td></tr>
<tr><td>2</td><td>A Copy of the document in support of the fact that the proponent is the rightful lessee of the mine should be given.</td><td>LOI for Mining Lease for 54.68 Ha area has been granted in favour of Mr Paras Sethi vide Letter No. SME/Jodhpur/CC/Barmer/Tender/2012-13/2896 dated 18.02.2013.And copy of the same is enclosed as Annexure-2.</td></tr>
</table>

<table>
<tr><td>3</td><td>All documents including approved mine plan, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology and should be in the name of the lessee.</td><td>All documents including approved Mine Plan, EIA and public hearing are compatible with one another in terms of the production levels, waste generation and its management and mining technology.
<table>
<tr><th>S.No.</th><th>Particulars</th><th>TOR</th><th>Public Hearing</th><th>Approved Mining Plan</th><th>EIA Report</th></tr>
<tr><td>1</td><td>Mine Lease Area (Ha.)</td><td>54.68</td><td>54.68</td><td>54.68</td><td>54.68</td></tr>
<tr><td>2</td><td>Production In LTPA</td><td>2.52</td><td>2.24</td><td>2.24</td><td>2.24</td></tr>
<tr><td>3</td><td>Waste generation</td><td>NIL</td><td>NIL</td><td>NIL</td><td>Nil</td></tr>
<tr><td>4</td><td>Mining Technology</td><td>Open Cast-Semi Mechanized</td><td>Open Cast-Semi Mechanized</td><td>Open Cast-Semi Mechanized</td><td>Open Cast-Semi Mechanized</td></tr>
</table></td></tr>
<tr><td>4</td><td>All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/toposheet should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone)</td><td>All corner coordinates of mine lease area are superimposed on High Resolution Imagery/toposheet. Given as Fig No 4.2 of REIA/EMP Report.
<table>
<tr><th>Latitude</th><th>Longitude</th></tr>
<tr><td>25°31’47.6” N to 25°32’56.8” N</td><td>71°13’43.9”E to 71°14’38.9” E</td></tr>
</table></td></tr>
<tr><td>5</td><td>Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances/violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large may also be detailed in the EIA report.</td><td>Yes, Proponent has a well laid down Environment Policy i.e. Committed to comply with applicable statutory requirements, proper implementation, and management for prevention of pollution as per Environment Clearance/Clearance from pollution control board/Environmental Laws / CPCB norms / guidelines issued from time to time by related department. Continue to improve the effectiveness of our environment and management system by regular training with optimum use of natural resources, better productivity by regular internal audit and up gradation of technology.
<u>Non Compliance Reporting Procedure:-</u>
The applicant has well defined procedures to bring into focus any infringement/deviation/violation of the environmental and forest norms.
The hierarchical system to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions.
Environmental Policy enclosed as Annexure No: 23 of REIA/EMP Report.</td></tr>
</table>

6	Issues relating to Mine Safety, including subsidence study, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	Mining will be carried out by open cast semi – mechanized only. Hence, no subsidence study is required. No drilling and blasting will be carried out. ➢ Mining will be done as per approved mining plan & progressive mine closure plan. ➢ All safety measures will be adopted at the time of operational phase as it is river bed mining. ➢ It will be implemented to prevent restrict access to excavation area by unauthorized person as per Mines Act 1952; MMR, 1961. ➢ Removal/ collection of sand (Bajri) will be up to 3 meter depth and 20.0 m offset has been left for the safety of river bank. Protective equipment like dust musk, Helmet, Shoe, goggles ear plug/ muffs and other equipment will be provided all workers. Safety measures discussed in Chapter – 9.Proposed safeguard given in section 9.8 of REIA Report.
7	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc should be for the life of the mine / lease period.	Existing Land use Map has been prepared. No change in Land use .i.e. Forest area, agriculture land, wildlife Sanctuary, National Park, Water bodies, human Settlements proposed except plantation along the River bed, or Near by Govt Land wherever is available. However, river sand shall be excavated from the mine lease area. The study area comprise of 10 km zone from the periphery of the mining lease is given in Chapter: 4, Figure No 4.1. No overburden and waste is likely to be generated during lease period. Existing & Proposed Land used pattern of the lease area and study area shown Below:

<table>
<tr>
<td>8</td>
<td>Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted.</td>
<td>
<table>
<tr><th>S. No</th><th>Class</th><th>Area in Ha.</th><th>(Area)%</th></tr>
<tr><td>1</td><td>Mattled Road</td><td>31.69</td><td>0.10</td></tr>
<tr><td>2</td><td>Cart Track</td><td>14.39</td><td>0.05</td></tr>
<tr><td>3</td><td>Rural Area</td><td>65.39</td><td>0.21</td></tr>
<tr><td>4</td><td>Rocky Area</td><td>1681.91</td><td>5.39</td></tr>
<tr><td>5</td><td>Barren Sand Dune Area</td><td>13503.25</td><td>43.31</td></tr>
<tr><td>6</td><td>Water body/River</td><td>41.28</td><td>0.13</td></tr>
<tr><td>7</td><td>Fallow Land</td><td>15843</td><td>50.81</td></tr>
<tr><td colspan="2">Total</td><td>31181.30</td><td>100</td></tr>
</table>
Land use map showing as Figure No.4.1 Chapter: 4 of REIA
No National Park, Wildlife Sanctuary, Migratory routes of fauna and National Monument present within study area.
<table>
<tr><th>S. No.</th><th colspan="2">Particulars</th><th>Present land use (Ha)</th><th>At the end of 3rd year (Ha)</th><th>At the end of 5th year (Ha)</th></tr>
<tr><td>1</td><td colspan="2">Mining area</td><td>0.0</td><td>27.90</td><td>46.500</td></tr>
<tr><td>2</td><td colspan="2">Dump area</td><td>0.0</td><td>0.0</td><td>0.0</td></tr>
<tr><td>3</td><td>Safety zone</td><td>Permanent Roads (1 no.)</td><td>0.0435</td><td>0.7836</td><td>0.7836</td></tr>
<tr><td>4</td><td colspan="2">Infrastructure (office, temp, shelter etc)</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>5</td><td colspan="2">Mineral Storage</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>6</td><td colspan="2">Plantation</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>7</td><td colspan="2">Un worked</td><td>54.6365</td><td>25.9964</td><td>7.3964</td></tr>
<tr><td colspan="3">Total</td><td>54.68</td><td>54.68</td><td>54.68</td></tr>
</table>
<u>Change in Land use:-</u>

The applied river bed lease area consists of Gair Mumkin nadi. No forest land, grazing land & agricultural land involved. No change in land use in post operation phase.
</td>
</tr>
<tr>
<td>9</td>
<td>Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.</td>
<td>No overburden and Solid waste will be generated from the proposed mining.
No habitation in lease area. Hence, No R&R issues.</td>
</tr>
</table>

10	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	No forest land involved in the project area. However for confirmation, letter submitted for the same vide letter No. Nil dated: 29-12-2014. Copy of the same enclosed as Annexure No.: 17
11	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	As the applied lease area is part of Gair Mumkin Nadi & Nallah as per revenue record. No forest land involved in proposed lease area. Hence, No clearace required.
12	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	The area is not covered under Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. Hence, it is not applicable.
13	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No RF / PF areas found in the study area.

<table>
<tr>
<td>14</td>
<td>A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.</td>
<td>The mining lease area is in non-forest land where presence of fauna is very rare. As such, there will be no adverse impact of the river sand mining activity on fauna around the mining lease area. Bio-diversity study conducted by Biodiversity experts and anticipated impact and conservation plan with budgetary allocation of Rs. 1, 50,000 Lac per annum (Total: 7.5 Lac for 5 Years). Details conservation plan with activities are given in Chapter: 9 of REIA/EMP.
<table>
<tr><td>Anticipated impact on flora & fauna</td><td>The flora & fauna in the core zone are so common that they could be found in all similar areas. So, no reduction in species diversity & no specific mitigation measures are proposed.</td></tr>
<tr><td>Habitat loss</td><td>The proposed mining activity will not change the existing land use of the area as it is river bed which would be replenished by natural means. Thus no habitat loss or fragmentation is envisaged.</td></tr>
</table>
</td>
</tr>
<tr>
<td>15</td>
<td>Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves/Critically Polluted Areas/Aravalli (existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the State Wildlife Department/Chief Wildlife Warden under the Wildlife (Protection) Act, 1972 and copy furnished.</td>
<td>There is no National Park, Sanctuary, Biosphere Reserve, Wildlife Corridor, Tiger /Elephant Reserve (existing as well as proposed) within 10 km radius of the periphery of mine lease.

Aravali Hill NOC from State Mining Department enclosed as Annexure No-11.</td>
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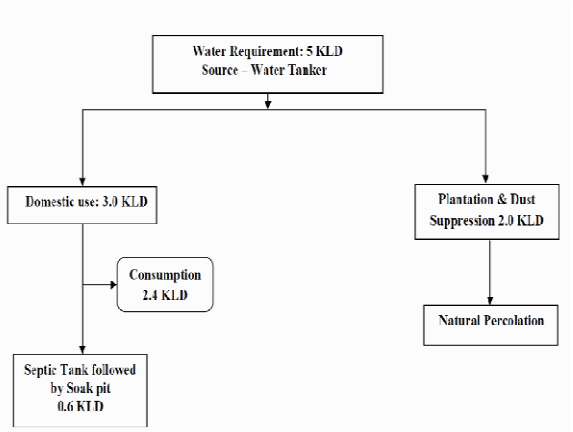
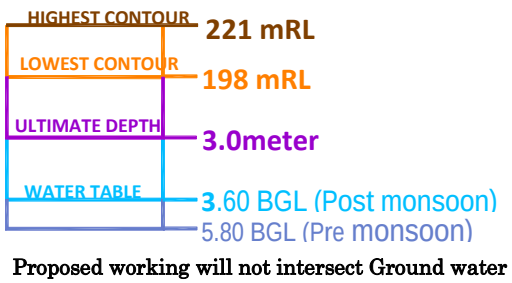
</table>

16	A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any Scheduled-I fauna found in the study area, the necessary plan for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Biological study for the study area [core and buffer zone (10 km radius of the periphery of the mine lease)] has been carried out in October-November & December, 2013; same are given in Chapter-4. Two faunal species of Schedule-1 i.e. Indian Peafowl (Pavo Cristatus) & Chinkara (*G. bennettii*) were found in study area & their conservation plan has been prepared. A budgetary provision for the same will be Rs 6,85,500 for 5 years. Biological Study with conservation plan is incorporated in Chapter No: 4 of REIA/EMP report.
17	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Dept. Should be secured and furnished to the effect that the proposed mining activities could be considered.	No Criticallly critically polluted industrial area proximity to the area notified by CPCB, New Delhi, vide memorandum no J- 11013/5/2010-IA.II (I) dated 13.1.2010 The provision for restriction, Aravali Range Under Notification S.O. 319 (E) Dated 7-05-1992 is not applicable to ML Area falling in Barmer district. The project area does not fall in Aravali hill ranges. Clearance certificare from the State Mining Department enclosed as Annexure no. 11.
18	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area. Location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Mining lease area does not falls in CRZ. Hence not Applicable.

19	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village located in the mine lease area will be shifted or not. The issues relating to shifting of Village including their R&R and socio-economic aspects should be discussed in the report.	No habitation exist in the project area, Means no Rehabilitation and Resettlement of the people from the project. Hence, no R & R issues are involved in the project.
20	One season (non-monsoon) primary baseline data on ambient air quality (PM_{10}, SO_2 and NOx), water quality, noise level, soil and flora And fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM_{10}, particularly for free silica, should be given.	One season (Post-Monsoon'2013) primary baseline data on ambient air quality, water quality, noise quality, Soil quality & flora & Fauna has been collected and mentioned in REIA/EMP report in Chapter: 4. The summary of the data is given in chapter: 4. Monitoring locations are given below; S. No. | Name of Site | Sampling code | Direction & Distance from Mining lease area | | Nearest Mining Block (where Working Proposed) | Selection Criterion 1. | Shivpura | AAQ1 | North | 0.2 km | Predominant direction | Near to Transportation route from block A to MDR-7 2. | Sanwalar | AAQ2 | North | 6.5 km | - | Upwind drirection 3. | Akora | AAQ3 | NW | 6.0 km | - | Near to MDR-17 4. | Goliyar | AAQ4 | South | 0.5 km | Downwind Direction | Downwind direction 5. | Ranisar | AAQ5 | SW | 5.5 km | -- | Downwind direction Near to Local Village Road Habitation in buffer zone

21	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	In order to predict the particulate emissions, AERMOD version 8.2 model was used to predict changes in air quality i.e., maximum ground level concentration (GLC's) of PM_{10}, SO_2 & NO_2 due to the proposed mining & Transporation activity.Air quality modeling has been carried out for prediction of impact due to proposed project activities on the present air quality of the area as shown in Chapter: 4. The Wind rose diagram indicating predominant wind direction is shown in Figure No.4.10 of Final REIA report.
22	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Water requirement for the project is 5.0 KLD which includes both for dust suppression and for Domestic purpose. The details of water requirement are given in Chapter: 2. Water Balance : 
23	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	The water requirement is only 5.0 KLD. Required water demand will be met from Tanker Water Supply. Hence, CGWA Permission is not required.
24	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Water conservation measures proposed to be adopted in the project have been incorporated in Chapter 5 of EIA /EMP Report.

<table>
<tr><td>25</td><td>Impact of the project on the water quality, both surface and groundwater should be assessed and necessary safeguard measures, if any required, should be provided.</td><td>Impact on Ground Water
The average groundwater table was observed 3.6 to 67.7 m below the riverbed level and there will be no intersection of ground water table as mining activity will be restricted up to 3.0m from bed level or 1.0 m above the ground water table.
Impact on Surface Water
The Shivpura River where the mining is undertaken is almost dry except monsoon period. Hence, impact on surface water is insignificant .Details are described in Chapter -4</td></tr>
<tr><td>26</td><td>Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.</td><td>At any stage river sand mining will not intersect groundwater table, as mining will be carried out to shallow depth (3m bgl). In the proposed river sand area ground water table depth is varies from 3.6 to at 67 m BGL. No intersect of the ground water table and no pumping of water required during mining operation. Hence, No need to take permission from Central Ground Water Board.
Detail of the elevation, ground water table and working level given below :
<table><tr><td>Site elevation</td><td>221-198 AMSL</td></tr><tr><td>Ultimate Working Depth</td><td>3.0 meter bgl</td></tr><tr><td>Ground water table (Pre-Monsoon)</td><td>5.80-67.71 mbgl</td></tr><tr><td>Ground water table (Post-Monsoon)</td><td>3.60-66.47 mbgl</td></tr></table></td></tr>
<tr><td>27</td><td>Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.</td><td>Mining will be carried itself in river bed, So no diversion/modification is proposed.</td></tr>
<tr><td>28</td><td>Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.</td><td> 

Proposed working will not intersect Ground water table.</td></tr>
</table>

29	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project.	A time bound Greenbelt Development Plan proposed as given in Chapter: 9 at table No. 9.2, 9.3. In which 750 no's of native trees per year to be planted are proposed for greenbelt development.
30	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered.	The total extraction of sand will be 800 TPD. The loading capacity of a truck is 20 ton hence 40 trucks will be used per day. The mine site well connected to MDR-17 connecting Sanchor to Barmer is at the distance of 5.6 km (N-W) from the lease area. It has sufficient capacity to take care of the extra traffic-load of the mine. As the load on the road network is not very high, no additional infrastructure is contemplated. Proposed transport Route map also enclosed as Annexure No 24.
31	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.	Facilities will be provided to the mine workers as per Approved Mining Plan & as per Mines Rules on temporary basis .i.e. Rest Shelter, drinking water facilities, washrooms separately for male & female workers, sanitary facility, first aid facilities, etc. will be provided as per Mines Rule 1955.
32	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Mining will be done only up to 3.0 m from the river bed or 1.0 m above the ground water table. River will be replenished up to some extent naturally by sediments during rainy season. However, the sections and conceptual plan described as Annex-21 & 22 of REIA/EMP Report.
33	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given.	About 9.37 Ha area will be coverd under green belt development programme during the lease period @ 750 Plant per Year. Hence about 3750 trees will be planted during lease period under social forestry programme.

34	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP.	No major occupational health hazard is anticipated. All workers will be subjected to Initial Medical Examination as per Mines Rule 1955 both at times of appointment and Periodical Medical Examination every year. Personnel Protective Equipments like face mask, earmuffs, ear plugs, gloves, safety goggles and safety boots will be provided. Details Given in Chapter: 9.
35	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	Dust will be generated due to transportation of sand to the roads. Water sprinkling measures will be taken at lease area for suppression of dust. Due to unavoidable circumstances, if villages cannot be bypass and vehicles have to move through the villages, the speed of the vehicles will be maintained 20kmph speed. It will minimize the dust generation. Details regarding public health incorporated in Chapter -9, of Final REIA/ EMP Report. Regular medical checkup of the worker will be carried out in medical camp.
36	Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	There is no habitation in proposed project site hence no local community will be influenced. River sand mining will increases infrastructure work and facilities that will help in generating employment and upliftment of society. Directly about 20 people will be employed during mining operation. Details of community welfare activities to be done for the local community, along with proposed budget are given in Chapter 5 of EIA/EMP Report.
37	Detailed environmental management plan to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	Detailed Environmental Management Plan has been incorporated in Chapter 9 and the environment impacts are given in Chapter 5 of EIA/EMP Report.
38	Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	Public hearing proceeding along with points raised and commitment of the project proponent with time bound action plan to be implemented is given as section 7.2 at Table No 7.1 & 7.2 with Time bound action plan of REIA/EMP Report.
39	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given.	Yes, A PIL in the High Court of Rajasthan filed by an NGO, Nature Club of Rajasthan. Copy other same enclosed as Annexure No.10.

40	The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.	Capital cost for the Proposed project: Rs 50 Lac. Cost for EMP: Rs.4.5 Lac Recurring cost for EMP: 12.8 Lac Total Cost For EMP:17.30 Lac Per Annum Details are described in Table No.9.6 of EIA/EMP Report.
41	Details of replenishment studies.	The total annual sediment deposition was computed and found about 1.47 LTPA. Case Study by CAZRI has been used to calculate the sedimentation yield. Details of replenishment of River sand area given in Section No 5.1.3.
42	Details of Transportation of mined out materials as per the Indian Road Congress for both the ways (loaded as well as unloaded trucks) load and its impact on Environment.	Existing road network are adequate for transportation of mined out material as per the Indian Road Congress and time to time maintenance of the road will be done by the help of concerned authority. Given in Section 4.13 of REIA/EMP report.
43	Proper species specific Conservation plan for Schedule–I and II species.	Proper Conservation Plan for *Schedule I* (Indian Peafowl, Chinkara) species are Given in Chapter: 4 of REIA/EMP report.
44	Impact of mining on plankton.	Core zone is the river sand bed so there in no plankton observed in the area.Details are Given in Chapter: 4 of EIA/EMP report.
45	Details of mining activity to be provided w.r.t Block Wise/ Calendar wise/ Zonal wise, as the mine lease area having a long stretch.	One Mining blocks (A) has been planned for the same as per approved mining plan. Given in Chapter: 2 of Final REIA/EMP report.
46	Details of Gradient of river bed to be provided.	The proposed area is a River bed which is gentle sloping. The elevation in the area varies from 221 AMSL to 198 AMSL. Given in Chapter: 4 of EIA/EMP report.
47	Details of excavation schedule & sequential mining plan.	Production is planned 2.24 LTPA, Total Production 11.20 LTPA for lease period 5 Year. Given in Chapter: 2 of Final REIA/EMP report.
48	The Mining Plan shall be prepared carefully, dividing lease area into manageable blocks to ensure scientific and systematic mining of minor minerals.	It is proposed to work in 01 block. Production capacity 2.24LTPA. Year wise development Plan is given in Chapter: 2 of Final EIA Report and copy of mining plan also enclosed as Annexure No.: 19.
49	The base line data shall be collected so as to represent the whole mine lease area.	Details given in Chapter: 4 of Final REIA/EMP Report.
Besides the above, the below mentioned general points will also have to be followed:-		
a	All documents to be properly referenced with index and continuous page numbering.	All documents have been properly referenced with index, page numbers and continuous page numbering.
b	Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be	The data presented in the report especially in table, along with the period in which the data was collected and the source has been incorporated.

	indicated.	
c	Where the documents provided are in a language other than English, an English translation should be provided.	Complied with.
d	The Questionnaire for Environmental Appraisal of Mining projects as devised by the Ministry shall also be filled and submitted.	The questionnaire for environmental appraisal of mining projects as devised by the Ministry is enclosed as Annexure – 15
e	While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.	All instruction mentioned in O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009 are being complied with.
f	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the PH process) will entail conducting the PH again with the revised documentation.	Yes, Initially production capacity was proposed 2.52 LTPA as per draft Mining Plan for TOR Approval.TOR is approved as a production capacity 2.52 LTPA vide Letter No vide letter no. J-11015/217/2013-IA.II (M) dated 14.10.2013. But as per the Approved mining Plan production capacity decresed from 2.52 to 2.24 LTPA. Final REIA/EMP report prepared as per the production capacity 2.24 LTPA
g	As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, you are requested to submit certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project by the Regional Office of Ministry of Environment & Forests, if applicable.	This is New River Sand Mining Project.

1.5 POST ENVIRONMENTAL MONITORING

Environmental Monitoring Program shall be implemented for the proposed mining operations in post environmental clearance phase also. Environmental monitoring program include (i) environmental surveillance (ii) analysis & interpretation of data (iii) preparation of reports to support environmental management system and (iv) Compliance of EC time to time. A comprehensive environmental surveillance shall be carried out by the project proponent. Monitoring report will be directly sent to the regulatory authorities. The monitoring data generated on routine basis shall serve as tools for: Environmental status of the area Performance of the

environmental protection measures Overall effectiveness of EMP. The monitoring program also includes the action plan in case of emergency, so that appropriate measure may be taken.

1.6 GENERIC STRUCTURE OF ENVIRONMENTAL IMPACT ASSESSMENT DOCUMENT

As per the EIA guidance manual prepared by Administrative Staff College of India (ASCI), Hyderabad, The mining sector manual consists of eleven chapters, which correspond to the generic structure given as per EIA notification 2006, as amended December 2009. Based on this manual, the generic structure of the report is as follows:

- Introduction
- Project Description
- Analysis of Alternatives (Technology & Site)
- Description of the Environment
- Anticipated Environmental Impact & mitigation Measures
- Environmental Monitoring Program
- Additional studies
- Project benefits
- Environmental Management Plan
- Summary & Conclusion
- Disclosure of Consultant Engaged

1.7 DENTIFICATION OF PROJECT PROPONENT

Name of Project: Mining of River Sand at Tehsil: Chohtan & District: Barmer, State: Rajasthan.

Project Proponent: Mr. Paras Sethi

Address: A-189, New Friends Colony, Delhi.

Mr. Paras Sethi has been granted a mining lease for extraction of Sand over an area of 54.68 Ha. The Applicant was experienced person in mining profession with a sound financial background. Letter of Intent enclosed as Annexure No.: 2.

1.8 BRIEF DESCRIPTION OF PROJECT

The proposed project is an open cast Semi-mechanized mining. It has been proposed to collect sand from the river bed of Shivpura River. Mining will be confined to the allotted lease area which lies on the river bed of Shivpura River from which approximately 2.24 LTPA of sand will be excavated and the estimated project cost is Rs.50 lac. The Department of Mines and Geology awarded mining lease of River Sand as per letter no. Jodhpur/CC/Barmer/Tender/2012-13, dated 18/02/2013.

PROJECT NATURE, SIZE & LOCATION:

NATURE

The proposed project is river bed sand mining project.

SIZE

It has been proposed to collect approximately 2.24 LTPA of river bed material annually over an area of 54.68 Ha.

LOCATION

The mining area is located in Revenue villages of Tehsil: Chohtan, District: Barmer, State: Rajasthan. The mining lease /proposed project area falls in Survey of India Toposheet No. 40O/2, 40O/3, 40O/6, 40O/7.

Latitude	25°31'47.6" N to 25°32'56.8" N
Longitude	71°13'43.9" E to 71°14'38.9" E

Nearest Railway Station	Barmer (Aerial distance : 27 km)
Nearest Airport	Jodhpur (Aerial distance : 194 km)
Nearest Highway	NH: 15 (Barmer - Sanchor Road)

1.9 REGULATORY COMPLIANCES & APPLICABLE LAWS/REGULATIONS

1.9.1 THE RAJASTHAN MINOR MINERALS (CONCESSION) REVISED RULES, 1986 (AMENDED UPTO 19TH JUNE 2012)

The rules inter alia provide for procedure for application for quarrying of minor minerals, grant of mining lease, restriction on grant of mining lease, various mandatory registers of mining lease, royalties in respect of mining leases, besides conditions applicable on mining lease, the rights of lessee and the rights and power of the government. The amended rules 2012, under newly introduced chapter IVA contains provision for systematic, scientific and environment friendly mining plan. The new rules also allow the lessees/licensees/Short term public holder having an area more than 1 ha and less than 5 Ha individually to form an association of cluster and submit environment management plans (EMPs), prepared by a recognized person under the rules, to the district level environment committee for approval.

1.9.2 RAJASTHAN STATE WATER POLICY

The spiral growth of imbalance between demand and supply of water and continued depletion of ground water resources along with deteriorating water quality has led the state to formulate a well-addressed water policy of its own by adopting a radical shift from engineering based solution to local community based water management solution under Integrated Water Resource anagement (IWRM). This new water policy presents the framework for sustainable development and management of water resources in the state. It focuses towards community level empowerment and responsibility for water management. The objective of the state water policy is to adopt an integrated and multi sectorial approach to the water resources planning, development and management on a sustainable basis by considering river basin/sub basin as unit.

1.9.3 RAJASTHAN STATE FOREST POLICY

In 2010, the State Government has enunciated its own Forest Policy within the framework of National Forest Policy. This was to meet the peculiar forest situation in the State. The policy guidelines cover almost all aspects of forestry in the State. Since forest and related issues are one of the few most important issues of the project, implementation Forest policy is directly relevant. Protection of existing forests from any kind of anthrogenic pressures and maintenance of forest on sustainable basis. The principal aim of this forest policy is environmental stability and ecological security through increased vegetal cover and reduction in soil erosion.

1.9.4 RAJASTHAN STATE POLLUTION CONTROL BOARD (RSPCB)

The Rajasthan State Pollution Control Board (RSPCB), established in 1975 under the provision of water (Prevention & Control of Pollution) Act 1974 is a statutory authority entrusted to implement and enforce environmental laws and rules with in the territorial jurisdiction of the state. It ensures enforcement of statues, judicial and legislative pronouncements in context to environmental protection within the state. The board is totally or partially responsible for implementation of central acts related to water, air, noise and Environmental Protection Act, 1986. Agency is also acting as a facilitator for Central and State environmental clearance process.

1.9.5 RAJASTHAN STATE ENVIRONMENT POLICY 2010

The objectives and principles of the State Environment Policy are the same as enshrine in the National Environment Policy, 2006. It inter alia includes the environment mission and climate change agenda for this state for 2010-2014 in keeping with the fourth assessment report of the inter-governmental panel on Climate Change (IPCC). This policy document is based on an analysis of the state-specific issues, the natural resource constraints from which these emerge, and their overall implications for the environment. The document identifies the key environmental challenges and outlines strategies and actions to address them. Above all, it is intended to be a guide to action, and accordingly provides inputs for a State Environment Mission, supported by Task Forces with specific agenda and action plan, and institutional arrangements for implementation of the proposed measures. Table-1.2 shows the salient features of the proposed project.

Table 1.2 Salient Features of the Proposed Project

Lease location	Village and River Shivpura Tehsil: Chohtan, District: Barmer, State: Rajasthan
Latitude	25°31'47.6" N to 25°32'56.8" N
Longitude	71°13'43.9" E to 71°14'38.9" E
Site Elevation	198 mRL is the lowest and 221 mRL is the highest point in the River Shivpura.
Survey of India Topo-sheet No.	40O/2, 40O/3, 40O/6, 40O/7
Leasehold Area	54.68 Ha.
Nearest village	Chohtan
Ecological Sensitive Areas (National Park, Wild Life Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/ Elephant Reserves)	None
Seismic Zone	Zone – II [as per IS 1893 (Part-I): 2002]
Letter of Intent	Letter no. Jodhpur/CC/Barmer/Tender/2012-13, dated 18/02/2013.
Mining Method	Semi mechanized opencast method

Note: All the distances mentioned above are aerial distances

1.10 INFRASTRUCTURE

1.10.1 NEAREST RAILWAY STATION

Barmer (Aerial distance: 27 km)

1.10.2 NEAREST AIRPORT

Jodhpur (Aerial distance: 194 km)

1.10.3 NEAREST HIGHWAY/OTHER ROAD

National Highway- 15 (16.5 km, towards East direction from lease area)

MDR-17 (5.6 km, towards North-West direction from mining lease area) and metal road (2.9 km, towards South-West direction from mining lease area)

1.11 COST OF THE PROJECT

The estimated capital cost of the project project is Rs.50 Lac.

1.12 ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Enviro Concept (I) Pvt. Ltd.,1/3A, (NABET Approved Consultant) Yudhister Marg, C-Scheme, Jaipur has been assigned for preparation of Environment Impact Assessment (EIA) and Environmental Management Plan (EMP) report for sand mining Project. The baseline data has been conducted by M/s Noida Testing Laboratories, Greater Noida, U.P (NABL Accredited Laboratory). The baseline data collection involves the data on air quality, water quality, land use, socio-economic profile of the study area, existing flora, fauna, prevailing noise levels, along with the physiographical status and meteorological conditions of the area. The current report is based on the information of the process technology, air emission, effluent generation; discharge and solid waste management. An effective plan to mitigate the adverse impacts and suggestive pollution control measures along with environmental management plan has been summarized.

1.13 SCOPE OF WORK

The scope of the work includes detailed characterization of various environmental components such as micro-meteorology, air, noise, water, land and socio-economy within 10 km radius from the proposed plant. The main objectives of the study are:-

- To identify and quantify significant impacts due to various operations of the proposed sand mining project on various environmental components through prediction of impacts.
- To assess the existing baseline status of air, water, noise, land and socio- economic environment.
- To evaluate and implement the Environmental Management Plan (EMP) detailing control measures and its efficiency to minimize the pollution levels within the permissible norms. To evaluate the beneficial and adverse impacts of the proposed sand mining project.
- To design an occupational health & safety plan for the employees.
- To design post project monitoring plan for regulating the environmental quality within the limits and help in sustainable development of the area.

*****

CHAPTER-2
PROJECT DESCRIPTION

2.0 GENERAL

Mr. Paras Sethi propose to develop a River Sand mining in, Tehsil: Chohtan, District: Barmer, State: Rajasthan. Total lease area of River sand mining is 54.68 Ha. The area is located in River Shivpura, Tehsil: Chohtan, District: Barmer covering the 1 village falling along the Shivpura River. The land form is mostly river bed and non-forest land. The river beds belong to Government River land as per revenue. The mining lease area falls on Survey of India Toposheet No. 40O/2, 40O/3, 40O/6 and 40O/7.

Project proponent: Mr Paras Sethi.

Ownership/Occupancy: River beds and nallas under mining lease areas are owned by Govt. of Rajasthan.

Table 2.1 Villages covering lease area

Village	Patwar Halka	Area in bigah-biswa
Shivpura	Taratara	337-19
Total Lease area in bigah-biswa		337-19
Total Lease area in Hect (1 Ha.- 6.18 Bigha)		54.68

The Environmental Impact Assessment report has been prepared in terms of EIA notification of the MoEF dated 14th Sept 2006, as amended on 1st Dec 2009 & 4th April 2011 and the EIA Guidance Manual for Mining of Minerals (Feb, 2010) of MoEF, Govt. of India, for seeking environmental clearance for mining in the area of sand mining lease measuring 54.68 Ha falling under category A.

2.1 DESCRIPTION OF THE PROJECT

The proposed project is to mine sand from the lease area. The estimated project cost is Rs 50 Lac. The Department of Mines and Geology intend to award mining lease of River Sand as per letter no. Jodhpur/CC/Barmer/Tender/2012-13, dated 18/02/2013. Its river sand area spreads in an area of 54.68 Ha, which is government transverse land.

2.1.1 LOCATION DETAILS

The proposed mining project is located in Revenue villages of Tehsil: Chohtan & District: Barmer, Rajasthan. The project site is covered under Survey of India Toposheet no: 40O/2, 40O/3, 40O/6, and 40O/7. The area falls between:

Latitude: 25°31'47.6" N to 25°32'56.8" N

Longitude: 71°13'43.9" E to 71°14'38.9" E

Fig.: 2.1 show the location map of the project.

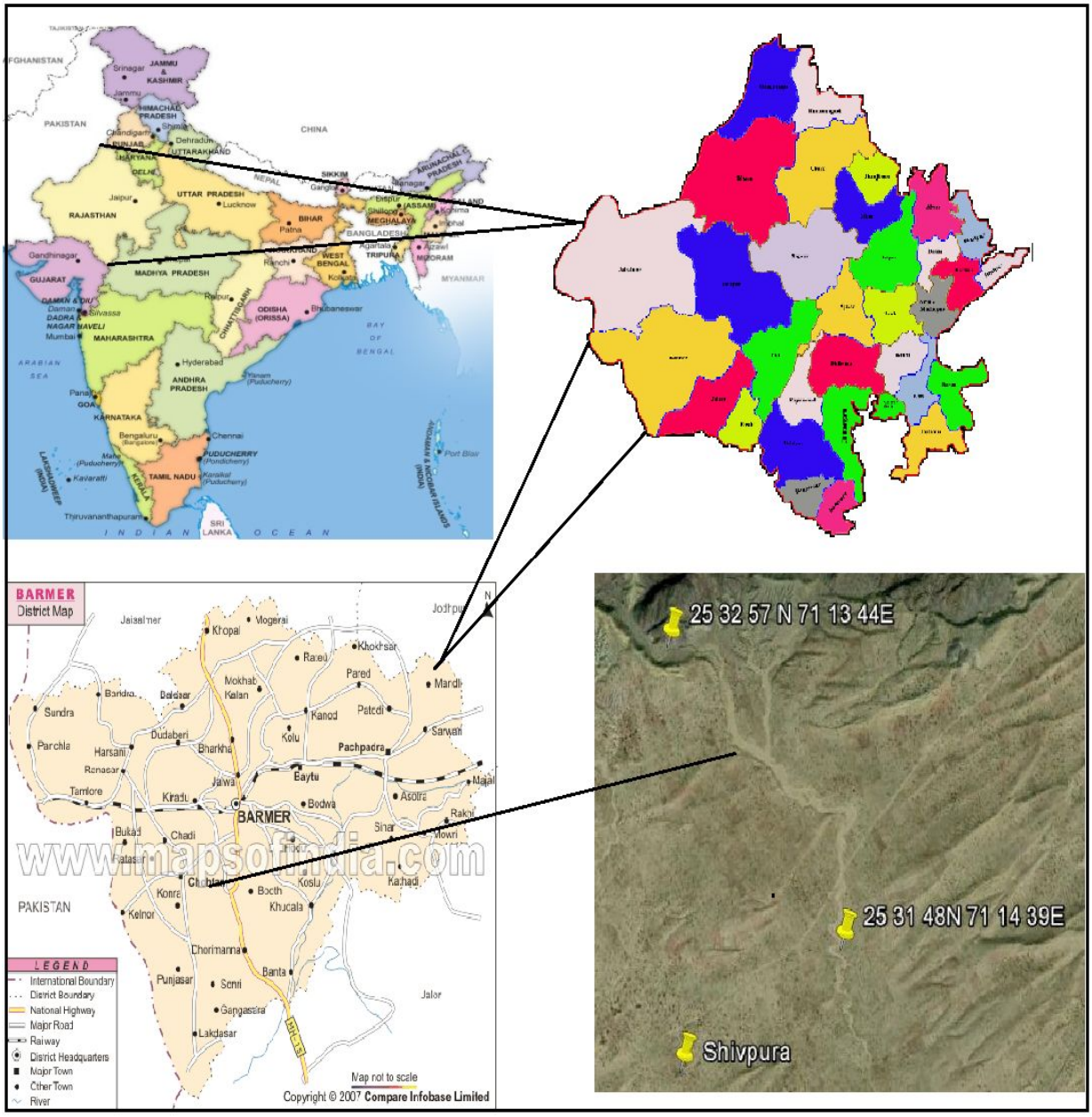


Fig.: 2.1 Location Map of the Project

2.1.2 NEED FOR THE PROJECT & IMPORTANCE TO THE COUNTRY OR REGION

The demand of sand in the area is increasing day by day both for private construction activities and infrastructure development by the Government Agencies The economy of India is the eleventh largest in the world by nominal GDP and the third largest by purchasing power parity. The country is one of the G-20 major economies and a member of BRICS. The primary reason for the economic growth can be attributed to the growth in infrastructure. Infrastructural growth is directly proportional to the availability of raw materials such as bricks, cement, sand etc. with the growing infrastructural requirement of the India, the demand of raw materials have increased geometrically. The proposed project will not only help the natural drainage pattern of the area by removing depositing sand on the river bed but also be a solution to the growing requirement of raw materials for infrastructure.

2.1.3 DEMAND AND SUPPLY GAP

There is large demand of sand for construction activities in the region. Demand of sand is fulfilled by this project to various end users in open market. The sand which is an important component in the construction activities of any kind increases the demand as whole. During the last three to four years sudden increase in the real estate activities in the region further enhance the high demand of the bajri is fulfilled by this project .

2.1.4 EXPORT POSSIBILITY

Sand will be sold out in only domestic market as well as capital market. No export of River sand is envisaged from this mine.

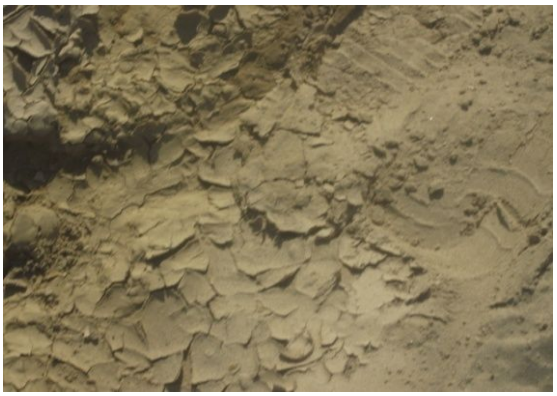
2.2 LEASEHOLD AREA

Total lease hold area of 54.68 Ha lies in the river bed of Shivpura. The area break up of leased area is shown in the following table.

Table 2.2 Breakup of Lease Area

S. No.	Particular	Area (Ha)
1	River Bed Area	54.68
2	Agricultural Land	Nil
3	Grazing Land	Nil
4	Forest Land	Nil
Total		54.68

North-West



North-East

South-West

South-East

Fig.: 2.3 Photographs of the Study Area

2.3 GEOLOGICAL PROFILE OF AREA

The Barmer district is located between $24^{0}58'$ to 26^{0} 32'N Latitudes and 70^{0} 05' to 72, 52' E Longitudes. Barmer is located in the Western part of the state forming a part of the Thar Desert. The district is

surrounded by Jaisalmer district in the North, Jalore district in the South, Pali district and Jodhpur district in the East and Pakistan in the West.

The Barmer Basin of Rajasthan as a major new hydrocarbon province. Most reserves are contained in fluvial sandstone reservoirs of the Fatehgarh Formation, which probably ranges in age from Late Cretaceous to Early Paleocene. The Fatehgarh sandstones were mainly derived from reworking of Mesozoic sandstones at the northern end of the Barmer rift, but with some volcanic bclastic input probably derived from Deccan volcanic rocks within and on the margins of the rift. These thick, quartz-rich, high porosity and permeability sandstones provide an excellent oil reservoir in the North of the Barmer Basin, but the increasing volcanic influence further South causes reservoir quality and thickness of net sand to deteriorate. This paper relates how the tectonic and volcanic evolution of the northwest margin of the Indian plate has influenced the depositional trends which have resulted in formation of this world class reservoir.

Aeolian sand, Alluvium, Tertiary sandstone, Lathi sandstone and Barmer sandstone (Mesozoic), Malani rhyolite, granite and Jalore Siwana granite (Post Delhi)

The Geology of the district is obscured by extensive desert sand & sand of dunes. The rock formations are mostly exposed in patches. The general stereographic succession worked out by Geological survey of India is as under Table No: 2.3.

Table 2.3 General Stereographic Succession

FORMATION	AGE	LITHOLOGY
--	Recent to sub recent	Sand, sandy soil, kankar, vast gypsum & selenite deposit.
Kapurdi formation	Lower to middle Eocene	Fuller's earth.
Mandhi formation & Akli formation	Lower Eocene to upper Paleocene.	Clays & ferruginous sandstone grey & black Shales with or without lignite inter calations, bentonite, siliceous earth.
Fateh garh formation	Middle Paleocene to upper cretaceous.	Sandstone.
Lathi formation	Triassic – Jurassic	Sandstone.
Malani igneous rock	Late Precambrian	Rhyolite granites & associated intrusives

The malani igneous suits of rocks are most extensive & are oldest in the area. They consist of volcanic rocks, rhyolites granites & associated intrusive like basic dykes aplites & quartz veins. Beside these volcanic, other rocks exposed in the area is sandstone belonging to Lathi, Fatehgarh & Mandhi formations, Akli & Kapurdi formations constituted by bentonite & Fuller's earth. They deing soft, in the plains & mostly covered under blown sand.

2.3.1 LOCAL GEOLOGY

The region west of Barmer-Consist of hillocks mainly composed of rhyollite and Graintes. East wards from Barmer i. e. towards sindri the cover of sand and sand dunes decreases and beyond Sindri the dunes are few. The area between Barmer and Shiv is mostly covered with blown sand, except in the vicinity of Bothia, west of Hathi Singh ki Dhani and Koatra, where sand stone forms small hillocks.

Geologically, the district is underlain by intrusive rocks at the basement (Post Delhi formation) consisting of Jalore and Siwana granite & Malani rhyolite and 10 granite followed by Mesozoic and Tertiary formations consisting of sandstone, shale, conglomerate. Mesozoic is consisting with Lathi series of Jurassic and Abur series of Cretaceous period. Tertiary is consisting with Akali and Kapurdi series of Eocene period. These formations are overlain by Pleistocene to recent alluvium consisting mainly clay, sand and silt.

The SE part of the district near Mangla, Balotara, Tilwara and Sindari is occupied by sand and sand dunes of recent to sub recent. In the SE of Dandali to Sindari some out crop are shown of Malani Rhyolite. These rocks are overlain by East to South trending rocks of Malani igneous rock of late Precambrian.

In the Northern part of Barmer is covered by the Sand Stone of fatehgarh formation, lignite of Akli Formation and fuller's earth of Kapurdi Formation. These are belonging to Tertiary age.

The oldest rocks found in the district are schists belonging to the Aravalli system. The sub aerial character of the lava is proved by the inclusion between the flow of bands of rolled pebbles of the lava itself and other crystalline rocks derived from the Aravalli range. The rhyolites of this area are pierced by dykes and bosses of granite (known as Siwana granite) containing hom- blende but no mica as distinct from the Jalore granite, which contains mica. These granites form a considerable hill mass in the east of the district, the Saora range south of Siwana rising to over 1125 metres above sea level. The rhyolites are also traversed by numerous bands of intrusive rock containing oegirime, augite, sanidine and sodalite. Sandstones and conglomerates wtraces of fossil leave occur at Barmer and are probably of Jurassic age. The sand also contains salt, which has been loosened by rain over the ages to collect in the Pachpadra depression. The district is poor in metallic mineral deposits. However, the important minerals produced in the district are bentonite, gypsum, siliceous, earth and salt yielding good annual revenue. The district is the largest producer of bentonite, which is used as grouting material in engineering construction, in drilling muds and in insecticide, paint, pharmaceutical, vegetable oils and petroleum industries. The important deposits extend fromKhoryal to Mahawar over a distance of 86 km. Fuller's earth which is used in refining of petroleum, vegetable oils and fats, occurs at Kapoordi. Gypsum deposits are located at Phulsund, Kawas and Utarlai and are used in the manufacture of fertilizer, plaster of paris, distemper and cement. Salt with sodium chloride is extracted from Pachpadra Lake. Lignite occurrences have been reported at Unrod and Bharka. Rhyolite and granite occur at Barmer and Siwana.

2.3.2 ESTIMATION OF RESERVES

The total mineable reserves are 22.95 lac Tonne (As per Approved Mining Plan). The lease of mine is for 5 years, with the proposed production capacity of 2.24 LTPA. The River Sand is brought by flood waters from upstream side and naturally deposited when the water current in the river slows down.

The River Sand is brought by flood waters from upstream side and naturally deposited when the water current in the river slows down. Shape, size, width and depth extension of mineral as conceived on the geological plan and section. Based on geological cross section the actual width and thickness is taken in to consideration. Reserves only in proved category are calculated to a depth of 3.0 m in river bed since mining has been restricted to 3.0m depth only for safety reasons.

Volumetric method is adopted for calculating reserves of River Sand. Reserves are estimation on the basis of established width, thickness, and stoke length based on influence of the mineralized formation in the river bed and where good inferences are available only such area are considered for reserve estimation. The depth is considered upto 3.0m as although working is permitted upto 3.0m depth in the riverbed.

Reserve calculation – Area in sq.mt x thickness of bajari x bulk density
= reserve in tones

Proved reserves as per UNFC code (111)

Total reserves = 2296560 Tonnes

Blocked reserves as per UNFC code (211 & 122)

Road (1 No.) = 1522.5 Tonnes

Total blocked reserve = 1522.5 Tonnes

Minable Reserves = A-B

= 2296560- 1522.5 =2295037.5 Ton

Lease area consists of 54.68 Ha in Khasra of 1 village in a stretch of 3 km.

Production programmed is 40 trucks/ day

Capacity of truck is 20 tons

Total production = 40 x 20 = 800 tons/ day

Table: 2.4 Five Years Proposed Production Details

Year	ROM (Ton)	Marketable Bajri
1st	224000	224000
2nd	224000	224000
3rd	224000	224000
4th	224000	224000
5th	224000	224000
Total	1120000	1120000

Therefore reserves are:

Cross sectional area 3^2 (average length x average width) x Depth x Bulk density. The reserves in the riverbed shall be replenished by flood waters every year during rainy season.

2.3.3 QUALITY OF RESERVES

The size of sediments varies from 1 mm to about 3 mm and is not uniform. The grains in the all size, small or large are rounded to sub rounded in shape. The color of river sand is grayish fine to course grained. River sand weathered particles of feldspethic rocks of granitic composition with mixture of silica and other accessories minerals. The total mineable reserve 22.95 lac Ton as per approved mining plan. The River Sand is of two grades i.e. fine and coarse River Sand and used for different purpose as tabulated below Table.

Table 2.5 River Sand Grade and Its Uses

Type of River Sand	Grade	Uses
Low grade River Sand	SiO_2 up to 85% Fe_2O_3 up to 2.75 %	Building materials of low cost use
High Grade River Sand	SiO_2 up to 98% Fe_2O_3 up to 0.5 %	Building of medium and high class use

2.4 TYPES OF MINING

The mining process is opencast semi-mechanized river bed mining of minor minerals. Drilling and blasting is not required as the material is soft in nature. Mining activity will be carried out by open cast semi mechanized method. The operation will be carried out in a semi-mechanized way. Mining work will be done in shivpura village and mining activity will be regularly in downstream the river side from regularly in downstream the river side from north direction to south direction. Mining work shall be carried out in one bench of 3m deep from surface level of river bed. The mine face will be inclined towards the periphery for safety. The minerals will be collected in its existing form. Excavation will be carried out only up to a depth of 3.0 m. Mining will be done by removal of River sand from river bed with help of Excavator / poclain (09 m^3 capacity) back hoe excavators, loaded into trucks and send it nearby market. This leaves a top bench of 1-3 mt depth and at least 20 mt width. The River Sand below this (2m / 3m bench) is then excavated by backhoe type excavators directly loading into large trucks for dispatch to consumers. Water is sprinkled in the area from where the River Sand is to be removed

before the operation start and thereafter at regular intervals to keep the dust allayed at the source its Removal of River sand precedes the wining of River Sand. Light weight excavators will be used for loading of mineral in tippers. No OB/waste material will be produced. No drilling\blasting is required as the material is loose in nature. Proper benching will be maintained. General Schematic diagram of proposed Mining described as follows:

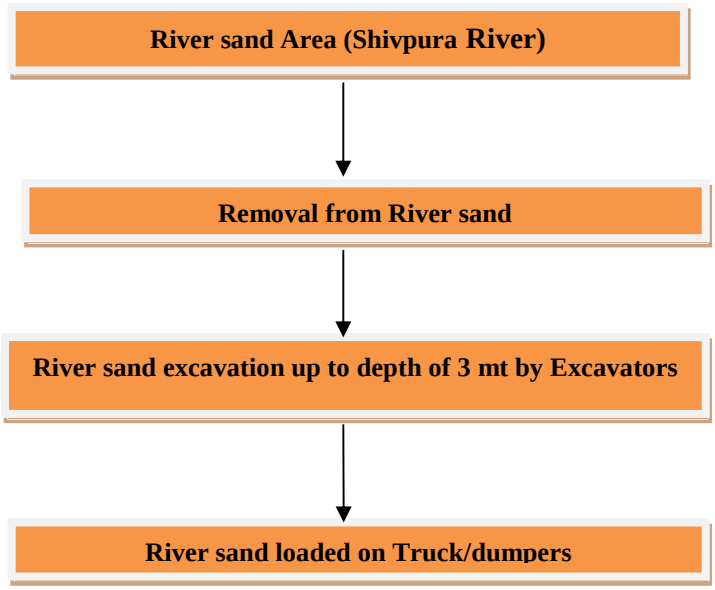


Fig.: 2.5 Process Flow Diagrams

Table 2.6 Mining Details

S. No.	Particulars	Details
1	Method of Mining	Open cast semi-mechanized
2	Mineable Reserves	22.95 lac Tonne (As per Approved Mining Plan)
3	Proposed Production	2.24 LTPA
4	No. of Bench	1
5	Total Block	1
6	Bench Height	3.0 mt
7	Ultimate working depth	3 m
8	Elevation Range	221-198mRL
9	Average Ground Water Table	67 m BGL
10	Number of working days	275

Source: Approved Mining Plan with Progressive Closure Plan

2.4.1 ULTIMATE WORKING DEPTH (BELOW GROUND LEVEL)

The deposits occur in the middle/bottom of the river. During the entire lease period, the river sand will be excavated from the surface up to 3 m bgl or above the ground water level, whichever is earlier.

2.4.2 WORKING BLOCKS

Lease area consists of 54.68 Ha.in khasra of 1 village in a stretch of 3.0 km it is proposed to work in 01 block.

2.5 GENERAL FEATURES

2.5.1 TOPOGRAPHY

The proposed area is a river bed which is flat. The Land profile adjoining the river bank is also flat. The difference of the highest & the lowest elevation of the area is about 23 mRL.

2.5.2 SURFACE DRAINAGE PATTERN

It is a river bed mining project. The total lease area is located in the Shivpura river catchment/water shed area.

2.5.3 VEHICULAR TRAFFIC DENSITY

The roads connect from the mine site to MDR-17 with a metal road. These roads are wide enough to facilitate easy and smooth movement of heavy duty trucks.

The MDR-17 has traffic density less than 5 trucks per hour. On this road trucks/trolleys ply regularly and these will easily accommodate additional dumper/tippers per hour.

2.5.4 TOWNSHIP

Since this mining is intermittent and labour employed would be mostly from adjoining villages, no colony is proposed.

2.5.5 POWER, WATER SUPPLY AND OTHER INFRASTRUCTURE REQUIREMENT

All the activities will be carried out only during day time. Hence, no power is required. The proposed river sand mining spreads in an area of 54.68 Ha which is government land. The water requirement in the mine is 5.0 KLD for mining activities, dust suppression, drinking purpose and greenbelt development. Water will be made available by the water tankers. The water balance in the proposed mining project is as follows.

Table: 2.7 Water Demand Break up

Activity	Water requirement in KLD
Domestic Use	3.0
Plantation & Dust Suppression	2.0
Total	5.0

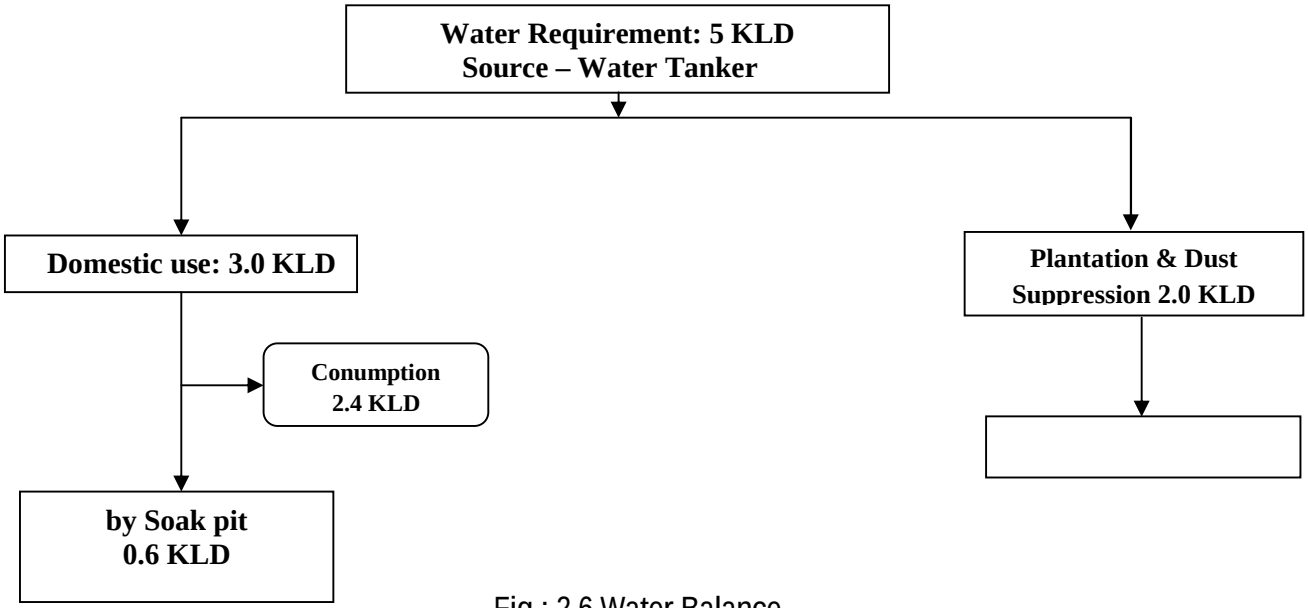


Fig.: 2.6 Water Balance

2.5.6 MINING MACHINERY

All the mining machinery will be used belongs to contractor on hire basis. The mining will be done with the help of. Excavators, front end loaders, Dumpers etc. Following equipment is proposed to be deployed for the desired production.

Table 2.8 List of Machinery

S. No.	Name of machinery	Capacity	Nos.	Status
1	Excavators	0.9 to 1.2 m	2	On hire
2	Tippers/ Trucks	20 tones	8	On hire
3	Water Tanker	4000 liter	1	On hire
4	Pay loader JCB	-	1	On hire
5	Light vehicles	-	1	On hire

** As per approved mining plan*

2.6 MANPOWER REQUIREMENTS

The proposed mining activity is envisaged to improve the socio-economic condition on a micro-economic scale by generating local employment. PP will follow a strict policy on recruiting locally available labor. The proposed project will generate direct employment to 20 personnel. Man power will be about 20 persons as per the details given below.

Table 2.9 Employment Details

S.No.	Category	Numbers
1	Manager- 1st class	1
2	Safety officer\Assistants	1
3	Technical Supervisor personal	1
4	Skilled personnel	2
5	Semi skilled personnel	5
6	Un skilled personnel	10
Total		20

2.7 PROJECT IMPLEMENTATION SCHEDULE

Efforts are being made to obtain all the statutory permissions of the mine. The commencement of production with proposed capacity of 2.24 LTPA will start soon after obtaining Environmental Clearance from MoEF followed by CTE & CTO.

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CHAPTER- 3

ANALYSIS OF ALTERNATIVES (TECHNOLOGIES & SITE)

3.0 ANALYSIS OF ALTERNATIVE SITES

Alternative sites are not selected as the proposed project is site specific. Auction for mining river sand has been processed as per Rajasthan Minor Mineral Concession (Amendment) Rules notified vides this Department Notification no. F.14 (1) Mines/ Gr. II/ 2011 dated 23.05.2012 as per amendment of rule 7 *"Provided that mining lease for mineral Bajri shall only be granted by way of tender or auction."Hence,* Mining lease auctioned by Department of Mines & Geology, Rajasthan to Mr. Paras Sethi. Consequent upon the e-auction conducted by the state government under the provisions of RMMC 1986 revised upto 2012, the letter of intent was granted vide Rajasthan State Government. The Honorable Apex Court of India in its order dated 25.11.2013, in SLP 34134, has granted interim relief for carrying out mining operation till the end of February 2014 to such holder of letter of intent who have submitted their application to the MoEF&CC for clearance. The Honorable Supreme Court in its order dated 27-03-2014 has directed that the interim relief for carrying mining operation is extended till further hearing and passing of order.

3.1 ANALYSIS OF ALTERNATIVE TECHNOLOGIES

Different methods of mining have been developed since mining had been started. With the development of the new technologies many advanced method have been adopted, yielding more extraction and least impacts on various environmental aspects such as land, air, water, noise, biodiversity. A well-known mitigating measure applied at various locations around the world is selecting sand mining method which will cause the least environmental damage. Conventionally the River Sand mining is carried out manually but in the present time semi- mechanized mining and pollution free mining method should be adopted. Mining methods should be adopted to facilitate the replenishment of the excavated pits during rainy season. Different methods of mining are as below:-

3.1.1 OPEN CAST MINING METHOD

River Sand/Bajri Mining proves beyond doubt that semi-mechanized mining method are most economical, environmentally friendly and safe.In spite of handling of large volume of river sand the mine has no or negligible adverse impact on environment hence environment and ecology of the area remains undisturbed. Mining of the river sand does not require blasting or drilling as the mineral is loose in nature.

3.1.2 SELECTION OF MINING METHODOLOGY

After the complete analysis of the technologies and the nature of the material to be extracted, mining will be done by semi mechanized open cast method, using light weight excavator sand directly loading in trucks and tractors. This is one of the most eco-friendly methods to minimize the impact of the mining on surrounding environment.

Semi-Mechanized Method of Mining

In contrast to the conventional manual method, the mining by deploying mechanical excavator including any other earth moving machines like J.C.B, Bulldozer, Pocklain, Loaders etc. in river or stream bed by the lease holder or permit holder or contractor as the case may be, is highly efficient and continuous process to win exorbitantly high daily / annual targeted production in a scientific and safe manner in accordance with the approved mining plan. The approved mining plan also permits the use of earthmovers and loaders in riverbeds. The Rules 37L (3) of Chapter IV A of RMMCR, 1986 amended upto 2012 also states that in order to ensure optimum production with minimum waste generation, every lease / license / short–term permit holder shall endeavour to deploy machinery and equipment as per mining plan. Thus use of mining machinery is not prohibited under the RMMCR. Besides this the approved mine plan also entails semi – mechanized method of mining and speaks about the extent of mechanization to be followed for mining. The targeted annual production as per approved Terms of refrence is 2.24 LTPA which corresponds to 800 tonne / day by mining in 3m deep and 20m wide benches. Man power required to achieve the targeted production will be around 20. If this daily production is to be achieved by manually more manpower required comparioson to semi machnized mining method.Besides this approximately 80 labours will be required at mine site for loading the sand into the trucks/trippers.

CONCLUSION

However, after analysis of the various factors the most environmentally compatible alternative will be selected. Selection of alternative may depend upon available technology, state policy objectives, social attitude, environmental and site constraints & project economics.

CHAPTER-4
DESCRIPTION OF EXITING ENVIRONMENT

4.0 GENERAL

The main objectives of generation of environmental baseline data are:

I. To assess present environmental quality for prediction of environmental impacts.

II. To identify environmentally significant factors for taking mitigating measures.

a. The chapter contains information on existing environmental status of land, air, water, biological& socio economic environment. The mining activity will remain confined to very small area and of little magnitude hence the zone of influence will be only surrounding fields of the leased out area. To achieve these objectives, monitoring of the environmental parameters within the core zone and buffer zone has been undertaken in accordance with the Terms of Reference and Guidelines for EIA issued by the Ministry of Environment & Forests, Govt. of India.

b. This chapter and the related discussions contain the results of field studies carried out during post monsoon season.

4.1 STUDY AREA AT A GLANCE

The study area is taken in accordance with the provisions of sector specific EIA guidance manual for Mining of Minerals manual published by Ministry of Environment and Forests, during 2010.The study area for the proposed sand mining is as follows:

- The proposed project area (Mine lease area) is considered as 'Core Zone'
- 10 km. radius from the boundary limits of the mine lease area is considered as 'Buffer Zone'.

The lease area is located in Revenue villages of Tehsil: Chohtan, District: Barmer, Rajasthan.

Table: 4.1 Environmental Setting of the Study Area

S. No.	Particular	Details
1	Study Area	10 km Radius/ Distance lease boundary
2	Teshil	Chohtan
3	District	Barmer
4	State	Rajasthan
	LOCATION	
2 5	Coordinates	Latitude: 25°31'47.6" N to 25°32'56.8" N Longitude: 71°13'43.9" E to 71°14'38.9" E
	CLIMATOLOGY (Study period)	
6	Average rainfall	0.0
7	Temperature (Max)	37°C
8	Temperature (Min)	9.1°C
9	Relative Humidity	55-65 %
10	Wind Direction	North
11	Average Wind Speed	0.61 m/s

Source: Census, 2011& IMD Barmer Station

4.2 STUDY PERIOD

The baseline environmental quality represents the background scenario of various environmental components in the study area. As part of Environmental Impact Assessment study, baseline environmental monitoring was carried out for post-monsoon season covering the months of October-November-December 2013.

4.2 Test Methodology for Environmental Monitoring and Testing

S. No.	Parameter	Test Method	Range	Instrument used	Model and Make of instrument
1	PM_{10}	IS 5182 (Part-23) 2006,Gravimetric CPCB Guidelines for Ambient Air Monitoring	5 to 1000 µg/m^3	RDS (Respirable Dust Sampler)	APM 460BL (Envirotech)
2	$PM_{2.5}$	Gravimetric CPCB Guidelines for Ambient Air Monitoring	5 to 1000 µg/m^3	APM 550	APM 550 (Envirotech)
3	SO_2	IS 5182 (Part-II) 2001,Reaff.2006	5 to 100 µg/m^3	Gas sampler	APM411 (Envirotech) AAS109 (Ecotech)
4	NOx	IS 5182 (Part-VI) 2006	6.0 to 100 µg/m^3	Gas sampler	APM411 (Envirotech) AAS109 (Ecotech)
5	CO	Electro Chemical Sensor	1-100 mg/m^3	--	--
6	Noise	IS 9876 – 1981and manufactures Manual	30 – 130dB(A)	Sound Level Meter	SLM 100 (Envirotech)
7	Weather Monitoring (Air temperature – MAX & MIN, Max RH, Min RH, Wind Speed, Wind direction, Rainfall, Air pressure.	-	Rainfall: 0.25mm - 100mm / hr. Air pressure: 350 mb - 950mb	Weather monitor	AWM (Ecotech)
8	Drinking Water Testing	IS 10500:2012, IS 3025 Various Parts	-	-	-
9	Soil Testing	Ref: Soil Chemical Analysis by M.L. Jackson Flame Photometry	-	-	-

Primary data collection Photographs given below:

4.3 LAND ENVIRONMENT

4.3.1 LAND USE OF LEASE AREA

The lease area of 54.68 Ha has flat topography with minimum (198 AMSL) & maximum (221AMSL) elevation of the leasehold area. No forest land is involved in the core zone. The study area of 10-km around the lease area is considered in the land use pattern study. For computation of the land use pattern in the study area ERDAS IMAGINE-9.2, Arc GIS and Auto Cadd software are used. The geographical area of all settlements covered within the study area is considered. In general the term land use refers to the human activities associated with specific piece of land and land cover relates to feature present on the surface of the earth. The data on land use has been collected from two sources. (i) Census data (ii) Satellite remote sensing. Below table present data collected from census hand book.

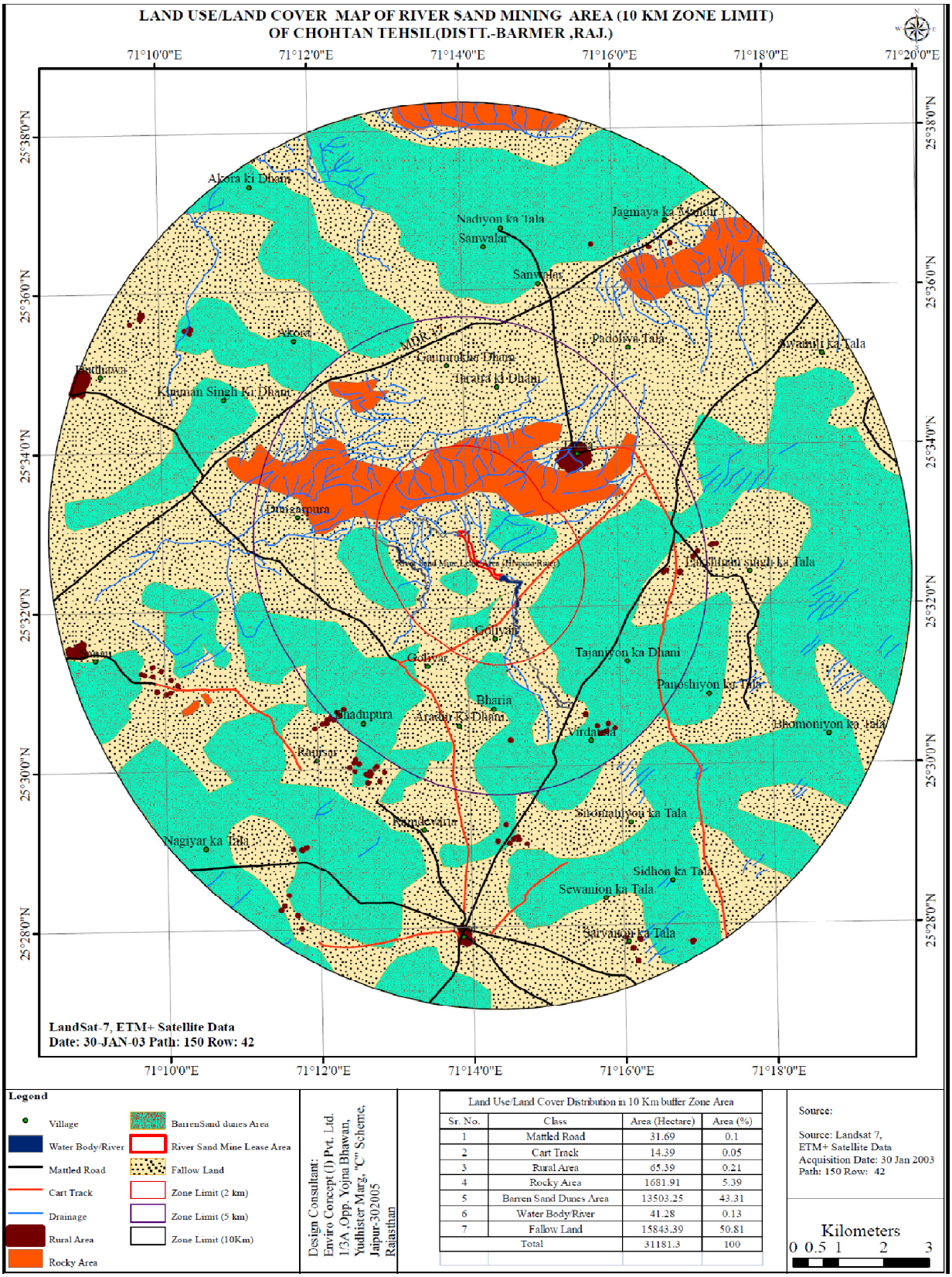


Figure 4.1 Land Use/ Land Cover Map of Study Area

The land use is classified into 07 classes - viz. Settlement, forest area, road, railway track, water bodies, agricultural land, park plantation, Nallas, scrub land.

Table 4.3 Land Use/Land Cover Classification in 10 Km Buffer Area

S. No	Class	Area in Ha.	(Area)%

1	Mattled Road	31.69	0.10
2	Cart Track	14.39	0.05
3	Rural Area	65.39	0.21
4	Rocky Area	1681.91	5.39
5	Barren Sand Dune Area	13503.25	43.31
6	Water body/River	41.28	0.13
7	Fallow Land	15843	50.81
Total		31181.30	100

The above table reveals that area is well endowed by fellow land. It covers 50.81% of total geographical area. Second largest area is under different type of water bodies and River and it covers 43.31 %, in which 54.68 Ha.area is Chohtan River Sand Mining Lease area.

4.3.2 OBJECTIVES OF LAND USE STUDIES

- To develop land use & land cover map using land coordinates of the project area.
- To identify and mark important basic features according primary and secondary data.
- To suggest measures for conservation and sustainable use of land.

4.3.3 METHODOLOGY

- Preliminary/ Primary Data Collection of the Study Area
- Satellite data procurement from NRSC Hyderabad
- Secondary Data Collection From Authorized Bodies
- Survey of India Toposheet (SOI) 40 O/2, 40 O/3, 40 O/6, 40 O/7
- Cadastral / Khasra Map
- GPS Coordinates of Mining Lease area
- Processing of satellite data using ERDAS Imagine 9.2 and prepare the land use &land cover maps (e.g. Forest, agriculture, settlements, wasteland, water bodies etc.) by digital image processing (dip) techniques.
- Geo-Referencing of the Survey of India Toposheet
- Geo-Referencing of Satellite Imagery with the help of Geo-Referenced Toposheet
- Enhancement of the Satellite Imagery
- Base Map Layer Creation (Roads, Railway, Village Names and others Secondary data
- Data Analysis and Classification
- Ground Truth Studies or Field Verification.
- Error Fixing / Reclassification
- Final Map Generation

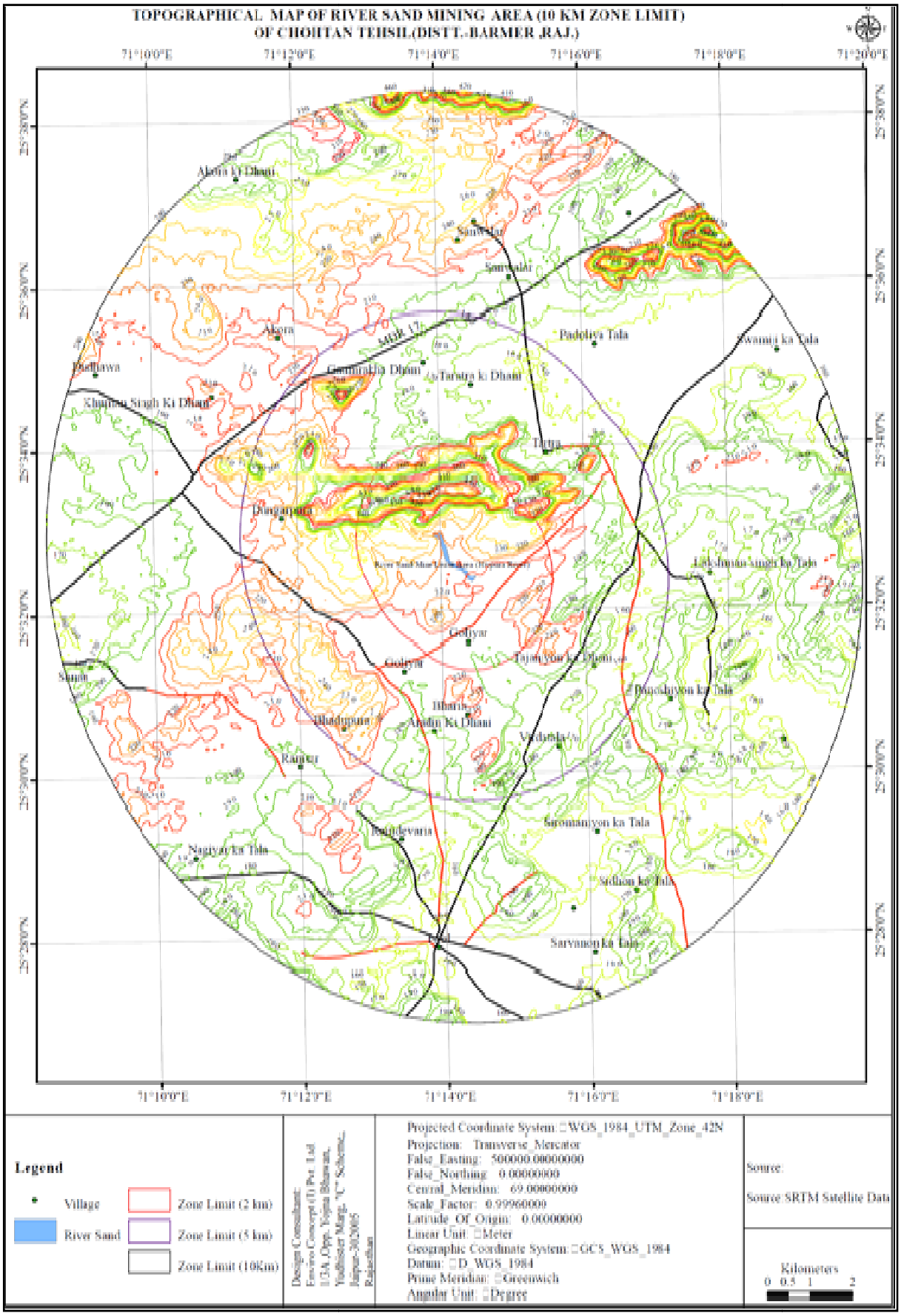


Figure 4.2 Topographical Map of the study area

4.3.4 TOPOGRAPHY

The proposed area is a river bed which is gentle sloping. The elevation in the area varies from 221 mRL to 198 mRL. The surrounding area is devoid of any thick vegetation except for patched agricultural lands. The Shivpura River flows from northwest to south east direction. River is non Perennial River and it turns only in rainy season and almost dry in summer.

Table 4.5 Slope Ratio

Highest elevation	221 mRL
Lowest elevation	198 mRL
Difference	221-198= 23 mRL
River Length	3 km

GEOMORPHOLOGY

The district forming the part of the 'Thar desert' is mostly covered by Aeolian sand. The area however exposes a variety of rock types ranging in age from upper Proterozoic to Quaternary. The pre- Malani ligneous suit comprises volcanic phase (rhyolite, agglomerate tuff), plutonic phase (granite) and dyke phase rhyolite, felsites, prophyrite, basalt). The Malani volcanic are dominated by acid volcanic flows. Three phases of acid volcanism, separated from each other by pyroclastic material, have been identified. The Birmania formation comprising limestone, chert, shale, sandstone, (Upper Proterzoic) overlite the Malani rocks the overlying Lathi formation (Jurassic) is represented by sandstone, siltstone, conglomerate and pockets of clay. Over most part of the area they are covered by Quaternary sediments and could be seen in dug well section. The Fategarh formation uncomfortably overlying the Lathi sandstone comprises sequences of conglomerate, gritty sandstone phosphalic sandstone, siltstone and bentonite Outliers of the Fategarh Formation are also seen around Sarnu. The emplacement of alkaline suite of rocks (alkali olivine basalt, hawaiite, trachyte, trachyandesite. syenite) within the Malanis. in the area around Sarnu and Dandali marks another magnetic phase The Tertiary sequence, overlying the Fatehgarh Formation is represented by the Akli, the Mandai, and the Kapurdi Formations. The Akli Formation consisting of argrillaceous sandstone, lignite, bentonic clay grades upward into the arenaceous Mandai Formation which includes conglomerate, sandstone, etc. The Kapurdi Formation (Eocene) consists mainly of Fuller's earth, variegated clay and ferruginous and gypseous concretions. The Bandah Formation consisting of friable and variegated sandstone and clay, seen in the western part of the district, is considered time equivalent of the Kapurdi Formation.

Geomorphologically, the district is classified into seven geomorphic units, namely, alluvial plain, obstacle dune, complex / composite dune, parabolic dune, sand sheet, rocky desert and denudational hill Geohydrologically, the district is classified into three hydrological domains (unconsolidated alluvium and pebble; semi consolidated formations; and consolidated fissured formations) with ground water potential ranging from < 10 to 100 LPS.

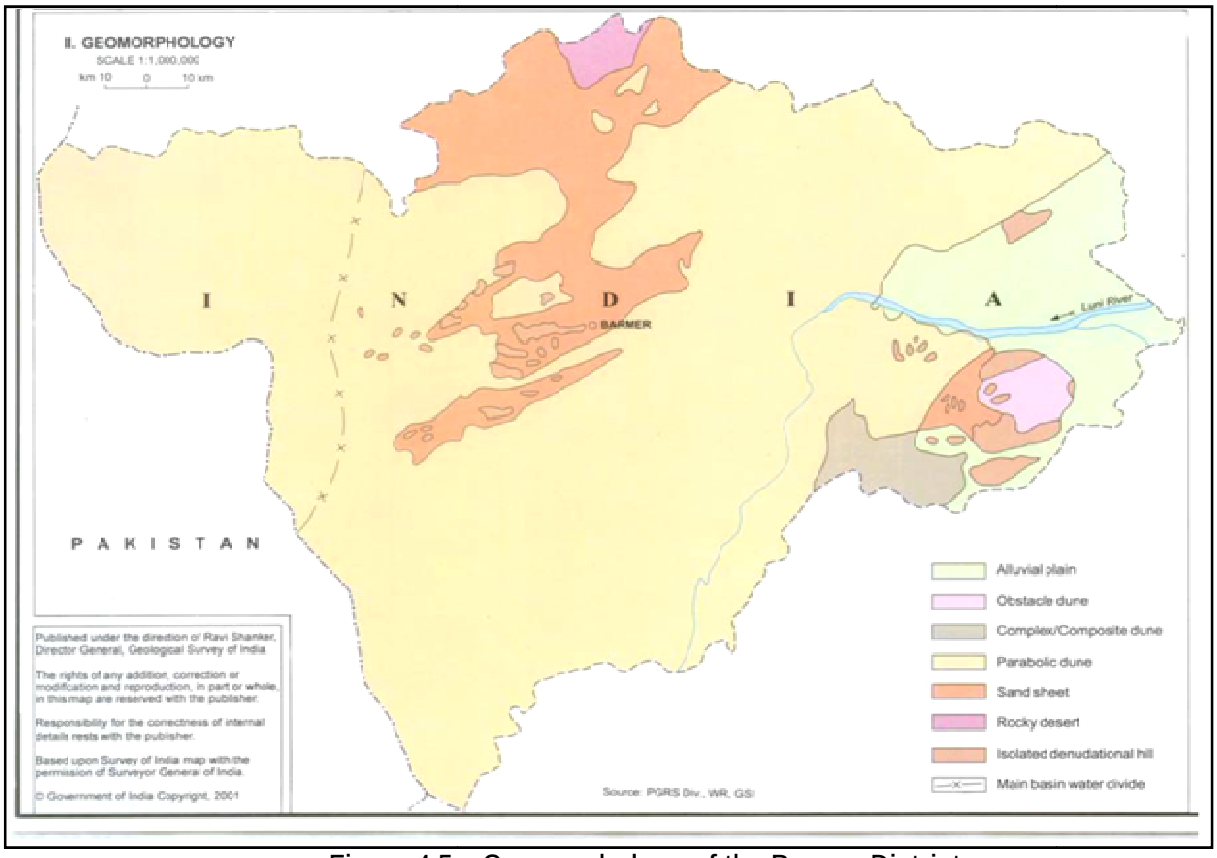


Figure 4.5 Geomorphology of the Barmer District

4.4 SEISMICITY OF THE AREA

The study area comes under Zone-II.

4.5 SOIL CHARACTERISTIC

Soils of the district are classified as follows:

Desert soil:

Desert soil area is occupied by alluvium and windblown sand, yellowish brown, sandy to sandy loam, loose, structure less, well drained with high permeability and lies in northern, western and central part of the district

Sand dunes:

These are non-calcareous soil, sandy to loamy sand, loose, structure less and well drained. It lies in northern, western and central part of the district.

Red desertic soil:

These are pale brown to reddish brown soils, structure less, loose, and well drained. Texture varies from sandy loam to sandy clay loam and lies in eastern and south eastern part of the district.

Saline soil of depressions:

This type of soil found in salt lakes. They are dark grey to pale brown, heavy soils with water table very near to the surface and are distinctly saline.

Lithosols & Regosols of hills:

This type of soil found in isolated hills as lithoslopes. These soils are shallow with gravels very near to the surface, high textured, fairly drained, reddish brown in color and lies in south eastern part of the district.

4.5.1 SOIL ANALYSIS

To understand the soil characteristics and best utility, the sampling of soils was done at five locations during the study period. The samples were examined for various physical and chemical parameters.

The objective of the sampling is:-

- To determine the baseline soil characteristics;
- To monitor the impact on soil (pollutant deposition/other) in long run.

Soil sample was collected from the proposed river sand area and nearby areas. Location of soil ,air Water & Noise is shown in Table 4.6.

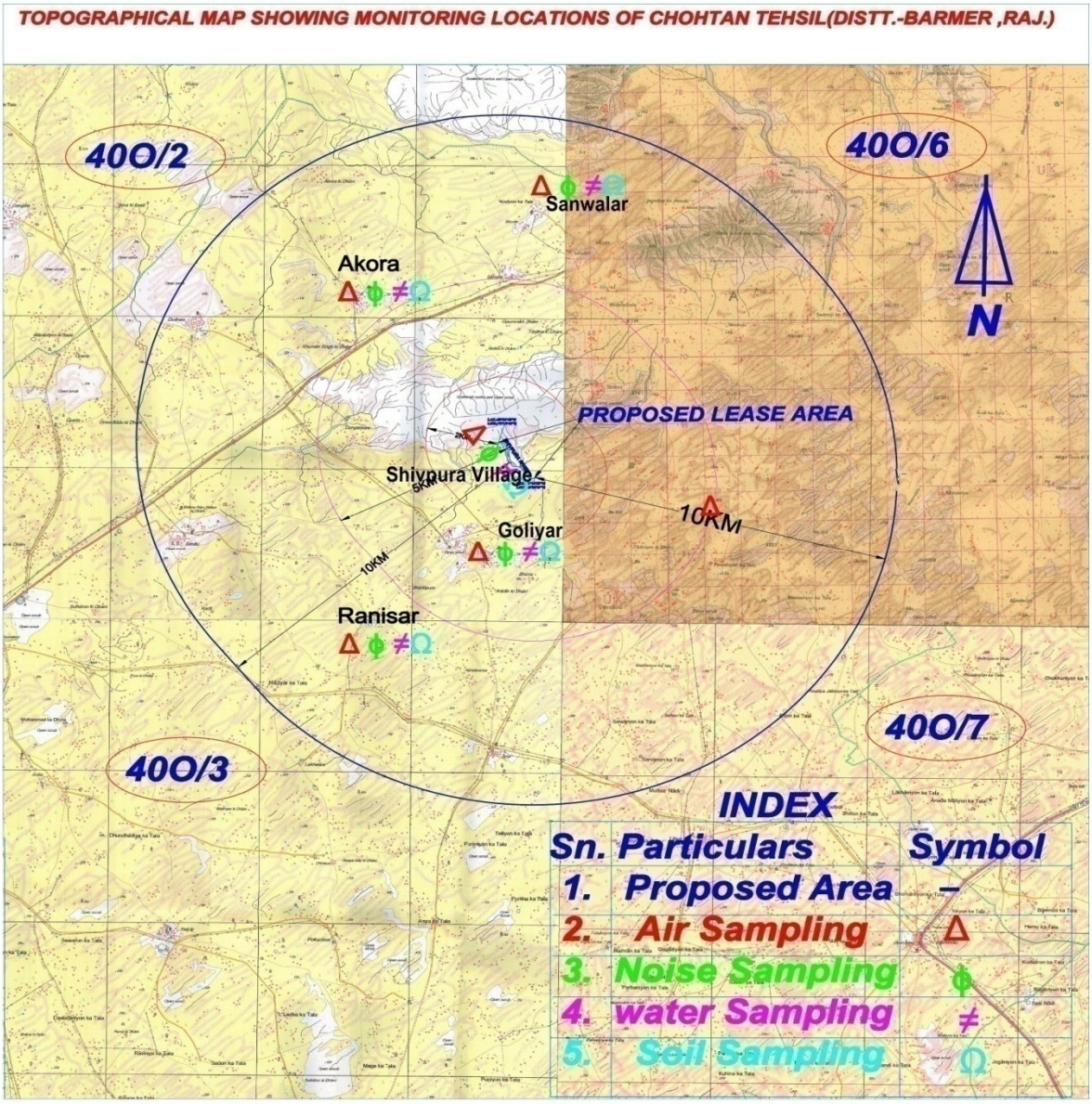


Fig.: 4.6 Environmental Monitoring Locations

4.5.2 MONITORING LOCATION

For studying soil quality of the region five samples were collected, description of the same as follows:

Table 4.6 Location of Monitoring Stations

S. No.	Name of Site	Sampling stations	Direction & Distance from Mining lease area	
1.	Shivpura	SQ1	North	0.2 km
2.	Sanwalar	SQ2	North	6.5 km

3.	Akora	SQ3	NW	6 km
4.	Goliyar	SQ4	South	1.5 km
5.	Ranisar	SQ5	SW	5.5 km

4.5.3 MONITORING RESULTS

The monitoring results are shown as below

Table: 4.7 Soil Analysis Results

S. No.	Parameters	Unit	SQ1	SQ2	SQ3	SQ4	SQ5
1	pH(1:5 suspension)	-	8.31	8.24	8.31	8.21	8.29
2	Electrical Conductivity at 25^{O}C (1:5suspension.)	µS/cm	123.7	123.0	123.07	122.1	123.4
3	Calcium (as Ca)	mg/kg	1059	1052	1061	1052	1056
4	Magnesium(as Mg)	mg/kg	54.38	54.31	54.39	54.30	54.36
5	Sodium (as Na)	mg/kg	112.66	112.59	112.66	112.55	112.64
6	Potassium(as K)	mg/kg	58.46	58.40	58.49	58.40	58.44
7	Water holding Capacity	% by mass	34.61	34.54	34.63	34.53	34.59
8	Porosity	% by mass	34.30	34.23	34.32	34.22	34.28
9	Sand	% by mass	73.53	73.46	73.53	73.44	73.51
10	Clay	% by mass	2.6	2.0	2.3	2.1	2.4
11	Silt	% by mass	24.59	24.52	24.59	24.50	24.57
12	Cation Exchange Capacity	Meq/100gm	4.97	4.90	4.97	4.87	4.95
13	Sodium Absorption Ratio	-	3.51	3.46	3.54	3.45	3.49
14	Nitrogen	% by mass	0.060	0.053	0.057	0.048	0.058
15	Phosphorus(P_2O_5)	mg/kg	16.93	16.86	16.95	16.86	16.91
16	Zinc (Zn)	mg/kg	4.94	4.87	4.95	4.85	4.92
17	Bulk Density	gm /cc	1.328	1.321	1.324	1.314	1.326
18	Organic Matter	% by mass	0.072	0.065	0.071	0.062	0.070

4.5.4 RESULT AND CONCLUSION

The soil analysis results are presented in above table. The result obtained is compared with the standard soil classification as given in Agriculture Soil limits. Five numbers of soil samples have been collected within study area and analyzed for physical and chemical properties. Samples collected from identified locations indicate pH value ranging from 8.21 to 8.31, which shows that the soil is alkaline in nature. Organic Matter ranges from 0.62% to 0.72% in the soil samples.

4.6 WATER ENVIRONMENT

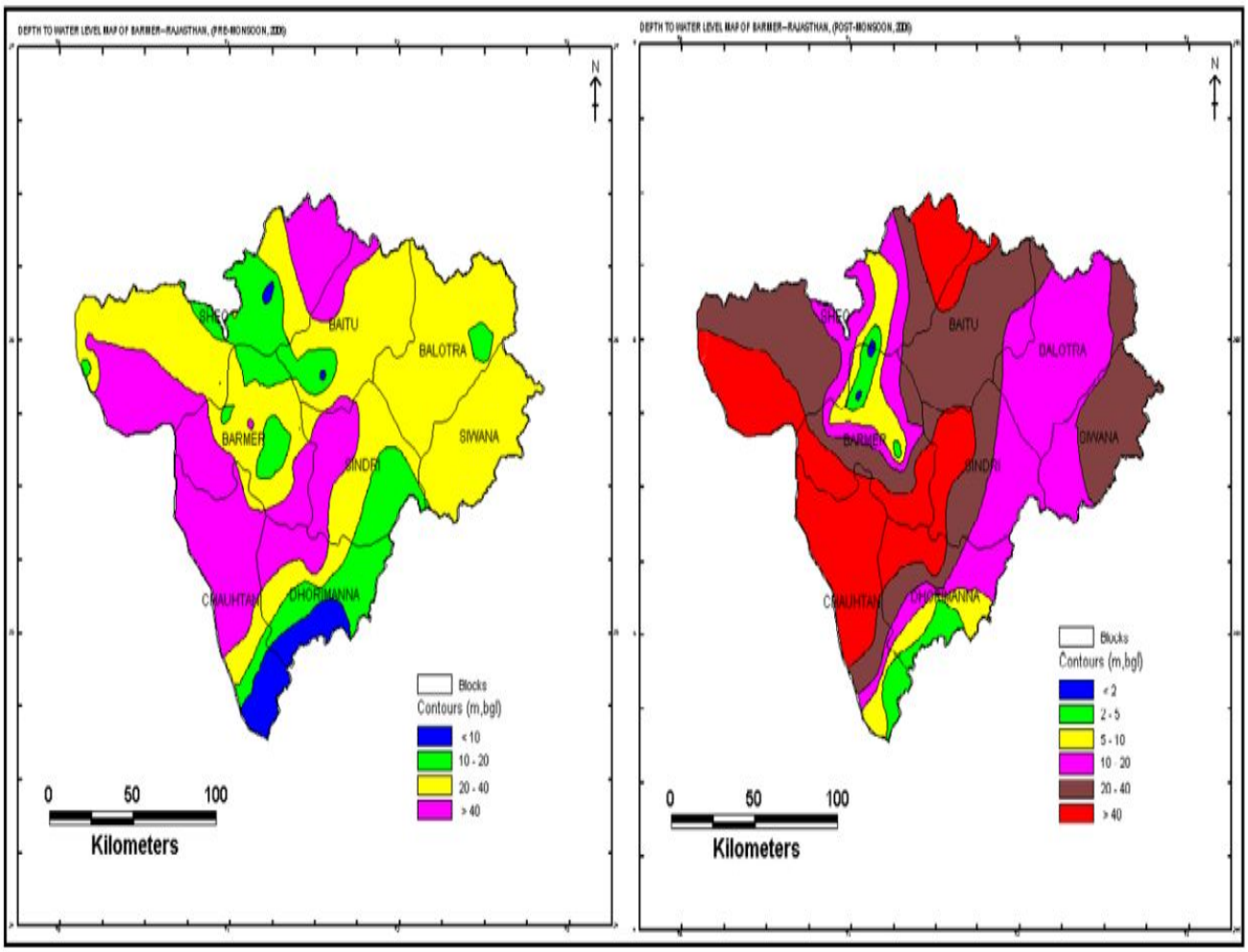
In order to conduct EIA Studies, baseline data pertaining to water environment of the existing project was carried out evaluating the basic characteristics, drainage pattern, and hydrology.

4.6.1 SURFACE WATER QUALITY

The project itself is a part of surface water body. The lease falls in Shivpura, near Tehsil: Chohtan & District: Barmer, State Rajasthan.

4.6.2 GROUND WATER QUALITY

The sources of potable water are the hand pumps, tube-wells & dug well in the area. Samples were collected from the available water resources around the mine lease area. The samples were collected & tested from different sites. The quality of ground water in water table aquifer varies widely from the composition of saline in Pachpadra salt lake to fresh water close to the hilly tract. Specific conductance ranges between 385 to 46,580 micro mhos/ cm. at 25°C. It has been observed that by and large, concentration of specific conductivity confirms broadly with that of chlorides. In greater part (about 60%) of the area, it is within 5000 micro mhos/ cm at 25°C. Higher values of specific conductance have been observed in the eastern parts of the district around Jasol, Central part around Hathi Tala and Sanwara, in northern part around Bisu kallan and in the north-western part around Napat. In general the quality of ground water deteriorates from upland and hilly tracts towards Luni River and its tributaries in the lower reaches and also in depressions in the vicinity of the saline lake. The chloride contents ranges from 10 to 19,099 ppm in phreatic aquifer and from 98 to 76470 ppm in deeper aquifer. Exploration has revealed that thickness of brine zone reaches up to about 60 m. The most extensive brine tract is between Thob and Chawa through Pachpadra. Fresh water at all levels is confined mainly to the area around Dhorimana and the alluvial tract between Balotra and Asotra. 2. Ground water is saline at all levels in the area between Thob and Chawa and around Sanwarla salt lakes. 3. Saline / brackish water is underlain by potable water in Bhimda and Ratri areas. 4. Fresh water underlain by saline water is in Balotra-Padru area. 5. In many parts of saline tracts especially close to tanks and streams, fresh water lenses over lies the saline water. Fluoride in the ground water ranges between traces and 11.30 mg/l. In major part of the area, it is within the limit of 2.0 mg/l. except in small pockets in the central part around Chawa; in northern part around Kashmir and Sau Padam Singh; in north western parts around Sandra and in the southern parts around Shamu Ki Dhani.



Source: Central Ground Water Department

Figure 4.7 Depths to Water Level Map of Study Area

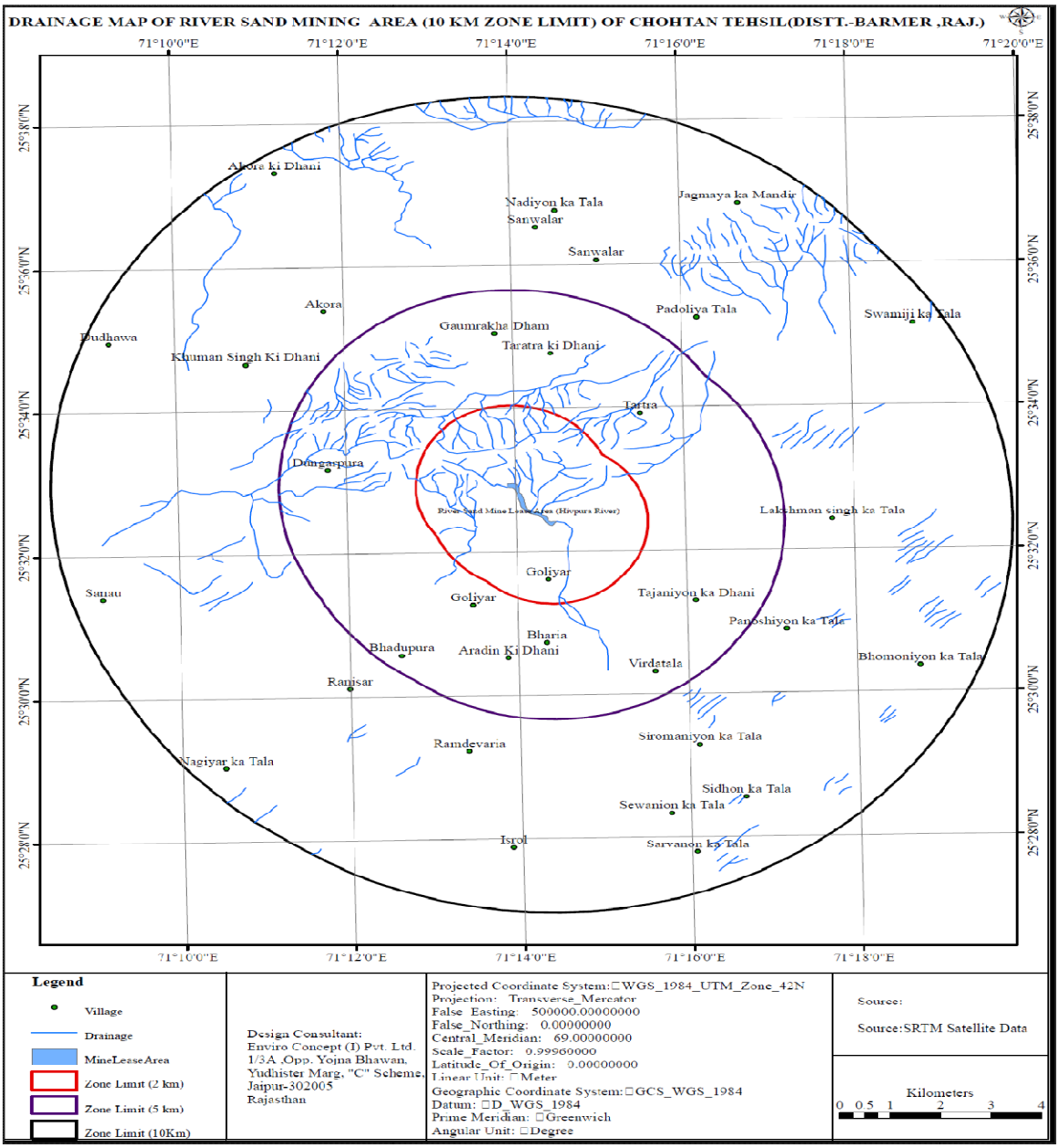
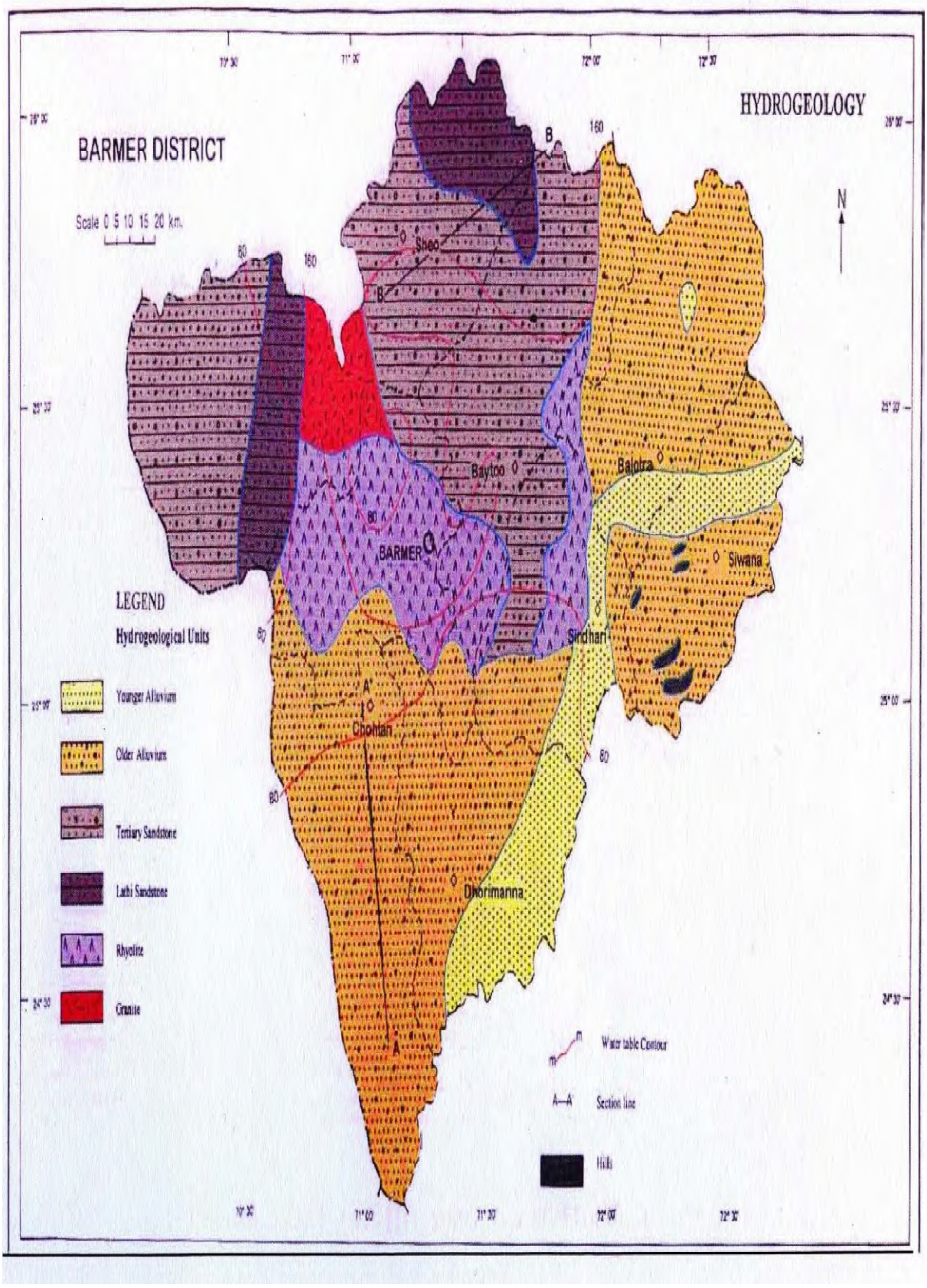


Figure 4.8 Drainage Map of River Sand Mining Study Area



Source: Central Ground Water Department

Figure 4.9 Hydrology Map of Barmer District

4.6.3 MONITORING LOCATIONS

Five groundwater samples were collected as grab samples separating the whole study area and were analyzed for various parameters. The analyzed results were compared with the standards for drinking water as per IS: 10500:2012. The water sampling locations are listed in Table 4.8 & Monitoring results in Table 4.9.

Table: 4.8 Location of Monitoring Stations

S. No.	Name of Site	Sampling stations	Ground water Table (m bgl)	Direction & Distance from Mining lease area	
1.	Shivpura	WQ1	67	North	0.2 km
2.	Sanwalar	WQ2	64.06	North	6.5 km
3.	Akora	WQ3	63.10	NW	6.0 km
4.	Goliyar	WQ4	66.10	South	0.5 km
5.	Ranisar	WQ5	65.10	SW	5.5 km

4.6.4 MONITORING RESULTS

Table 4.9 Monitoring Results

Parameter	Requirement (Desirable Limit) (As per BIS 10500:2012	Permissible limit in the Absence of Alternate source (As per BIS 10500:2012	Location and Source of Water Sample				
			GW1 Shivpura	GW2 Sanwalar	GW3 Akora	GW4 Goliyan	GW5 Ranisar
Colour	5	15	<1.0	<1.0	<1.0	<1.0	<1.0
Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Taste	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity	1	5	<1.0	<1.0	<1.0	<1.0	<1.0
pH value	6.5-8.5	-	7.75	7.81	7.68	7.70	8.06
Total dissolve solid (TDS)	500	2000	233	256	279	241	311
Aluminum (as Al)	0.03	0.2	BDL	BDL	BDL	BDL	BDL
Total Ammonia	0.5	No Relaxation	BDL	BDL	BDL	BDL	BDL
Anionic surface Detergents(as MBAS)	0.2	1.0	BDL	BDL	BDL	BDL	BDL
Barium (as Ba)	0.7	No Relaxation	BDL	BDL	BDL	BDL	BDL
Boron (as B)	0.5	1.0	<0.1	<0.1	<0.1	<0.1	<0.1
Calcium (as Ca)	75	200	20.75	21.38	21.03	71.92	71.62
Chloramines (as Cl_2)	4.0	No Relaxation	BDL	BDL	BDL	BDL	BDL
Chloride (as Cl)	250	1000	58.59	59.95	59.27	60.47	61.79
Copper (as Cu)	0.05	1.5	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoride (as F)	1.0	1.5	0.74	0.74	0.75	0.76	0.74
Free Residual Chlorine	0.2	1.0	BDL	BDL	BDL	BDL	BDL
Iron (as Fe)	0.3	No Relaxation	0.186	0.206	0.202	0.199	0.311
Magnesium (as Mg)	30	100	8.976	8.739	9.476	6.958	9.671
Manganese (as Mn)	0.1	0.3	BDL	BDL	BDL	BDL	BDL
Nitrate (as NO_3)	45	No Relaxation	3.85	3.98	3.73	3.82	4.02
Selenium (as Se)	0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
Silver (as Ag)	0.1	No Relaxation	BDL	BDL	BDL	BDL	BDL
Sulphate (as SO_4)	200	400	15.93	16.02	16.42	15.97	17.21
Sulphide(as	0.05	No Relaxation	BDL	BDL	BDL	BDL	BDL

H_2S)							
Alkalinity (as Ca CO_3)	200	600	62.75	62.92	61.69	60.97	61.86
Total Hardness (as $CaCO_3$)	200	600	90.49	91.47	90.84	91.68	92.29
Zinc (as Zn)	5.0	15	0.327	0.365	0.361	0.356	0.421
Cadmium (as Cd)	0.003	No Relaxation	BDL	BDL	BDL	BDL	BDL
Cyanide (as CN)	0.05	No Relaxation	BDL	BDL	BDL	BDL	BDL
Lead (as Pb)	0.01	No Relaxation	BDL	BDL	BDL	BDL	BDL
Mercury (as Hg)	0.001	No Relaxation	BDL	BDL	BDL	BDL	BDL
Nickel (as Ni)	0.02	No Relaxation	BDL	BDL	BDL	BDL	BDL
Arsenic (as As)	0.01	0.05	BDL	BDL	BDL	BDL	BDL
Total Chromium (as Cr)	0.05	No Relaxation	BDL	BDL	BDL	BDL	BDL
Coliform Bacteria	Absent/100ml	--	Absent	Absent	Absent	Absent	Absent
E.Coli	Absent/100m1	--	Absent	Absent	Absent	Absent	Absent

Source: Environmental Monitoring Report *BDL: Below Detection limit.*

4.6.5 RESULTS & CONCLUSIONS

The analysis results indicate that the pH ranges from 7.68 to 8.06 of study area. The TDS (Total Dissolved Solids) was found to be in the range 233 mg/L to 311 mg/ L. It is seen that the physico-chemical analysis of other parameters like chloride, calcium, magnesium, nitrate and fluoride were found within desirable limit of IS (10500:2012)., Values are not exceeding the limits and are suitable for drinking purpose.

4.7 AIR ENVIRONMENT

To establish the ambient air quality the studies were carried out during post – monsoon of the year 2013-14. Ambient air quality of the study area has been assessed through a network of 5 AAQ locations.

4.7.1 AIR SAMPLING

In order to identify the background air quality data and also represent the interference from various local activities, screening techniques have been used for identification of air quality stations in the study area. Ambient air quality of the study area has been assessed through a network of 5 AAQ locations.

4.7.2 METEOROLOGY

Air borne pollutants are dispersed by atmospheric motion. Knowledge of these motions, which range in scale from turbulent diffusion to long-range transport by weather systems, is essential to simulate such dispersion and quality of impacts of air pollution on the environment. Meteorology influences the way air pollution is dispersed, including wind direction and wind speed, type of terrain and heating effects The purpose of EIA provides an opportunity to identify and compute the short term maximum pollutant concentrations likely to encounter at fixed locations (Know as the receptor), due to the given sources (locations and rates of emission known), under the prevailing site specific atmospheric conditions. Meteorology data has been collected from the IMD Barmer.

SEASONS

For the Study area, India Meteorological Department (IMD) broadly divides the year into four seasons given below:

Table: 4.10 Four Seasons Divided by IMD

Season	Months
Winter	January to February
Pre-monsoon	March to May

Monsoon	June to September
Post Monsoon	October to December

Table 4.11 site specific micro metrological data

Month	Temp (°C)		Relative Humidity (%)		Rainfall (in mm)	Average wind speed (m/s)
	Max.	Min.	08:30 hrs.	17:30 hrs		
October 2013	37	20.2	31-78 %	19-33%	0.0	0.75
November 2013	32.7	14.1	56-82%	34-37%	0.0	0.75
December 2013	29.0	9.0	33-85%	19-70%	0.0	0.34

4.7.3 WIND ROSE

A wind rose is a graphic tool used by meteorologist to give a succinct view of how wind speed and direction are typically distributed at a particular location. Wind velocity is a measure of wind speed and direction. It is one of the most important meteorological parameters and governs dispersion, diffusion and transportation of pollutants to the atmosphere.

Wind rose is the diagrammatic representation of wind speed in a specified direction with its arms representing sixteen direction, each arms give a clear frequency distribution of wind speed in a particular direction for a given period of time.

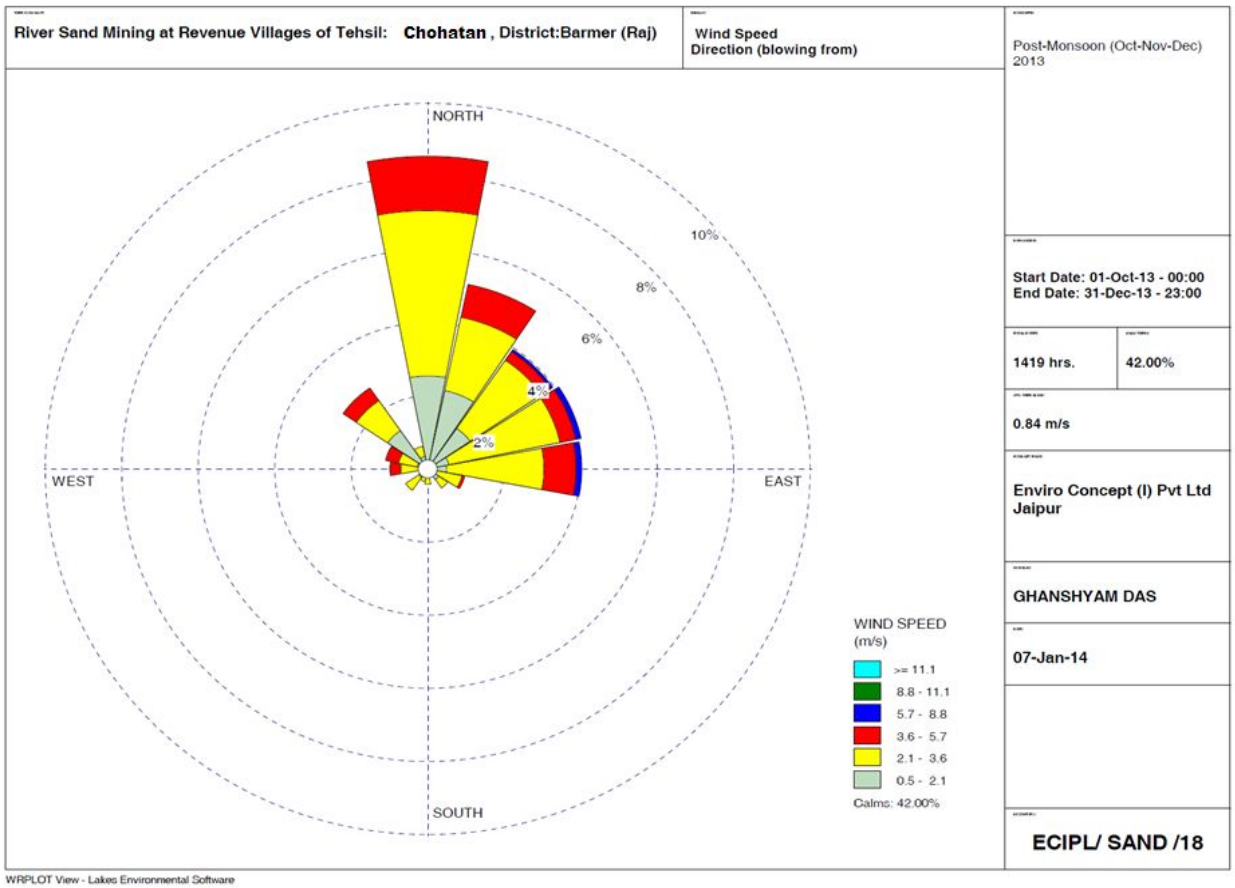


Figure 4.10 Wind Rose Diagram

Table: 4.12 Frequency Distribution (24 hr.)

S. No.	Directions /Wind Classes (m/s)	0.5- 2.1	2.1 - 3.6	3.6 - 5.7	5.7 - 8.8	8.8- 11.1	≥11.1	Total (%)
1	348.75 - 11.25	2.537	4.51022	1.47992	0	0	0	5.48256

2	11.25 - 33.75	2.18464	2.04369	0.91614	0	0	0	3.30766
3	33.75 - 56.25	1.33897	2.25511	0.28189	0.07047	0	0	2.53738
4	56.25 - 78.75	0.56378	2.95983	0.42283	0.14094	0	0	2.628
5	78.75 - 101.25	0.49331	2.537	0.84567	0.14094	0	0	2.58269
6	101.25 - 123.75	0.07047	0.84567	0.07047	0	0	0	0.63435
7	123.75 - 146.25	0.35236	0.28189	0	0	0	0	0.40779
8	146.25 - 168.75	0.14094	0.07047	0	0	0	0	0.13593
9	168.75 - 191.25	0.21142	0.21142	0	0	0	0	0.27186
10	191.25 - 213.75	0.21142	0.14094	0	0	0	0	0.22655
11	213.75 - 236.25	0.28189	0.42283	0	0	0	0	0.4531
12	236.25 - 258.75	0.14094	0.07047	0	0	0	0	0.13593
13	258.75 - 281.25	0.21142	0.49331	0.28189	0	0	0	0.63435
14	281.25 - 303.75	0.28189	0.49331	0.35236	0	0	0	0.72497
15	303.75 - 326.25	1.2685	0.98661	0.42283	0	0	0	1.72179
16	326.25 - 348.75	0.35236	0.28189	0	0	0	0	0.40779
	Sub-Total	6.84187	11.9619	3.26235	0.22655	0	0	22.2927
	Calms							42.0027
	Missing/Incomplete							35.7046
	Total							100

4.7.4 AMBIENT AIR QUALITY (AAQ)

Prevailing air environment i.e. base line conditions in an area is primarily governed by the different activities going on in that area including industrial, agricultural, domestic and commercial activities. The pollutant concentrations in the atmosphere is also governed by the meteorology, topography, natural settings in terms of plantation, forest cover, vegetation etc. as these factors in combination with each other are responsible for dispersion, diffusion, transportation and assimilation of pollutants in the local air shed.

Method of Monitoring

The Central Pollution Control Board (CPCB) has published comprehensive document on emission testing regulations ("Emission Regulations Part-3, 1985). There are a number of useful additional procedures and expressions that are of relevance to measurement of stack emissions, which are recommended to supplement the CPCB procedures.

Frequency and Parameters for Sampling

The ambient air monitoring was carried out at the frequency of two days per week at all locations during one complete season.

Table: 4.13 Monitored Parameters and Frequency of Sampling

Parameters	Sampling Frequency
PM_{10}	24 hourly sample twice a week
$PM_{2.5}$	24 hourly sample twice a week
Sulphur Dioxide (SO_2)	24 hourly samples twice a week
Oxides of Nitrogen (NO_x)	24 hourly samples twice a week
Carbon Monoxide (CO)	8 hourly for 24 hrs sample twice a week

4.7.5 METHODOLOGY ADOPTED FOR AIR QUALITY MONITORING

Monitoring location

The baseline status of the air quality in the study area was assessed though a scientifically designed ambient air quality monitoring network. The selection of monitoring network was based on the following aspects:

- Topography / terrain of the study area
- Populated area within the study area
- Residential and sensitive areas within the study area.
- Magnitude of the surrounding industries.
- Representation of regional background levels.

Monitoring locations is shown as table 4.6.

Table 4.14 Methods for Monitoring

S. No.	Parameters	Instrument	Method	Method of Analysis
1.	PM_{10}	Respirable Dust Sampler and High Volume air sampler	BIS 5182 Part IV-1973 (Average flow rate not to be less than 1.1 m^3/ minute)	Gravimetric
2.	$PM_{2.5}$	Fine Particulate Matter FPM 550	Gravimetric	Gravimetric
3.	Sulphur Dioxide	Respirable Dust Sampler and High Volume air sampler	BIS 5182 Part II-1969 Improved West & Gaeke method (Pararosaniline method)	Calorimetric Ultraviolet fluorescence
4	Nitrogen Oxides	Respirable Dust Sampler and High Volume air sampler	BIS 5182 Part IV-1973 Jacob & Hochheiser modified (Na-Arsentine method)	Calorimetric Gas phase Chemiluminescence
5	Carbon Monoxide	By Electro Chemical Sensor	--	Non Depressive Infrared (NDIR) Spectroscopy.

Five sampling stations were established around the core zone within 10 km radius to study the present air quality. The locations are given in Table 4.2 and the area marked .The Selection of air monitoring station was carried out on the basic of prominent wind direction that is one is down wind direction & two at the up wind directions.

Table: 4.15 Location of Air Quality monitoring station

S. No.	Name of Site	Sampling code	Direction & Distance from Mining lease area		Nearest Mining Block (where Working Proposed)	Selection Criterion
1.	Shivpura	AAQ1	North	0.2 km	Predominant direction	Near to Transportation route from block A to MDR-7
2.	Sanwalar	AAQ2	North	6.5 km	-	Upwind drirection
3.	Akora	AAQ3	NW	6.0 km	-	Near to MDR-17
4.	Goliyar	AAQ4	South	0.5 km	Downwind Direction	Downwind direction
5.	Ranisar	AAQ5	SW	5.5 km		Downwind direction Near to Local Village Road Habitation in buffer zone

Table 4.16 (a) Summary of Air Quality Monitoring Results

Parameters	Location	No. of Observations	Max.	Min.	Avg	98%tile	CPCB Standerds
PM_{10} ($\mu g/m^3$)	Shivpura	24	64.55	56.26	60.21	64.28	100
	Sanwalar		64.55	56.14	60.34	64.28	
	Akora		64.25	56.33	60.36	64.22	
	Goliyan		64.55	56.02	60.13	64.36	
	Ranisar		64.55	56.87	60.40	64.28	
$PM_{2.5}$ ($\mu g/m^3$)	Shivpura	24	45.31	37.01	41.16	44.40	60
	Sanwalar		45.69	37.14	41.415	44.77	
	Akora		45.36	37.02	41.19	44.45	
	Goliyan		45.99	37.55	41.77	45.07	
	Ranisar		45.68	37.21	41.445	44.76	
SO_2 ($\mu g/m^3$)	Shivpura	24	15.47	7.02	11.31	15.31	80
	Sanwalar		15.36	7.02	11.31	10.55	
	Akora		15.9	7.21	11.6	7.21	
	Goliyan		15.37	7.02	11.26	15.01	
	Ranisar		15.78	7.45	11.45	15.68	
NO_2 ($\mu g/m^3$)	Shivpura	24	24.2	16.35	20.38	24.02	80
	Sanwalar		24.69	12.54	20.07	16.99	
	Akora		24.7	16.3	20.4	24.1	
	Goliyan		24.69	16.25	20.58	24.31	
	Ranisar		24.65	16.25	20.47	24.58	
CO (mg/m^3)	Shivpura	24	0.59	0.36	0.475	0.58	2
	Sanwalar		0.59	0.36	0.473	0.39	
	Akora		0.59	0.36	0.48	0.58	
	Goliyan		0.59	0.36	0.475	0.58	
	Ranisar		0.59	0.34	0.47	0.58	

4.7.6 RESULT AND CONCLUSION

Ambient Air Quality Monitoring reveals that the concentrations of PM_{10}, $PM_{2.5}$, SO_2, NO_2 & CO for all the 5 AAQM stations were found within prescribed Limit. Ambient Air Quality Monitoring reveals that the concentrations of PM_{10} and $PM_{2.5}$ for all the 5 AAQM stations were between 56.02 to 64.55$\mu g/m^3$ and 37.01 to 45.99$\mu g/m^3$ respectively. As far as the gaseous pollutants SO_2 and NO_2 are concerned, the prescribed CPCB limit of 80$\mu g/m^3$ has never surpassed at any station. The concentrations of SO_2 were in range of 7.02 to 15.9$\mu g/m^3$. The concentrations of NO_2 were in range of 16.25 to 24.69$\mu g/m^3$.The Concentration of CO were in range of 0.34 to 0.59mg/m^3

4.8 MINERALOGICAL COMPOSITION FOR PM_{10}

RSPM is “defined as the component of inhaled respirable dust small enough to reach the pulmonary or alveolar region of the lung”.

Table 4.17 Mineralogical composition of PM_{10}, Post Monsoon season 2013

Location	Sampling Stations	Free Silica $\mu g/m^3$		
		Max	Min	Avg

Shivpura	AAQ1	3.6	3.4	3.5
Sanwalar	AAQ2	3.6	3.4	3.5
Akora	AAQ3	3.7	3.5	3.5
Goliyan	AAQ4	3.6	3.4	3.5
Ranisar	AAQ5	3.6	3.4	3.5

National Institute for Occupational Safety and Health (NIOSH) recommended permissible exposure limit (PEL) for free silica is 50µg/m³ as a time-weighted average (TWA) for up to a 10-hr workday during a 40-hr workweek.

4.9 NOISE ENVIRONMENT

Noise can be defined as an unwanted sound. The acoustic environment varies dynamically in magnitude and character throughout in most communities. The noise level variation can be temporal, spatial. It interferes with speech and hearing and is intense enough to damage hearing or is otherwise annoying. The definition of noise as unwanted sound implies that it has an adverse effect on human beings and their environment.

4.9.1 INSTRUMENT USED FOR SAMPLING AND MONITORING

Instant Sound Level Meter (SLM) is used for the collection of data related to noise at an interval of one hour. The day noise levels have been monitored during 6:00 AM to 10:00 PM and night noise levels during 10:00 PM to 6:00 AM at all the locations covered in the study area.

4.9.2 Monitoring Location

Five sampling stations were established around the core zone within 10 km radius to study the present air quality. The locations are given in Table 4.6.

Table No 4.18 Locations of Noise Monitoring

S. No.	Name of Site	Sampling code	Direction & Distance from Mining lease area		Classified Zone
1.	Shivpura	NQ1	North	0.2 km	Silence zone
2.	Sanwalar	NQ2	North	6.5 km	Commercial Zone
3.	Akora	NQ3	NW	6.0 km	Residential Zone
4.	Goliyar	NQ4	South	1.5 km	Silence zone
5.	Ranisar	NQ5	SW	5.5 km	Residential Zone

4.9.3 RESULTS AND CONCLUSIONS

Generally noise levels in public places like temples and community hall have higher values in day time. In the study area higher Noise value of 62.8 dB (A) was recorded during day time in Sanwalar (Near Bus Stand) & lower Noise value of 35.6 dB (A) was recorded during night time in village Akora (Residential area). Table No 4.18 shows the noise levels in the study area. The noise quality of the study area is shown as below:

Table 4.19 Noise Quality Monitoring Results

Sampling code	Name of the location	Noise levels dB(A)	
		Leq_{day}	Leq_{night}
NQ1	Shivpura	46.3	35.6
NQ2	Sanwalar	62.8	51.4
NQ3	Akora	52.4	38.9
NQ4	Goliyan	44.8	36.1
NQ5	Ranisar	51.3	40.5

A) Day time Noise Levels (Leqday)

The daytime (Leqday) noise levels are observed to be in the range of 44.8 to 62.8 dB

Night time Noise Levels (Leqnight)

The nighttime (Leqnight) Noise levels are observed to be in the range of 35.6 to 51.4 dB(A).

Table 4.20 Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence Zone	50	40

4.10 BIOLOGICAL ENVIRONMENT

Biodiversity studies comprise the systematic examination of the full array of different kinds of organisms together with the technology by which the diversity can be maintained and used for the benefit of humanity. Current basic research at the species level focuses on the process of species formation the standing level of species numbers in various higher taxonomic categories and the phenomena of hyper diversity and extinction proneness. The major practical concern is the massive extinction rate now caused by human activity which threatens losses in the esthetic quality of the world, in economic opportunity and in vital ecosystem services.

Biodiversity and ecosystems need to be protected in order to preserve the quality of life on Earth. Biological impact assessment is an integral and important component of "Environmental Impact Assessment" (EIA). Biological impact assessment (BIA) generally includes lists of plants and animals present in the core and buffer areas of the proposed project site. The identified species then check for their status according to an IUCN list of threat categories viz., endemic, endangered, vulnerable, rare, indeterminate and insufficiently known. In certain cases it is also considered desirable to conduct vegetation analysis using standard phyto-sociological methods.

BIA documents and collates the baseline data and information on the status of biodiversity and bio-resources likely to be impacted by the proposed activity and suggests measures for mitigation of the impact. Thus the fundamental objective of the BIA is to conserve the biodiversity and ensure its sustainable utilization.

In India BIA comes under the purview of the Environmental Protection Act 1986, Environmental Impact Assessment Notification of 1994, Wildlife Act of 1972, Forest Conservation Act 1980 amended in 1988, Biodiversity Act 2002.

Plant and animal communities are indicators of the environment. They respond not only to one environmental factor, but also to an interacting group of factors. These communities influence and react sensitively to changes in the balance of environmental stresses. Therefore, a detailed knowledge of the diversity of the area helps in managing the area properly following suitable practices. Floral and faunal surveys conducted for assessing the biological diversity and its status over a period of time that forms an integral part of Impact Assessment Techniques.

The study was conducted in the project area to assess all possible consequences on the biological environment. The study area consists of open scrub, where the arid vegetations are sparsely distributed with undulated topography due to sand dunes. The present study is highlighting the various issues pertaining to floristic diversity and the faunal wealth in and surrounding area of the study site at Tehsil: Chohatan, District: Barmer, Rajasthan.

4.10.1 Objectives of the study:

The biological study of the area has been conducted in order to understand the ecological status of the existing flora and fauna to generate baseline information and evaluate the probable impacts on the biological environment.

The present objectives were undertaken with the following objectives:

- To collect the baseline terrestrial biodiversity status regarding flora and fauna in the project area.
- To assess the frequency, density, abundance, Importance Value Index (IVI) and Shannon-Wiener Diversity Index (flora).
- To evaluate the dominant species of plant and animal. Secondary data also be collected from the local residents and authenticated list of flora and fauna by the Department of Forest, Govt. of Rajasthan, Rajasthan.
- To identify the endangered / threatened / scheduled species in the study area (both flora and fauna). The conservation plan will be given if any wildlife species of schedule I is present there.
- To mark the wetlands and other ecologically sensitive areas such as national parks/ sanctuaries, if present there.
- To provide the conservation plan and suggestion / recommendation for social forestry green belt / plantation.
- To assess the effect of construction and operation of the project on existing ecology.

On the basis of on-site observations a checklist of flora and fauna was prepared.

4.10.2 STUDY APPROACH AND METHODOLOGY

Delineation of the Study Area

The project study area was delineated into two zones for biodiversity inventory. The project lease boundary was considered as Core Zone (540000Sq.m./54.ha) while, the area encompassing 10 km radius from the project boundary was designated as Buffer Zone. Field survey was carried out in all major habitats covering both core and buffer zones.

4.10.3 METHODOLOGY

To achieve the above objectives, a detailed study of the area was undertaken in proposed project site. The field sampling was conducted during the Oct. - Dec. 2013

The species of Flora & Fauna found in the study area are mentioned below:

Core zone:

The study was consisted in arid zone therefore mostly xerophytic and semi-arid adapted plant species were observed during site visit. Only Aak (*Calotropis procera)* shrub *and* Saniya (*Crotalaria burhia)* herb were present in the core area.

Table- 4.21 List of Plants in the study area

TREES							
S. No	Plant Species	Common name	Habitant	Family	Abun.	Avrg.	Mini.
1.	*Tecomella undulata*	Rohira	Arid & Semi Arid Region	Bignoniaceae	Y		
2.	*Zizyphus mauritiana*	Ber	Arid & Semi Arid Region	Rhamnaceae		Y	

3.	*Salvadora oleoides*	Meetha Jal	Arid and Semiarid region	Salvadoraceae		Y	
4.	*Prosopis cineraria*	Khejari	Arid , Semi arid & region	Fabaceae	Y		
5.	*Ficus religiosa*	Pipal	Arid , Semi arid & Tropical region	Moracea			Y
6.	*Azadirachta indica*	Neem	Arid to Tropical region	Meliaceae		Y	
7.	*Ziziphus xylopyra*	Gathbor	Arid and Semi Arid region	Rhamnacea		Y	
8.	*Acacia Senegal*	Kumat	Arid and Semi Arid region	Mimosacea	Y		
9.	*Acacia tortalis*	Israili Babool	Arid and Semi Arid region	Mimosacea	Y		
10	*Pongagamia pinnata*	Karanj	Arid to Tropical region	Fabaceae			Y
11	*Ricinus communis*	Aranda	Arid to Tropical region	Euphorbiacae		Y	
12	*Sapindus emarginatus*	Aritha	Arid to Tropical region	Sapindaceae			Y
SHRUBS							
1.	*Lyrium european*	Murali	Arid and Semiarid region	Fabaceae		Y	
2.	*Euphorbia royleana*	Thor	Arid and Semiarid region	Euphorbiacaea	Y		
3.	*Clerodendron phlomoides*	Ami/Irna	Arid and Semiarid region	Lamiacea	Y		
4.	*Zizyphus numnularia*	Jharber	Arid and Semiarid region	Rhamnaceae		Y	
5.	*Caparis deciduas*	Kair	Arid and Semiarid region	Caparaceae	Y		
6.	*Salvadora persica*	Khara Jal	Arid and Semiarid region	Salvadoraceae	Y		
7.	*Ricinus communis*	Aranda	Arid & Tropical Region	Euphorbiaceae			Y
8.	*Maytenus emerginata*	Kankera	Arid and Semiarid region	Fabaceae			Y
9	*Prosopis juliflora*	Vilayati Babool	Arid and Semi arid region	Fabaceae	Y		
HERBS							
1.	*Leptadenia pyrotechnica*	Khimpra	Arid and Semiarid region	Asclepiadaceae	Y		
2.	*Indigofera argentea*	Neel	Arid to tropical region	Fabaceae		Y	

3.	*Argemone european*	Satyanasi	Arid to Tropical region	Papaveraceae		Y	
4.	Aerva tomentosa	Bui	Arid and Semiarid region	Amaranthaceae	Y		
5.	Xanthium strumarium	Adhashish*i*	Arid and Semiarid region	Asteraceae			Y
6.	Calotropis procera	Aak	Arid and Semiarid region	Asclepiadacea	Y		
7.	*Crotolaria burhia*	Sinia	Arid and Semiarid region	Fabaceae	Y		
8.	Achyranthes aspera	Andhijhara	Arid and Semiarid region	Amaranthaceae			Y
CLIMBERS							
1.	*Cuscuta reflexa*	Amarbel	Arid and Semiarid region	Cuscutaceae	Y		
2.	*Ichnocarpus frutescens*	Dudhi	Arid and Semiarid region	Apocynaceae			Y
3.	*Aristolochia bracteata*	Hukkabel	Arid and Semiarid region	Aristolochiaceae	Y		
4	*Aristolochia braccteata*	Makra	Arid and Semiarid region	Poaceae		Y	
GRASSES							
1	*Cenchrus barbatus*	Bharut (Brown)	Arid and Semiarid region	Gramineae		Y	
2.	*Saccharum spontaneum*	Kans	Arid and Semiarid region	Poaceae	Y		
3	*Aristida depressa,*	Lapla	Arid and Semiarid region	Poaceae		Y	

4.10.4 FLORAL STUDY

The vegetation sampling was carried out by using quadrate method across different habitats. The quadrants are useful for quantification of the density and abundance of the vegetation in the study area. The size and number of quadrates needed were determined using the species area curve (Mishra, 1968) and the running mean method (Kershaw, 1973). Summarization of previously used methods and recommendations led to the use of more than often (10x10m) quadrates laid out for sampling the tree stratum and 1x1m quadrates for herbs and grasses. DBH of trees was also determined. All individuals ≥ 10 cm GBH (Girth at Breast Height) were included in tree category. However, for examining the shrub species 3x3m sample plots were laid out.

The data collected for biodiversity information were quantitatively analyzed for density, frequency, abundance and Shannon-Wiener Diversity Index. The relative values of frequency, density and dominance of all the species were summed up to represent Importance Value Index (IVI). The followings are the formulae to derive frequency, density, abundance, Importance Value Index (IVI) etc.

$$\text{Frequency} = \frac{\text{Total number of quadrate in which species occurred}}{\text{Total number of quadrate studied}} \text{------ x } 100$$

$$\text{Density} = \frac{\text{Total number of individuals of a species}}{\text{Total number of quadrate studied}}$$

$$\text{Abundance} = \frac{\text{Total number of individuals of species in all quadrate}}{\text{Total number of quadrate in which species occurred}}$$

$$\text{Dominance} = \frac{\text{Total Basal Area}}{\text{Total area sampled}}$$

$$\text{Relative Frequency} = \frac{\text{Frequency of the species}}{\text{Total frequency of all species}} \times 100$$

$$\text{Relative Density} = \frac{\text{Density of the species}}{\text{Total density of all species}} \times 100$$

$$\text{Relative Abundance} = \frac{\text{Abundance of the species}}{\text{Total abundance of all species}} \times 100$$

$$\text{Relative Dominance} = \frac{\text{Dominance of the species}}{\text{Total Dominance of all species}} \times 100$$

Buffer zone: Trees (10x10 m)

Importance Value Index (IVI) = Relative frequency + Relative density +Relative dominance
Shanon – Weaver Index (1948):

The number of species and number of individuals in a community is measure of species diversity which depends on stability of the habitat. Vegetation of the study area was assess by determining Shannon – Weaver diversity index (1948)

$D = -\Sigma (ni / n) \log_2 (ni / n)$

ni = Number of individuals of each species in the sample

n = Total number of individuals

Result are showing that Rohida (*Tecomell undulate), Khejri (Prosopis cineraria),* Israyali babool*(Acacia tortalis)* and Meetha jal*(Salvadora oleoides)* were dominant species as per the IVI values. Therefore, we can say that arid and semi-arid adaptive native trees are quite better in numbers as compare the other local species.

S. No	Species name	Binomial name	Total No of quadrate studied	Total no of quadrate in which species occurred	Total no of individual of species in all quadrate	Density	Relative Density	Frequency	Relative Frequency	DBH (d) (cm) Av.	Basal area (m^2)	Relative Dominance	Importance Value Index (IVI)	SWD Index H= - ∑ P_i (lnP_i)
1	Karanj	*Pongamia pinnata*	50	11	14	0.28	7.650	22	7.19	55.2	0.02426	10.036	24.875	-0.1966
2	Pipal	*Ficus religiosa*	50	4	6	0.12	3.279	8	2.61	45.2	0.01627	6.730	12.623	-0.1121
3	Khejri	*Prosopis cineraria*	50	24	29	0.58	15.847	48	15.69	49.9	0.01977	8.178	39.711	-0.2919
4	Gathbor	Zizyphus xylopyra	50	22	26	0.52	14.208	44	14.38	42.4	0.01426	5.899	34.486	-0.2772
5	Kumat	*Acacia senegal*	50	10	13	0.26	7.104	20	6.54	38.3	0.01164	4.815	18.455	-0.1879
6	Neem	*Azadirachta indica*	50	14	16	0.32	8.743	28	9.15	67.8	0.03659	15.136	33.030	-0.2131
7	Rohida	*Tecomell undulata*	50	28	31	0.62	16.940	56	18.30	51.2	0.02085	8.625	43.866	-0.3008
8	Aranda	*Ricinus communis*	50	15	19	0.38	10.383	30	9.80	72.4	0.04167	17.238	37.424	-0.2352
9	Aitha	*Dalbergia sissoo*	50	4	5	0.1	2.732	8	2.61	58.9	0.02756	11.401	16.747	-0.0984
10	Israyali babool	*Acacia tortalis*	50	21	24	0.48	13.115	42	13.73	60.3	0.02887	11.943	38.783	-0.2664
														2.1795

Buffer zone: Shrub (3x3)

Table No 4.22 Phyto-sociological features of Shrubs in Study area

S. No	Species name	Binomial name	Total No of quadrate studied	Total no of quadrate in which species occurred	Total no of individual of species in all quadrate	Frequency	Density	Abundance	Relative Frequency	Relative Density	Relative Abundance	Importance Value Index (IVI)	SWD Index $H= - \sum P_i (\ln P_i)$
1	Kair	*Capparis decidua*	50	20	67	1.34	13.32	40	10.20	3.35	10.22	33.74	-0.2685
2	Vilayati Babool	*Prosopis juliflora*	50	14	51	1.02	10.14	28	7.14	3.64	11.11	28.39	-0.2321
3	Aak	*Calotropis procera*	50	12	27	0.54	5.37	24	6.12	2.25	6.86	18.35	-0.1570
4	Saniya	*Crotalaria burhia*	50	16	27	0.54	5.37	32	8.16	1.69	5.15	18.68	-0.1570
5	Arni	*Clerodendron phlomoides*	50	13	35	0.7	6.96	26	6.63	2.69	8.21	21.80	-0.1855
6	Phog shrub	*Calligonum polygonoides*	50	18	43	0.86	8.55	36	9.18	2.39	7.29	25.02	-0.2102
7	Khimp	*Leptadenia pyrotechnica*	50	19	56	1.12	11.13	38	9.69	2.95	8.99	29.82	-0.2444
8	Munja grass	*Saccharum munja*	50	14	27	0.54	5.37	28	7.14	1.93	5.88	18.39	-0.1570
9	Thor	*Euphorbia royleana*	50	12	21	0.42	4.17	24	6.12	1.75	5.34	15.63	-0.1326
10	Jal	Salvadora persica	50	16	61	1.22	12.13	32	8.16	3.81	11.63	31.92	-0.2559
11	Jharberiber	*Zyzipus nummularia*	50	14	21	0.42	4.17	28	7.14	1.50	4.57	15.89	-0.1326
12	Murali	*Lyrium european*	50	17	39	0.78	7.75	34	8.67	2.29	7.00	23.42	-0.1983
13	Anwal	*Cassia auriculata*	50	11	28	0.56	5.57	22	5.61	2.55	7.76	18.94	-0.1608
													-2.4918

Buffer zone: Herbs, grasses and climbers

S.No	Species name	Binomial name	Total No of quadrate studied	Total no of quadrate in which species occurred	Total no of individual of species in all quadrate	Frequency	Density	Abundance	Relative Frequency	Relative Density	Relative Abundance	Importance Value Index (IVI)	SWD Index $H= - \sum Pi (\ln Pi)$
1	Bhurat	*Cenchrus biflorus*	50	33	141	2.82	15.43	66	11.07	4.27	8.13	34.63	-0.2883
2	Satyanasi	*Argemone*	50	27	70	1.4	7.66	54	9.06	2.59	4.93	21.65	-0.1968

		mexicana											
3	Amar bel	*Cuscuta reflexa*	50	15	58	1.16	6.35	30	5.03	3.87	7.35	18.73	-0.1750
4	Bui	*Aerva tomentosa*	50	19	45	0.9	4.92	38	6.38	2.37	4.50	15.80	-0.1483
5	Bermuda Grass	*Cynodon dactylon*	50	17	58	1.16	6.35	34	5.70	3.41	6.49	18.54	-0.1750
6	Motha	*Cyperus rotundus*	50	8	23	0.46	2.52	16	2.68	2.88	5.47	10.67	-0.0927
7	Jangli chaulai	*Amaranthus spinosus*	50	11	20	0.4	2.19	22	3.69	1.82	3.46	9.34	-0.0836
8	Jhor Grass	*Cenchrus barbatus*	50	9	34	0.68	3.72	18	3.02	3.78	7.19	13.93	-0.1224
													1.2821

Xerophytic shrubs were quite better in numbers at study area. This is indicating that sparse vegetations which are tolerant of heat and draught escaping mechanism adaptation in nature which are most suitable vegetation of arid region. Herbs and grasses which are also of xerophytic adaptive and semi-arid nature, quite better in number were present at study area. These shrubs and herbs are very useful of for food and other medicinal value of local Habinats.

Faunal study:

i. Avifauna

Point count method was followed for counting the birds. Opportunistic surveys were also carried out with respect to avifaunal checklist. Identification by calls was also made for species which were not directly encountered or were hidden in the vegetation or canopy. Secondary data collected from the literature.

ii. Herpetofauna

Amphibians and reptiles recorded during area searches were identified by visual characteristics. Aquatic searches involved examining each type of aquatic habitat.

iii. Mammals

Presences of mammals were documented by using both direct sightings and indirect evidences i.e. animal burrows/holes, scats, pellets, droppings and tracks. Opportunistic sightings were also included. Circular Plots were used to search indirect evidences.

Fauna:

Pieces: No pieces species observed during the site visit.

Core zone:

The species were observed during site visit. Only House Sparrow *(Passer domesticus)*, House crow (*Corvus splendens)* were present in the core area.

Table No 4.23 (a) List of Fauna found in study area

Particulars	S.No	Common Name	Binomial Name	Family	Schedule IW(P)A / IUCN
Avifauna	1	House sparrow	*Passer domesticus*	Passeridae	IV
	2	Bulbul	*Pycnonotus barbatus*	Pycnonotidae	IV
	3	Rock Pigeon	*Columba livia*	Columbidae	IV
	4	House crow	*Corvus splendens*	Corvidae	V
	5	Peacock	*Pavo cristatus*	Phasianidae	I
	6	Rose-ringed Parakeet	Psittacula krameri	Psittacidae	IV
	7	Koyal	*Eudynamus scolopaceus*	Cuculideae	IV
	8	Gray Partridge	*Francolinus pondicerianus*	Phasianideae	IV
	9	Kite	*Milvus milvus*	Acipitrideae	IV
	10	Owl	*Bubo bubo*	Stirgideae	IV

Table No 4.23 (b) List of Reptilian found in study area

Particulars	S. No.	Common name	Binomial name	Family	Schedule IW(P)A / IUCN
Reptilian	1	Indian sand boa	*Eryx johnii*	*Boidae*	IV
	2	Common House Gecko	*Hemidactylus frenatus*	*Gekkonidae*	LC
	3	Garden Lizard	*Calotes versicolor*	*Agamidae*	LC
	4	Yellow-Green House Gecko	*Hemidactylus flaviviridis*	*Agamidae*	LC

Table No 4.23 (c) List of Mammals found in study area

Particulars	S. No	Common Name	Binomial Name	Family	Schedule IW(P)A / IUCN
Mammals	1	Chinkara (Indian gazelle)	*Gazella bennettii*	Bovidae	I
	2	Blue Bull / Nilgai	*Boselaphus tragocamelus*	Bovidae	III
	3	Five stripped palm squirrel	*Funambulus pennantii*	Sciuridae	IV
	4	Common House rat	*Rattus rattus*	Muridea	V
	5	Indian Hare	*Lepus nigricollis*	Leporidae	IV
	6	Hedge hog	*Hemiechiinus*	Murideae	IV

			collaris		
	7	Bat	*Piisstrellus pipistellus*	Vespertilionidae	V

According to Wildlife Protection Act 1972 the Study area has got Schedule I fauna, viz. Pea fowl (*Pavo cristatus*), Chinkara *(Gazella bennettii)* fauna. No water body present in the study area. Therefore no planktonic study is done.

The Faunal studies were conducted using tracking (Visual encounter survey) and scats method during the months of Oct-Dec 2013. *Schedule I* species (IWPA 1972) Indian Peafowl *(Pavo cristatus)* and Chinkara*(Gazellla benentti)* species was found in study area. Indian Peafowl and Chinkara reported as direct evidence in the study area. Conservation plan for *schedule I* species with the consultation of forest department is prepared given in Environmental Mangement Plan of Chapter: 9. List of flora and fauna is submitted in DFO, Barmer for authentication which is under process.

4.11 SOCIO-ECONOMIC ENVIRONMENT

An essential part of environmental study is socio-economic environment incorporating various facts related to socio-economic conditions in the area, which deal with the total environment. Socio-economic study includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as feature of aesthetic significance such as temples, historical monuments etc. at the baseline level. This would help in visualizing and predicting the possible impact depending upon the nature and magnitude of the project.

Socio-economic study of an area provides a good opportunity to assess the socioeconomic conditions of an area. This study will possibly make a change in living and social standards of the particular area benefitted due to the Project. The gross economic production of the area will be increased substantially due to the existence of this project. It can undoubtedly be said that this project will provide direct and indirect employment and improve the standards of living of the area. The fabrics of socio-economic changes are so complicated that this study would seem to be extremely limited, almost superficial and at time subjective in nature. More thorough and quantified socio-economic study will undoubtedly require vastly longer time and resources, and is, therefore, beyond the scope of the present EIA study.

4.11.1 OBJECTIVES OF THE STUDY

- To conduct socio-economic assessment study in project Area.
- To know the current socio-economic situation in the region to cover the sub sectors of education, health, sanitation, and water and food security.
- To recommend practical strategic interventions in the be sector.
- To help in providing better living standards.
- To provide employment opportunities.

4.11.2 SCOPE OF WORK

- To study the Socio-economic Environment of area from the secondary sources.

- Developing a questionnaire for SIA Survey.
- Data Collection & Analysis.
- Prediction of project impacts.
- Mitigation Measures.

4.11.3 METHODOLOGY

For socioeconomic study of the project area, both qualitative and quantitative methods were adopted. Data regarding the field area were collected both from primary as well as secondary sources. Primary sources include data collected through direct field sampling, observations based on schedules, questionnaires etc. A suitable format of Questionnaires was developed by us & survey was conducted. Secondary sources include various reports, records, literatures, documents, maps, charts, and photographs etc, collected from various public and private organizations. To know the perception of local people on socio-economic impact of river sand mining in the area, a field survey was conducted during Oct-Nov 2013. The target groups were selected from villages of core and buffer area of Chohtan Tehsil. About 20 people were interviewed to get response. Focus Group Discussion (FGD) and Participatory Rural Appraisal (PRA) techniques are the two important tools of participatory method used in the field. Household level contacts and interviews have been undertaken with each family for completing the household socio-economic profile. For individual farmers and community members, qualitative interviews were used since this approach allows a more in-depth investigation into the each interviewee. It also allows people to speak for themselves without their answers being biased by predetermined hypothesis-based questions. The questionnaire was basically focused to gather respondents´ views from the study areas on the impacts of river sand mining.

The data collected from various sources were processed, computed and tabulated to fit the problem. These tabulated data was interpreted and analyzed with the help of various quantitative techniques. More thorough and quantified socio-economic study will undoubtedly require vastly longer time and resources, and is, therefore, beyond the scope of the present EIA study. The EIA will give a reasonably clear picture of the socio-economic conditions prevailing in the study area.

4.11.4 DEMOGRAPHIC STRUCTURE

Total population of the area is 28282 persons out of which 15074 (53.30%) are male and 13208 (46.70%) are female. The lease area falls in one village where 2.84 percent of total population of area under study lives. Representation of Scheduled Cast and Scheduled Tribe population is only 18.09% and 11.44% respectively. The table 4.36 shows that the female population is less than man in all categories i.e. SC, ST or General.

Table 4. 24 Demographic Structures

(Figure in parenthesis are %)

S. No	Population					SC			ST		
	Range	Number of Villages	Total	Male	Female	Total	Male	Female	Total	Male	Female
1	Nr.Villages of Core Area	1	804 (2.84)	424	380	115	60	55	453	237	216

2	Villages of Buffer Area	32	27478 (97.16)	14650	12828	5002	2623	2379	2783	1490	1293
Total		33	28282	15074 (53.30)	13208 (46.70)	5117 (18.09)	2683 (52.43)	2434 (47.57)	3236 (11.44)	1727 (53.37)	1509 (46.63)

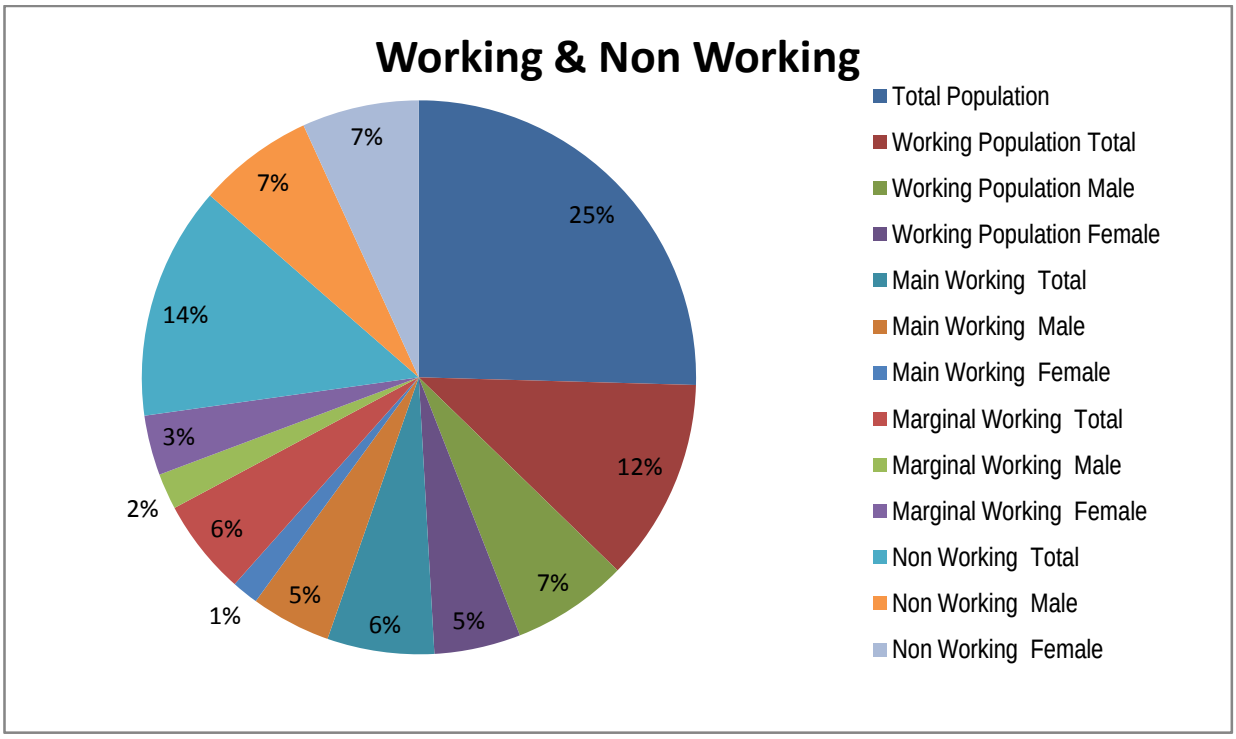
Source: - Barmer District Census Hand Book 2011

Work Force:-River sand mining is labor oriented mining because it covers large area. Hence requires large population of man and women for excavation, loading, transportation and storage work. From employment point of view, labors are low paid worker. They prefer to be engaged in nearby area so as to save the travel cost and time. Therefore availability of worker in core area of mining is important. Table – 4.27 presents statistics of work force available in the villages of core as well as buffer zone of Chohtan tehsil. The total population in the region is 28282 persons out of which 46.52 % are working and 53.48 % are Non working population. In the village of core area the total population is 804 (2.84%) persons out of which working population is only 407 (50.64%).

Table 4.25: Work Force

(Figure in parenthesis area %)

S.No	Range	Total Village	Total Population	Working Population			Main Working			Marginal Working			Non Working		
				Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
1	Nr.Villages Of Core Area	1	804 (2.84)	407	215	192	43	37	6	364	178	186	397	209	188
2	Villages of Buffer Area	32	27478 (97.16)	12751	7331	5420	6883	5160	1723	5868	2171	3697	14727	7319	7408
Total		33	28282	13158 (46.52)	7546 (57.35)	5612 (42.65)	6926 (52.64)	5197 (75.04)	1729 (24.96)	6232 (47.36)	2349 (37.69)	3883 (62.31)	15124 (53.48)	7528 (49.78)	7596 (50.22)



The male and female population is 7546 (57.35%) and 5612 (42.65%) respectively. Among the worker there are two category i.e. main worker and marginal worker. Main worker are those who work for the major part of the year i.e. 183 days or more and marginal worker is one who work for less than 6 months in a year. Other category is of non worker, those who are either under the age of 15 years or more than 64 years. This class is not fit for any work. Hence availability of work force in the core zone is very less. One has to bring the worker far from the work place.

Table – 4.26 Occupational Structures

(Figure in parenthesis are %)

S. No.	Range	Total Village	Total Population	Working Population	Occupational Structure: Main Cultivator	Main Agriculture Labor	Main Household Industries	Main Other Working	Marginal Cultivator	Marginal Agriculture Labour	Marginal Household Industries	Marginal Other Working
1	Nr.Villages of Core Area	1	804 (2.84)	407	5	11	3	24	117	222	8	17
2	Villages of Buffer Area	32	27478 (97.16)	12751	4487	427	144	1825	4262	1057	141	408
Total		33	28282	13158 (46.52)	4492 (34.14)	438 (3.33)	147 (1.12)	1849 (14.08)	4379 (33.28)	1279 (9.72)	149 (1.13)	425 (3.23)

4.11.5 Occupational Structure

Occupational structure of an area shows the nature and status of employment activities in the area. Out of the total population about only 46.52 % population is working which is further grouped in eight fold classification as shown in table No.4.38. Out of total working population, 3.19 percent population lives in the village of core area. The percentage of population in core area is very low compare to total number of villages. The main occupation of people in desert region is agriculture hence main cultivators and marginal cultivators constitute major portion of the working population which is 34.14% and 33.28%

respectively. Other major category of working population is also associated with agriculture that is main/marginal agriculture labor. The percentage of main agriculture labor in 3.33 and marginal agriculture labor is 9.72. People engaged in household industries are only 1.23 percent.

4.11.6 LITERACY

Literacy in any region is key indicator for socio-economic progress. The Indian literacy rate grew to 74.04% in 2011 from 12% at the end of British rule in 1947. Although this was a greater than six fold improvement, the level is well below the world average literacy rate of 84% and of all nations, this region currently has large illiterate population.

Table – 4.27: Literacy

(Figure in parenthesis are %)

S.No	Range	Population			Literates			Illiterates		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1	Nr.Villages of Core Area	804 (2.84)	424	380	194	145	49	610	279	331
2	Villages of Buffer Area	27478 (97.16)	14650	12828	10729	7426	3303	16749	7224	9525
Total		28282	15074 (53.30)	13208 (46.70)	10923 (38.62)	7571 (69.31)	3352 (30.69)	17359 (61.38)	7503 (43.22)	9856 (56.78)

The table – 4.27 shows out of total population only 10923 (38.62%) are literates and 17359 (61.38%) are illiterates. If we look at male-female literacy ratio, there is a wide gender disparity. Out of total literate population there are 69.31% male literates while female literates are 30.69% only in the region. The percentage of illiterates is 61.38. Among illiterates there are 43.22% male and 56.78% females to total illiterates. This analysis shows that literacy in the region is low. Hence the potential availability of unskilled labor is more in this region.

4.11.7 INFRASTRUCTURE FACILITIES

Infrastructure is basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function. It can be generally defined as the set of interconnected structural elements that provide framework supporting an entire structure of development. It is an important term for judging a country or region's development. The term typically refers to the technical structures that support a society, such educational institutions, medical facilities banking facilities, telecommunications and so forth, and can be defined as "the physical components of interrelated systems providing commodities and services essential to enable, sustain, or enhance societal living conditions.

4.11.8 Education Facilities

Education is important as it gives knowledge about happenings around us. It develops a perspective of looking at life in us and helps us build opinions as well as have points of view on things in life. It equips us with everything that is required to make our life sensible.

Table – 4.28: Education Facilities

S.No	Range	Total Village	Primary School	Middle School	Secondary School	Sr.Secondary School	Adult Literacy Class
1	Nr.Core Area	1	0	0	0	0	0
2	Buffer Area	32	29	6	2	0	0
Total		33	29	6	2	0	0

The table -4.28 shows the educational facilities available in the villages of core area as well as buffer area of river sand mine. There is no educational facility in the village of core area.Even in the buffer area out of 32 villges 29 village have the primary school six villages have middle school and only 2 villages have secondary school. There is no adult school in the region.

4.11.9 MEDICAL FACILITIES

The data reveals that the area is lacking in medical facilities particularly buffer zone where out of 33 villages only 5 villages have medical facilities. There are 2 primary health centres and 2 primary healths only. The table :4.29 shows that about 85 percent of the villages do not have institutional health facilities of any type, though the Centrally Sponsored NRHM Program has been introduced in the state.

Table – 4.29: Medical Facilities

S. No.	Range	Total Village	Medical Facilities	Child Welfare Centre	Health Centre	Primary Health Centre	Primary Health Sub Centre	Allopathic Dispensary	Ayurvedic Dispensary
1	Nr.Villages of Core Area	1	0	0	0	0	0	0	0
2	Villages of Buffer Area	32	5	0	0	2	2	0	0
Total		33	5	0	0	2	3	0	0

The field investigation has revealed that for petty health problem most of the villagers visit nearby dispensaries or hospitals located in the study area. However, during emergency and long treatment they rush to district or sub-district hospitals or the hospitals located at nearby town. Field survey has revealed that the health care institutions located in the villages are not fully equipped with man power, medicines, equipment and ambulances.

4.11.10 DRINKING WATER FACILITIES

Drinking water is a basic need for survival of mankind. There are a number of central and state sponsored programme are running in the state, but the table: 4.30 shows that none of the village have source of drinking water except the well water which is probably private source. Because no respondent has reported any water source govern by the state.

Table –4.30: Drinking Water Facilities

S. No.	Range	Total Village	Well Water	Tank Water	Tube Well Water	Hand Pump
1	Nr.Core Area	1	YES	NO	NO	NO
2	Buffer Area	32	YES	NO	NO	NO
Total		33	0	0	0	0

4.12 DETAILS OF TRANSPORTATION OF MINED OUT MATERIALS AS PER THE INDIAN ROAD CONGRESS FOR BOTH THE WAYS (LOADED AS WELL AS UNLOADED TRUCKS) LOAD AND ITS IMPACT ON ENVIRONMENT

Traffic analysis is carried out by understanding the existing carrying capacity of the roads near to the project site and the connecting main roads in the area. The roads connect from the mine site to MDR-17. These roads are wide enough to facilitate easy and smooth movement of heavy duty trucks.

Then depending on the capacity of the mine, the number of trucks that will be added to the present scenario will be compared to the carrying capacity. Traffic impact study can be used to help evaluate whether the development is appropriate for a site and what type of transportation improvements may be necessary. It will help:-

- To establish the existing trips/ day without the project activity;
- To understand the increment on the traffic load due to the project activity;
- To know the existing road will sustain or not after the commission of the project.

INDIAN ROAD CONGRESS (IRC) GUIDELINES

Factors for conversion of different type of vehicle into equivalent passenger car unit (PCU) based on their relative interference value as per Indian Road Congress Guidelines i.e. IRC 64: 1990 & IRC 106: 1990 is given below Table No:- 4.31

Table No 4.31 Recommended PCU Factors for various types of vehicles on road

Vehicle Type	Rural Road
	Equivalency factor for PCU
Fast Vehicles	
Motor Scooter (Two wheelers)	0.50
Passenger Car, Pickup Van,Auto Rickasaw	1.00
Agricultural Tractor, Light Commercial Vehicle	1.5
Bus or Trucks	3.0

Truck Trailer, Agricultural Tractor – Trailer	4.50

(Source: - IRC 64-1990 & IRC 106-1990)

Level of Service (LOS)

Capacity standards are fixed normally in relation to the Level of Service (LOS) adopted for design. Five levels of service are recognized commonly designated from A to E. Considering the need for smooth traffic flow; it is recommended that normally LOS-C be adopted for design of urban roads. At this level volume of traffic will be around 0.70 times the maximum capacity. Capacity or Design Service volume is the maximum hourly volume at which vehicle can reasonably be expected to transfers a point or uniform section of a lane or road way during a given time period. As per IRC 64: 1990 guidelines, ratio of existing volume of PCU on roads (V) and its capacity (C) with corresponding level of services (LOS) and their performance is given below Table No.4.32

V/C	LOS	Performance
0.0 - 0.2	A	Excellent
0.2 - 0.4	B	Very Good
0.4 - 0.6	C	Good / Average / Fair
0.6 - 0.8	D	Poor
0.8 – 0.9	E	Very Poor
1.0	F	Worst

Highway Capacity Manual (HCM) used travel speed and volume by capacity ratio (v/c ratio) to distinguish between various levels of service. The value of v/c ratio can vary between 0 and 1. Depending upon the travel speed and v/c ratio, HCM has defined six levels of service, level A to level F based on a graph between operating speed and v/c ratio as shown in the figure above. Level of service A represents the zone of free flow. Here the traffic volume will be less, traffic will be experiencing free flow also. The effect of minor incidents and point breakdowns are easily aborted at this level. Level of service B represents zone of reasonably free flow. At level of service C, the presence of other vehicles begins to restrict the maneuverability within the traffic stream. At level of service D, the average speeds begin to decline with increasing flows. Level of service E defines operation at capacity. At this level, the stream reaches it's maximum density limit. Level of service F represents the region of forced ow, having low speed, and complete breakdown of the system.

Presentation of Results

The present level of traffic has been converted to Passenger Car Units (PCU) at all the locations as per the conversion factors stipulated by Indian Road Congress (IRC). The traffic volume at each location is

summarized below No 4.33 (a &b). Transporation Route Map is enclosed as Annexure No 24.

Table: 4.33 (a) Traffic Volume Count on MDR-17 near Mine lease area

Traffic Vehicle category	PCU Factor	No. of vehicle/day	No. of PCU/day
2 Wheelers	0.5	44	22
Mini Bus	1.5	56	84
Car	1.0	68	68
Tempo/LCV	1.5	77	116
Truck	3.0	82	246
Bus	3.0	48	144
Total	--	375	680

Table: 4.33 (b) Traffic Volume Count on Village Road

Traffic Vehicle category	PCU Factor	No. of vehicle/day	No. of PCU/day
2 Wheelers	0.5	32	16
Mini Bus	1.5	34	51
Car	1.0	56	56
Tempo/LCV	1.5	79	119
Truck	3.0	34	102
Bus	3.0	33	99
Total	--	268	443

Table No 4.34 Impact during Mine operation:

Total Capacity of mine	2.24 LTPA
Capacity per day	800 Ton
No. of working days	280
Truck Capacity	20 ton
No of Block	1
No. of trucks deployed per day (2 way loaded & unloaded)	40
PCU/Day	120
PCU/hr	5
Working Hours per day	8
Design Service Volume for Two Lane Roads as per IRC	15000 PCU/Day

:64:1990	625 PCU/hr
Recommended Design Service for Intermediate Lane Roads as per IRC :64:1990	6000 PCU/Day 250 PCU/hr

Table No 4.35 Incremental rise at MDR-17

Design Service Volume PCU/day	Existing Daily Traffic Data		Envisaged Traffic due to Mining		Cumulative Movement at Post Project Scenario		Design service volume tentative to be utilized in post project scenario	Incremental rise in PCU due to envisaged traffic movement owing to mining activity	LOS in post project scenario
6000	PCU/day	PCU/hr	PCU/day	PCU/hr	PCU/day	PCU/hr			
	680	28	120	5	800	33	13.33 %	2 %	A

Table No 4.36 Incremental rise at near Local village road

Design Service Volume PCU/day	Existing Daily Traffic Data		Envisaged Traffic due to Mining		Cumulative Movement at Post Project Scenario		Design service volume tentative to be utilized in post project scenario	Incremental rise in PCU due to envisaged traffic movement owing to mining activity	LOS in post project scenario
6000	PCU/day	PCU/hr	PCU/day	PCU/hr	PCU/day	PCU/hr			
	443	18	120	5	563	23	9.38 %	2 %	A

Conclusion:

Not much impact on local transport as only 40 no of truck will be required for transport of mineral from mine. The LOS value from the proposed mine may be “Excellent” for all Local Village Road & MDR-17. So the additional load on the carrying capacity of the concern roads is not likely to have any significant adverse affect.

CHAPTER-5
ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

5.0 GENERAL

Mining of Sand from the riverbed may have direct or indirect impacts on several Environmental attributes. These may be broadly classified as the physical, biological, socio-economic and or cultural components. An understanding of the existing environmental scenario of the Buffer zone of the proposed project along with the impacts of the proposed project resulting in change in the environmental components are vital to ensure the project impacts on the environment is not adverse. Environmental impacts both direct and indirect on various environmental attributes due to proposed river sand mining activity in the surrounding environment, during pre-operational, operational and post-operational are being discussed. An impact can be defined as any change in physical, chemical, biological, cultural and/or socio-economic environment that can be attributed to activities related to alternatives under study for meeting the project needs. Impact methodology provides an organized approach for prediction and assessing these impacts. The nature of the impacts due to said project activities are discussed and identified here. Any economic development in a project, whether it is a simple and small or a large and complex it has some environmental implications. The environmental implications may be beneficial or adverse, but the main objective of impact identification is to specify areas that are likely to be affected by the implementation of the project. The objectives of impact identification are as follows:-

- To ensure compliance with regulations.
- To provide a comprehensive coverage of a full range of impacts, including social, economic and physical.
- To distinguish between positive and negative, large and small, long term and short term, reversible and irreversible impacts.
- To identify secondary, indirect and cumulative impacts as well as direct impacts.
- To consider impacts within the constraints of an area's carrying capacity.

The proposed operations broadly consist of collection/excavation, loading, transportation, etc., will have an impact on the following environmental attributes.

- Land Environment
- Water Quality & Hydro-geology
- Air Environnent
- Noise Environment
- Biological Environment
- Socio-economic Environment

5.1 LAND ENVIRONMENT

The proposed extraction of streambed materials, mining below the existing streambed, and alteration of channel-bed form and shape leads to suppose several impacts such as erosion of channel bed and banks, increase in channel slope, and change in channel morphology.

These impacts may cause:

- Undercutting and collapse of river banks.
- Loss of adjacent land and/or structures.
- Upstream erosion as a result of an increase in channel slope and changes in flow velocity.
- Downstream erosion due to increased carrying capacity of the stream

- Downstream changes in patterns of deposition.
- Changes in channel bed and habitat type.

5.1.1 Anticipated Impacts on Land Environment

The mining lease is situated in the Shivpura River. The River has a length of 3 km. The highest point of the mining lease area is 221 meter above mean sea level and the lowest point of the lease area is 198 meter above mean sea level. The project area is almost flat; the topography is not likely to change as the river sand shall get replenished every year during monsoon. The scientific mining i.e. systematic removal of sand will not cause bed degradation and will not affect aquatic environment also. There will be no waste water or waste generation and therefore there will be no degradation of land due to the mining. As no waste dump sites are needed for the project.

5.1.2 Mitigation measures

Since the project is mainly for sand excavation, no loss of top soil will be involved. Sand mining will be restricted up to the depth of 3 meter or one meter above the water table whichever less is.

I. The mining will be done in unsaturated zone, thus minimizing loss to habitat.
II. Care will be taken to ensure that ponding is not formed in the river bed.
III. Dredging will not be allowed.
IV. Safety zone of 45.0 m radius is being demarked for the wells located in the river bed.

5.1.3 SAND BUDGET & REPLENISHMENT STUDY

For ecological & environmental sustainable balance there must be a balance between river sand mining and replenishment. The imbalance may cause following measure threatening to the eco- system of the area / region, especially in arid and semi- arid region of Rajasthan.

I. Transformation of river into buried Channel.
II. Changes in abiotic environment.
III. Soil / Land erosion (especially at banks) at the time of flool.
IV. Possible Changes in regional water table (may increase or decrease in pockets) or may form a local water tables.
V. Quality of groundwater may change
VI. Ponding in river bed
VII. Change in river course.

A Number of researchers work on sedimentation in different part of world like Darid & Higgitt & XiXi Lu (U.K.) on Upper Yangtze basin (China) taking sediment yield data from more than 250 stations and concluded that increasing soil erosion is not clearly matched by a increase in sediment yield over time and role of water conservancy projects in trapping and storing sediment requires further attention. Other author *V. Subramanian* (J.N.U. Delhi) also calculated the sediment load of Indian rivers and reveals that the major contribution which Indian rivers make to total amount of sediment delivered to the ocean at a global scale , but also highlights the large temporal and spacial variability of riverine sediment transport in the Indian sub – continent. This variability is evident not only in the quantites of sediment transported but also in size and mineralogical charactastics of the sediment load.Over the years, considerable data have been collected concerning sediment transport in saveral Indian river ,For example Abbas & Subramanien (1984) estimated the sediment load of the G angas at Farrakaa Barrage to be 1235 t km^{-2} $year^{-1}$ which is 8 time the world average erosion rate (150 t km-2 year-1) calculated by Milliman & Meade (1983) . Under the influence of its special physiographic condition and extensive human activity, the primary patterns of surface erosion in the Upper Yangtze basin (UYB) are water erosion, gravitational erosion and combined erosion. The eroded area amounts to about 351 x

103 km^2, accounting for 35% of the territory of the UYB, which has an annual gross erosion of 1.57 x 1091 and an average rate of erosion of 1559 t km"2 year"1. Soil loss occurs primarily in the Jinsha and Jialing basins, and especially in the Lower Jinsha and Upper Jialing basins. According to the available hydrometric data, the mean annual runoff and suspended sediment yield of the UYB are 439 X 109 m3 and 523 X 106 t respectively. The Jinsha and Jialing rivers are the major source of sediment, contributing 72.8% of the sediment but only 48.6 % of the runoff. The high sediment yield region with *Ms* > 20001 km"2 year"1 occupies only 4.6% of the territory, but contributes 32.8% of the sediment load. The sediment delivery ratios of tributary watersheds lie in the range 0.4-0.61, and the average value for the entire UYB is about 0.34.The variation of measured annual sediment yields over four decades, and both statistical and qualitative analyses, indicate that the sediment yield in the UYB fluctuates in a random way with no clear tendency to increase or decrease during a long period. Soil erosion control and sediment yield reduction within the entire UYB will only be effective through sustainable, large scale and long-term soil and water conservation works.*F. E. Dendy & G.C. Bottom* (U.S. Department or Agriculture, Mississippi) also carried out a Study on "Sediment Yield runoff drainage area relationship in the United States".He used sediment deposition data from more than 500 reservoirs to develop relationship between sediment yield, drainage-area size, and mean annual runoff. On the average, sediment yield per unit area was inversely proportional to the 0.16 power of net drainage area for drainage areas between 1 and 30,000 square miles. Sediment yield to per unit area increased quite rapidly to about 1,860 tons per square mile per year as runoff increased from 0 to about 2 inches. It then decreased as runoff increased from 2 to about 50 inches.He developed equations 5 and 6 to relate mean sediment yield to mean annunal runoff and drainage – area size. While these equations explained 75 percent of the variation in average sediment yield, we should emphasize that they were derived from average values of grouped data. Use of the equations to predict sediment yield for individual drainage basins would be unwise. Local factor, including soils, geology , topography, land use , and vegetation, may influence sediment yield much more than either runoff or drainage area, Actual sediment yield from individual drainage basins may vary 10- fold or even 100-fold from computed yield.

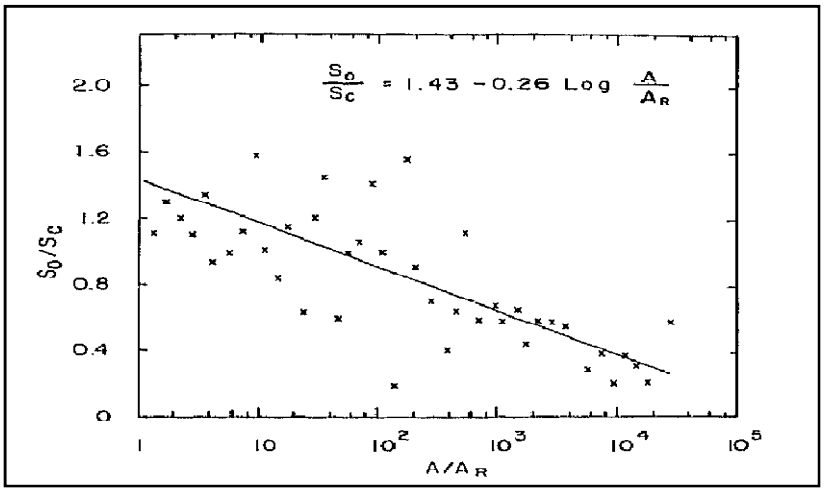


Fig No 5.1 Variation in Computed sediment yield as related to drainage area

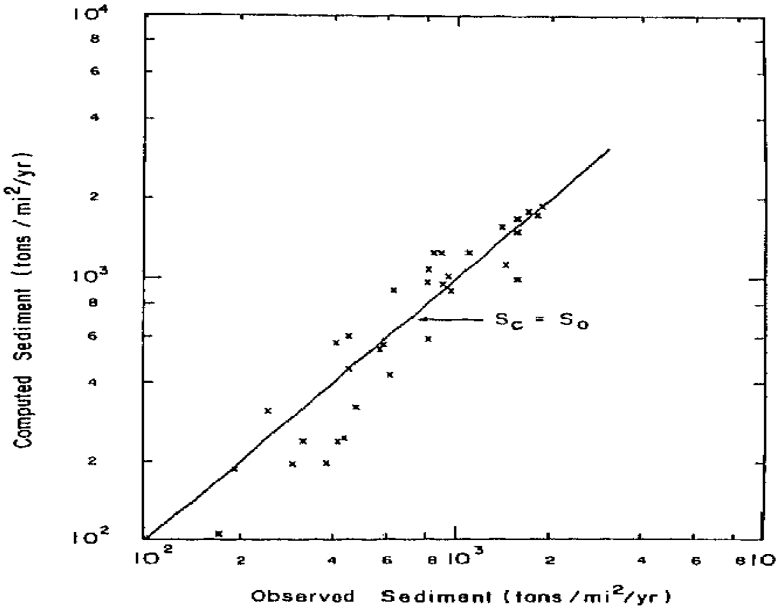


Fig No 5.2 Observed Versus computed sediment yield

The equations express the general relationships between sediment yields, runoff end drainage area. They may provide a quick, rough approximation of mean sediment yield on a regional basis for preliminary watershed planning. Because we derived the equations from average values, compute sediment yield normally would be low for highly erosive areas and high for well stabilized drainage basins with high plant density. Mostly, above studies were candied out on perennial rivers, which flow all around the year, but the climatic condition of Rajasthan with having a erotic rainfall, these studies dose not correlate to arid or semi-arid condition.

K. D. Sharma (Central Arid Zone Research Institute, Jodhpur) carried out a study on soil erosion and sediment yield in the Indian arid zone. He stated that High Sediment Yield are generated in the Indian arid zone due to erratic and torrential rainfall, sandy and eroded rocky drainage basin's and biotic activity. Sediment Yield increases with increasing rainfall and drainage basin slope and its magnitude depends upon the nature of surface material. In recent years, it has been confirmed that high sediment yields are associated with arid/semiarid, seasonal mediterranean, and tropical conditions (Walling & Webb,1983). A compilation of sediment yields for meso scale drainage basins suggests that arid basins export 36 times more material than humid temperate and 21 times more than humid tropical equivalents (Reid & Frostick, 1987). Bare soil is highly susceptible to replenish and washes erosion, and arid zones produce record suspended sediment concentrations (Jones, 1981). The sediment not only causes water quality to deteriorate but also affects physical and biological conditions in the receiving systems. In the Indian arid zone, the storage capacity of small reservoirs (400 to 700 000 m3) is reduced by 1.9 to 7.8% annually due to sediment deposition (Sharma & Joshi, 1982).

Hydro logically, the arid zone in India (Fig.5.3) consists of three main zones. Zone I covers 42 900 km^2 and receives major inputs of water from more humid regions, and supports extensive irrigated agriculture. This is a canal irrigated area and no significant sedimentation problems are encountered here. Zone II comprises sandy plains, interdunes plains, sand dunes, eroded rocky/gravelly surfaces and isolated hillocks with a poorly developed or no stream network (148600 km^2). It contains no integrated stream network in the conventional sense; rather, there is a system of repetitive micro-hydrology. The internal drainage basins generate high sediment yields under occasional and sporadic torrential rainfall. Zone III represents the sloping region with an integrated stream network (94 280 km^2).

These are ephemeral channels which remain dry for 90% of the year. When runoff does occur as a direct response to torrential rainfall, flash floods result and large quantities of sediment are transported down the valleys. In this zone the infrequent nature of rainfall and runoff encourages intensive measurement programmers.

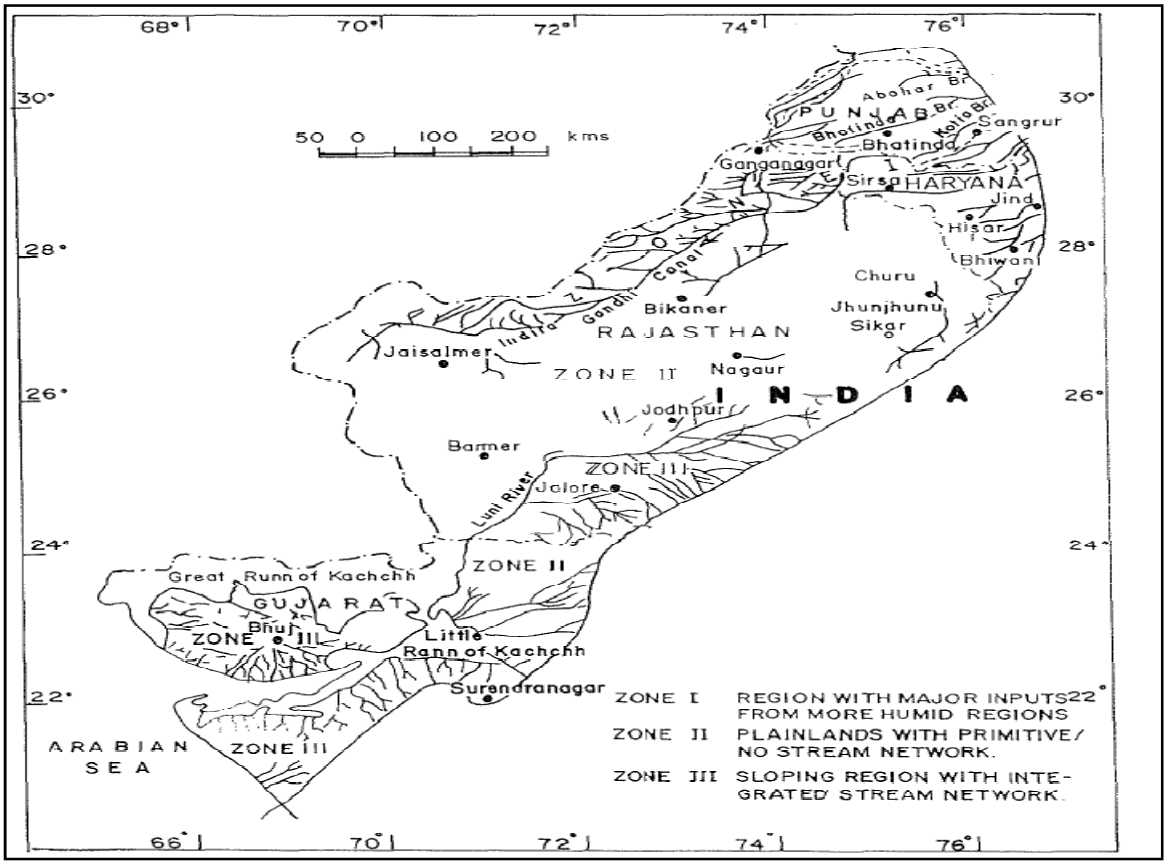


Fig No 5.3 Hydrological zones of the arid region of India

In the zone of internal drainage (zone II), the sediment yields have been estimated through measurement of sediment accumulation in small reservoirs following the recommendation of McManus & Duck (1985), and Owens & Slay maker (1992). One hundred small reservoirs were selected by stratified random sampling from a total of 1436 reservoirs occurring in the region. The distribution of the sample was adjusted to represent the majority of the physiographic environments, soil types, vegetation and rainfall conditions. In the sandy plain and dune complex environments, the deposited sediment mainly consists of fine to very fine sand, silt and clay, overlying windblown loose sand. This layer is deposited during the summer when the reservoirs are dry and acts as a marker to identify the successive depositional cycles. The sediment deposited in the younger alluvial environment is composed of medium to fine sand and silt over which a thin layer of clay is deposited. The occasional presence of gravel in the deposits acts as a marker to identify the successive depositional cycles. A distinct layer of gravel mantled by medium to fine sand and silt is the characteristic depositional pattern in the older alluvial environment; and the proportion of clay is very small in these deposits. Equal amounts of fine sand, silt and clay are associated with the sediment deposits in the rocky/gravelly piedmonts. These sediments also contain stone chips. Sediment samples were obtained from fresh cuts in the beds during May-June 1993, when the reservoirs were dry. The annual average depth of deposition was calculated from 4 to 6 depth measurements in the bed of the reservoir between two successive marker layers. This value multiplied by the area of the reservoir provides an estimate of the total volume of sediment deposited each year. The annual specific sediment yield was obtained by

dividing the total volume of sediment deposited per year by the drainage basin area. Measurements of drainage basin area and slope were taken from 1:50000 scale topographic maps.

In the zone with an integrated stream network (zone III), information on the spatial variation of stream discharge and sediment yield has been obtained from 34 gauging stations which are located on various tributaries of the Luni River. Hourly stage heights were observed at each station during periods of flow and discharge has been calculated by the slope-area method, with values for the roughness coefficient of these sand bed channels taken from Vangani & Kalla (1985). The initial water sample is taken at the onset of flow, and subsequent samples are collected at irregular intervals and with significant changes in the discharge until the flow ceases. The samples were collected using a US DH-48 depth integrating suspended sediment wading type hand sampler, employing the equal transit rate method as recommended by Jones (1981) for arid regions. The samples thus collected were transported to the laboratory and subjected to standard concentration analysis by filtration and evaporation. The resulting data, together with recorded runoff rates, provided a reasonably accurate representation of the variation of sediment concentration during each flow event, as well as permitting the computation of sediment yield. These data were collected for 16 years over the period 1979-1994.As with the effective rainfall distribution, the largest number of events is found in the smallest sediment yield class of 0-100 t km^2; thus providing a positively skewed unmoral frequency distribution (Sharma *et al.*, 1994). Chang & Stow (1988) observed that catastrophic flood events caused the highest sediment loss from drainage basins in the arid zone. Thus, while sediment production occurs more generally in the drainage basin, significant sediment delivery is limited to major flood flows. The relationship between sediment yield and effective rainfall is depicted in Fig. 5.4. Wide variations in the magnitude of annual sediment yield were observed among the various physiographic regions encountered in the Indian arid zone (Table5.2).

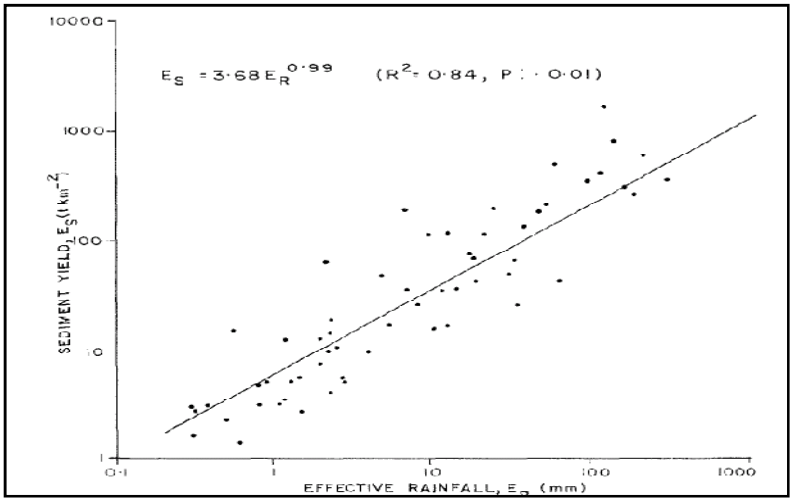


Fig No 5.4 Sediment yield as a function of effective rainfall

The older alluvial plain has the highest sediment yield, while the younger alluvial plain has the lowest. The sediment yields from the rocky/gravelly piedmont, dune complex and sandy plain areas lie between these two extremes. Except for the higher sediment yields from the older alluvial plain and the rocky/gravelly piedmont, the annual sediment yields from the other physiographic regions are in agreement with the mean rates of 2.6, 4.0 and 4.6 m^3 ha^{-1} year^{-1} reported from the arid regions of Australia, Tanzania and USA, respectively (Jones, 1981), under the similar rainfall conditions.

Table No 5.2: Annual sediment yield in the Indian arid zone

Physiographic region	Average sediment yield (m^3 ha^{-1} year^{-1})	No. of observation

Sandy plain	3.4	36
Dune complex	4.8	18
Younger alluvial Plain	2.7	30
Older alluvial Plain	18.4	5
Rocky /gravelly piedmont	14.3	11

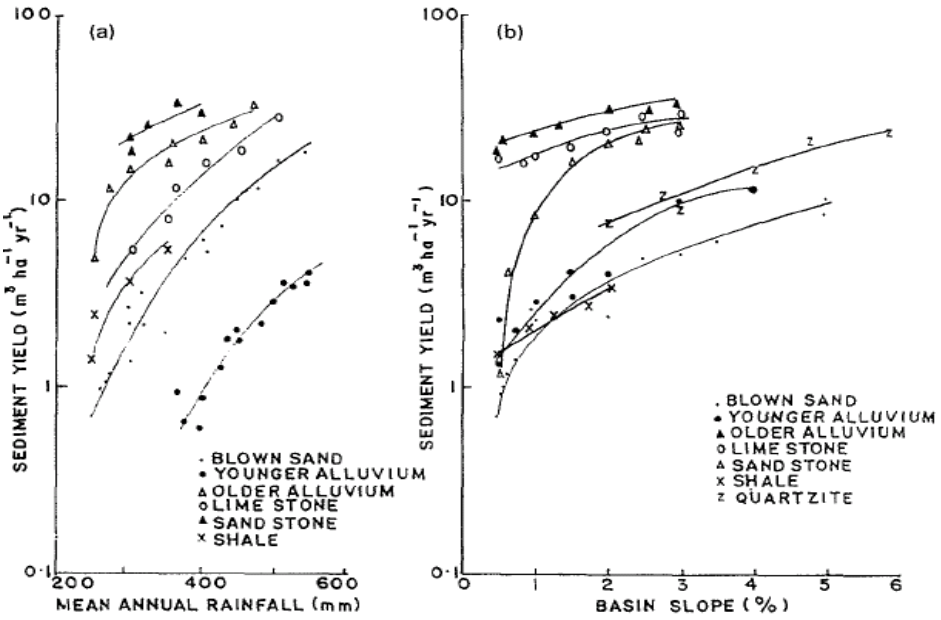


Fig No: 5.5 Mean annual sediment yield as a function of (a) mean annual rainfall,and (b) drainage basin slope for the indicated lithogies

Sediment yield is also a function of basin lithology together with the drainage basin slope, and the amount and intensity of rainfall. It can be seen from Fig. 7.5 that Sediment yields are highest from the sandstone drainage basins, (26.1 $m^3 ha^{-1} year^{-1}$) followed by the phyllite (22.7 $m^3 ha^{-1} year^{-1}$), older alluvium (14.8 $m^3 ha^{-1} year^{-1}$), limestone (12.0 $m^3 ha^{-1} year^{-1}$), quartzite (8.4 $m^3 ha^{-1} year^{-1}$), blown sand (5.8 $m^3 ha^{-1} year^{-1}$), shale (2.0 $m^3 ha^{-1} year^{-1}$) and the younger alluvium (1.5 $m^3 ha^{-1} year^{-1}$). However, this trend is slightly changed when the relationship between sediment yield and basin slope is plotted (Fig. 3(b)). In this case sediment yield follows the order: sandstone (25.9 $m^3 ha^{-1} year^{-1}$) > phyllite (22.7 $m^3 ha^{-1} year^{-1}$) > limestone (18.1 $m^3 ha^{-1} year^{-1}$) > older alluvium (14.9 $m^3 ha^{-1} year^{-1}$) > quartzite (14.2 $m^3 ha^{-1} year^{-1}$) > younger alluvium (4.4 $m^3 ha^{-1} year^{-1}$) > blown sand (4.1 $m^3 ha^{-1} year^{-1}$) > shale (2.5 $m^3 ha^{-1} year^{-1}$). For a single lithologie unit there is a general increase in sediment yield with both annual rainfall and drainage basin slope. The variations of sediment yield with rainfall and drainage basin slope are due to the nature of the rock. The sandstone outcrops in this region are composed of medium to fine sand with intercalated beds of grit or gravels; these outcrops generate the highest sediment yield in comparison to shale which is more resistant, and in consequence loses the least sediment. The phyllite is composed of medium to coarse grains with uniform structure and loses less sediment than the sandstone. The limestone formations are fine, compact, hard and cherty with fractured and weathered upper layers and, thus, still produce less sediment than the quartzite which is medium to coarse grained. When sediment yields are plotted against the runoff generated in during individual events (Fig. 4), a general increase in sediment yield with runoff can be seen. The higher runoff is associated with greater kinetic energy for erosion and transport of the eroded sediment. There

are striking differences between the various events however, in the rate at which sediment yield increases with runoff.

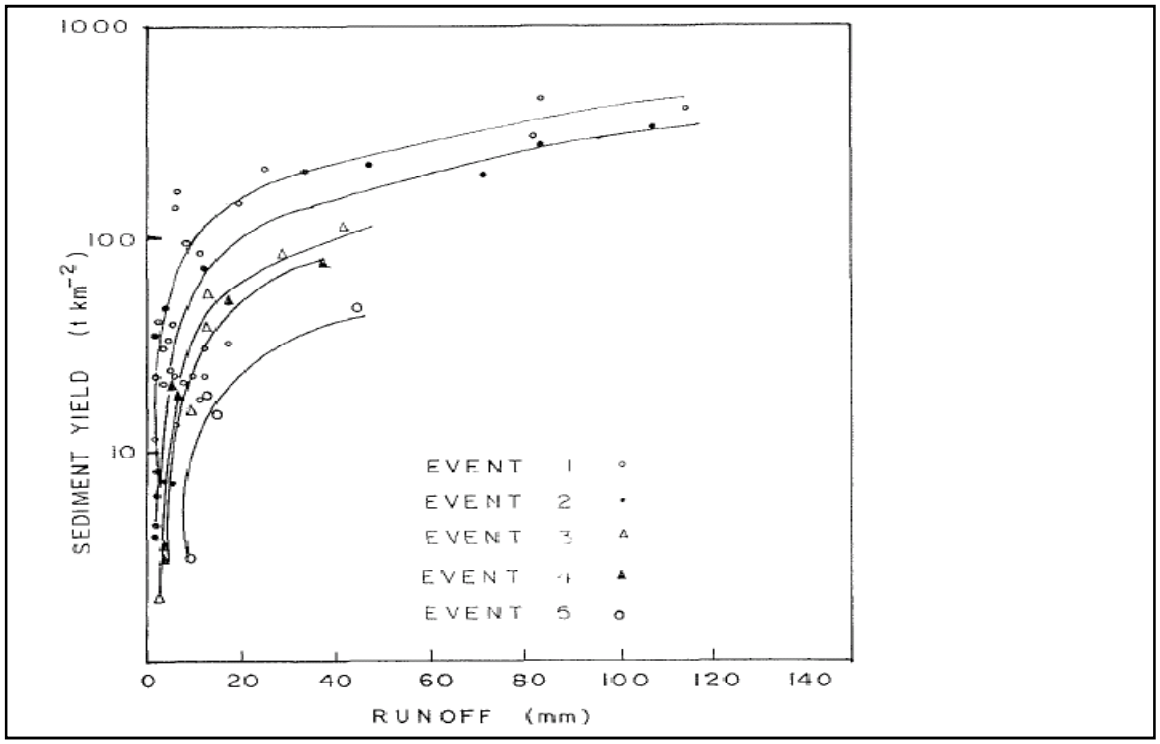


Fig No. 5.6 The relationship between sediment yield and runoff for a sequence of storm events

This is due to the presence of greater amounts of readily transported loose material in the drainage basin at the onset of the first event of the wet season. The supply of this loose material decreases progressively during a sequence of storm events, due to shorter intervals that allow less biotic activity. As the study area fall in arid and semi-arid climatic condition and papers (K. D. Sharma) based on collected data and observations, Souads to be more realistic used for calculation of replenishment for river sand mining projects.

Table No 5.3 Total sediment yields per year

Category of Cathment Area	Average Sediment yield (M^3Ha-1 year-1)	Sediment yield (T Ha-1 Year-1)	Catchment Area in Hect.	Sediment (LTPA)
Sandy Plain	3.4	4.76	6990	0.332724
Older Alluvial Plain	18.4	25.76	2660	0.685216
Rocky/ Gravelly piedmont	14.3	20.02	2270	0.454454
Total			11920 Ha.	1.47

Source: K.D. Sharma, CAZRI, Jodhpur

Total catchment area of Shivpura River up to sand mining area is 11920 ha. Sediment quantity of sand in the proposed area has been estimated by K.D.Sharma, (CAZRI, Jodhpur).The finally we have concluded that the adequate quantity of sand (1.47 LTPA) will be replenishment naturally during monsoon period.

5.2 WATER ENVIRONMENT

5.2.1 ANTICIPATED IMPACT ON WATER ENVIRONMENT

The water demand for the project is very minimal. Total water requirement will be 5 KLD, utilized for drinking as well as dust suppression and plantation purpose. Mining of sand from within a streambed has a direct impact on the stream's physical habitat characteristics. These characteristics include geometry, bed evaluation, substrate composition and stability, in stream roughness elements, depth, velocity, turbidity, sediment transport, stream discharge and temperature. Altering these habitat characteristics can have deleterious impacts on both in stream biota and associated riparian habitat. The detrimental effects, if any, to biota resulting from bed material mining are caused by three main processes:

1. Alteration of flow patterns resulting from modification of the river bed.
2. An excess of suspended sediment
3. Damage to riparian vegetation and in stream habitat.

5.2.2 Mitigation Measures

During the lease period, the mining activities will be confined to 3.0 meter depth from surface level of river bed. The extraction will be carried only on dry sand bed and restricted to monsoon period. The flow pattern of the river will not be changed and the sequence of operations will be changed as per the flow pattern of the river course. As mining will be done at shallow depth and the ground water table will not pollute the quality of course nor intersect ground water and will not pollute the quality of water as no trade effluent is discharged.

It is not proposed to divert or truncate any stream. No proposal is envisaged for pumping of water either from the river or tapping the ground water. In the lean months, the proposed sand mining will not expose the base flow of the river and hence, there will not be any adverse impact on surface hydrology and ground water regime due to excavation of river sand. Thus, the project activities will not have any adverse affect on the physical components of the environment and therefore may not have any effect on the recharge of ground waters or affect the water quality.

5 .3 AIR ENVIRONMENT

The mining activities will be confined to the river bed, to extract soft sediments, without drilling & blasting, by semi-mechanized method of mining. The activities in the regular operation can be broadly classified into excavation, loading and transport. As the proposed activity is only a collection and sand normally having moisture does not have much impact on the Air Environment. The generation of dust will be negligible and the air quality will be marginally affected. However, control measures like water sprinkling on haul road are required to reduce the dust level and keep it within permissible limit.

However, the impacts due to the various activities during operational phase of the proposed sand mining project are given hereunder-

Table 5.3: Mining Activities and its Environmental Impacts

S. No	Activity	Environmental Impacts
1	Sand Excavation	Emission of fugitive dust
2	Sand Loading	Emission of fugitive dust
3	Sand Transportation	Emission of fugitive dust Vehicular exhaust Emission

5.3.1. Impacts of the Sand Excavation

Daily, around 800 tonne of sand will be excavated. Excavation is proposed to carry out by Backhoe. During the excavation time, the sand may be discharged in to air environment. However, as the area

experiences calm winds during most of the times the displacement of sand by air will be very insignificant. However, even such small quantities also need to be addressed in the project.

5.3.2 Impacts of the Sand loading in to trucks

Daily around 800 tonne sand will be loaded in to the trucks for transportation to the nearby areas. Loading of sand in to the trucks may likely to release particulate matter.

5.3.3 Sand Transportation

It is envisaged that about 40 trucks will transport about 800 tonne of sand to the nearby areas. The transportation is done on road by trucks with a capacity of 20 Ton. Thus, the transportation process also contributes to vehicular emissions like SO_2, NO_X, CO.

5.3.4 Mitigation Measures for Air Pollution

In the sand mine, air pollution is caused mainly due to dust generation added with gaseous emission from mining activities like loading & transport etc. The gaseous pollutants (SO_2 NO_2, & CO) are anticipated by transportation vehicles.

Dust Pollution: One of the main pollutants in air will be particulate matter (PM), which will be generated during various activities of mining such as extraction of sand, and movement of vehicles. Following measures is been taken to minimize air pollution.

- Haulage road will be adequately sprayed with water by water sprinkler.
- The haul roads in the area will be made compact. Both sides of the haul roads will be planted with trees to arrest air borne dust.
- Green belt/plantation will be developed all along the haul roads and other places to arrest dust.
- Dust mask/Face mask will be provided to all employees working in the likely dusty areas.
- Proper maintenance of vehicles is been done, which minimize the pollutants.
- Ambient Air Quality Monitoring is been conducted on regular basis to assess the quality of ambient air as per the EC conditions and submitted to respective authorities.
- Proper tuning of vehicles to keep the gas emissions under check.

5.3.5 Air Quality Impact Predictions (AQIP)

The air quality in the mining areas depends on the nature and concentration of emissions and meteorological conditions. The major sources of air pollution due to the mine is dust generation due to excavation, loading and transportation of mineral, wind erosion of exposed material. Dust emissions from these operations mainly depend on moisture content of the sand and type of control measure adopted. In this study, United States Environmental Protection Agency (USEPA – 42 series) approved mathematical equations have been used to predict concentrations for different operations in mining including the mineral transportation. The major sources for the Fugitive dust emissions from the proposed sand mining project include:

- Sand excavation
- Sand Loading on to trucks
- Sand transportation to designated sites/market

Details of Source & Emissions

1. Area Source Emission

Air pollution i.e. fugitive & dust emission will be generated due to excavation and handling of sand.

2. Line Source Emission

Pollution due to vehicular movement is main source of line source emissions in mining activities. Surface conditions of the roads and the fuel consumption of the vehicles remains on the worst side due to which these emissions rate remains higher as the vehicular density increases. The major sources of

line emissions during mining activities are the vehicular exhausts and dust due vehicle movement. The major emissions from this source are carbon monoxide, nitrogen oxide and Sulphur dioxide etc.

Air quality modeling was done using line source model as published by USEPA "Workbook of Dispersion Modeling" by Turner, for transportation though roads and the empirical emission factor equations from USEPA. Emission factors to be used in Line source Dispersion equation is adopted from formula as given below:

E= k * (1.7) * (s/12)*(S/48) * (W/2.7)0.7 * (w/4)0.5 * (365-p/365) kg/VKT

Where

E = Emission Rate (kg/VKT)

k= Particle size multiplier = (0.36)

s = Silt Content of the Road surface material (%) = 12%

S = Mean Vehicle Speed (km/hr) = 20 km/hr

W=Mean Vehicle Weight (tonnes) = 20 tonne

w= Mean number of wheels = 8

p= Number of days with at least 0.254 mm of precipitation per year = 20

f = frequency of Vehicle movement in no per hour = 5 vehicles / hour

Concentration of the fugitive dust was calculated using the empirical equations for unpaved roads published by USEPA- AP42.

A. Area source emission – Sand Excavation

Particulars	PM_{10}
Production capacity, Tonne per Annum	2,24,000
Production capacity, Tonne per Day	800
Operational Hours per year	2240
USEPA Emission Equation in lb/ton	$0.75[18.6\ (s)^{1.5} / (M)^{1.4}]$
Emission of dust, g/sec	0.006414
Area of influence, m^2	10000 sqm
Uncontrolled Emission Rate, $G/S/M^2$	0.0000064

B. Haulage Emissions (unpaved) – Transport of sand

Particulars	PM_{10}
Production capacity, Tonne per Annum	2,24,000
Production capacity, Tonne per Day	800
Total Block	1
Operational Hours per day	8
Capacity of each truck	20 ton
Total no. of trucks per day	40
Total no. of trucks per hour	5
Lead Length per trip,km	50 km(Two way)
USEPA Emission Equation in lb/VMT (Pounds per vehicle miles traveled)	[(k) x [(s/12)^0.9] x [(W/3)^0.45] ((365-p)/365))
Emission, kg/VKmT (kilogram per vehicle kilometer traveled)	0.796 Ib/VMT 0.224 (Kg/VMT)

Area of influence, m^2	10,000
Uncontrolled Emission Rate, G/S/M^2	0.000022

Emission factor computed based on silt content of 12 % and moisture content of 10%.

For each, a brief description characterizing the source and the general methodology used to estimate emission rates are provided. Based on USEPA emission factors, the possible emissions from different mining activities such as excavation, loading and transportation has been computed. The summary of emissions for peak rated production capacity of 100% from different mining activities calculated.

A substantial portion of these emissions may consist of heavy particles that settle out within the mining site. Considering the silt content of the mining sand (12%) with a moisture content (10%)

5.3.6 Air Quality Modeling

In order to predict the Particulate emissions, AERMOD 8.2 View Model was used to predict changes in air quality i.e. maximum Ground Level Concentration (GLC's) of particulate matter, due to the various sand mining activities of the proposed project. The model uses the steady state Gaussian plume equation for continuous source. For convenience, 10000 m X 10000 m square block by keeping project centre coordinates as (0.000, 0.000) has been selected for modeling so as to include all the air quality baseline monitoring stations in the block. The GLC's were predicted for Environment Management Plan with 90% of pollution control for peak production capacity .The inputs required for the model is:

- Hourly meteorological data
- Source data
- Receptor data
- Emission rate
- Terrain data

Model Options Used For Computations

The options used for short-term computations are:

- Buoyancy Induced Dispersion is used to describe the increase in plume dispersion during the ascension phase;
- Calms processing routine is used by default;
- Wind profile exponents is used by default, 'Irwin';
- Flat terrain is used for computations;
- It is assumed that the pollutants do not undergo any physico-chemical transformation and that there is no pollutant removal by dry deposition;
- Washout by rain is not considered;
- Cartesian co-ordinate system has been used for computations; and
- The model computations have been done for 10 km with 500-m interval.

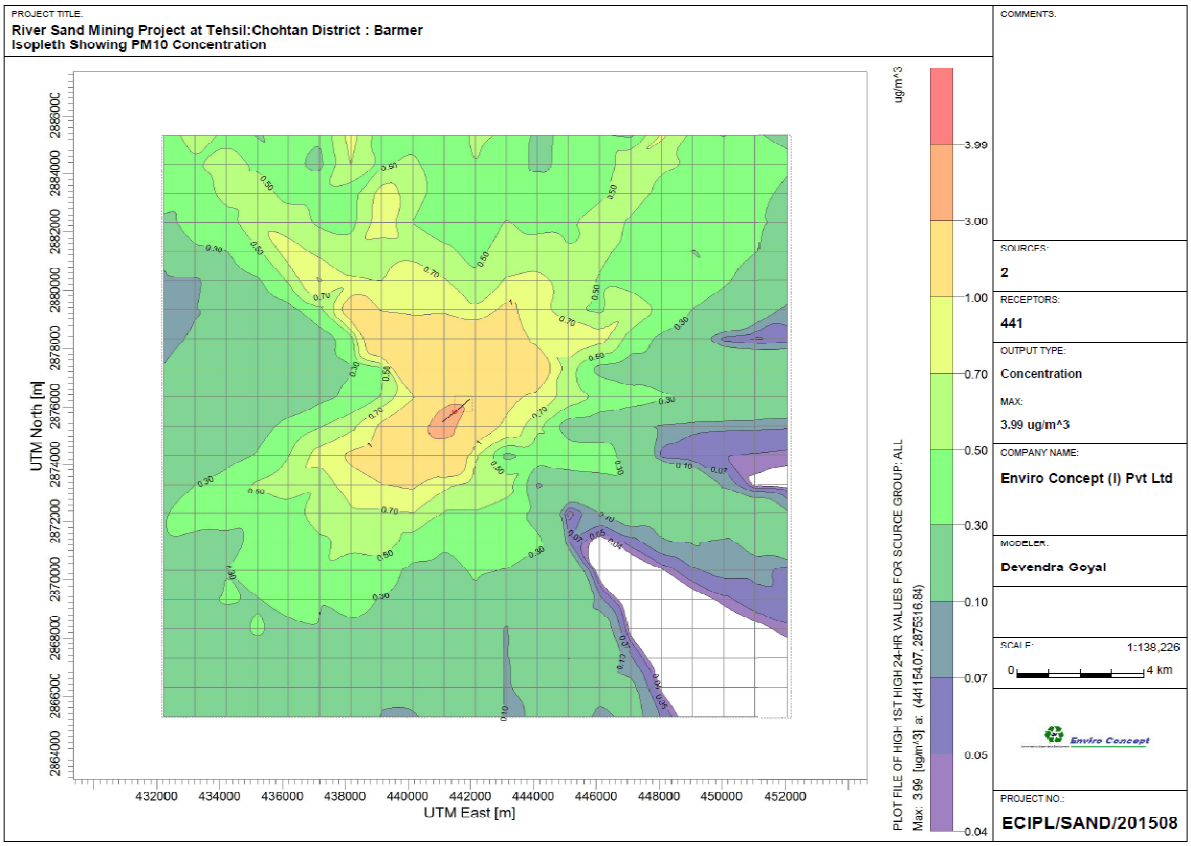


Fig No.5.7 (a) Isopleths showing predicted incremental GLC's of PM_{10}

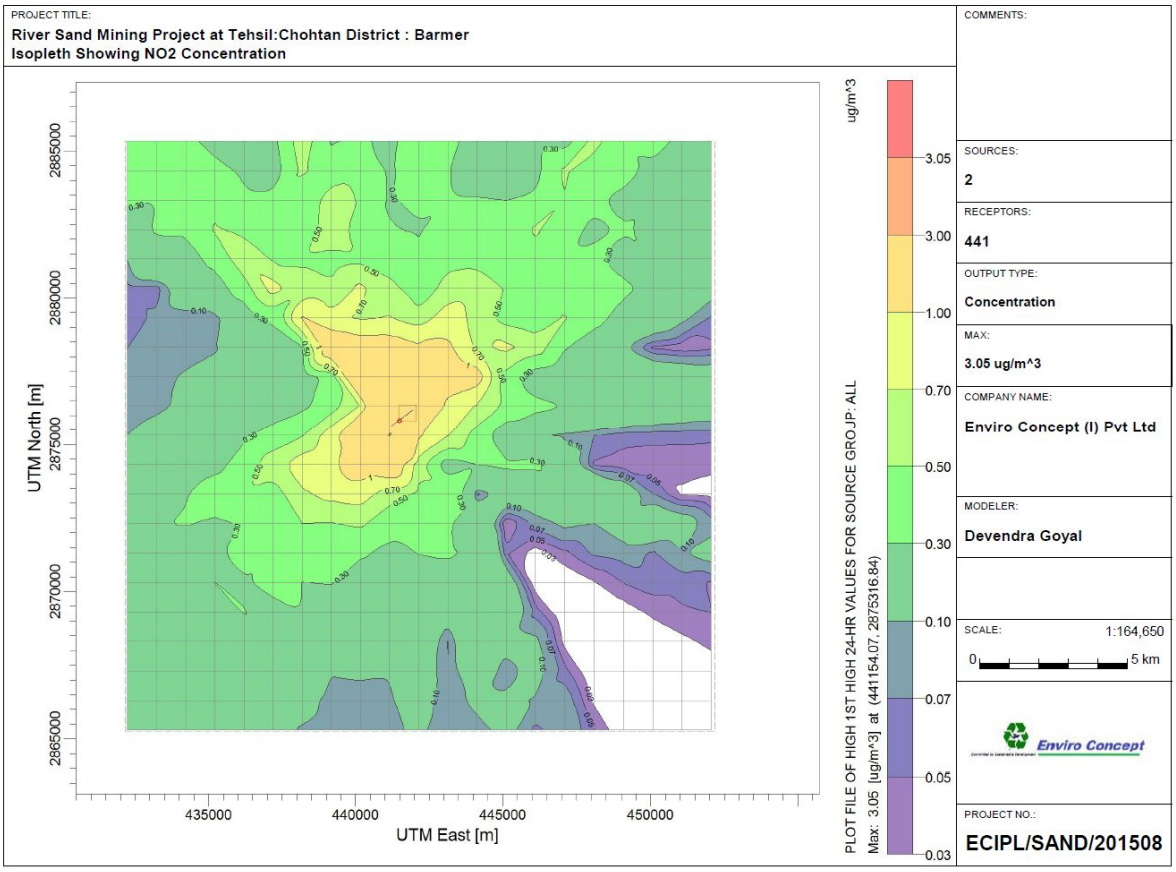


Fig No.5.7 (b) Isopleths showing predicted incremental GLC's of NO_2

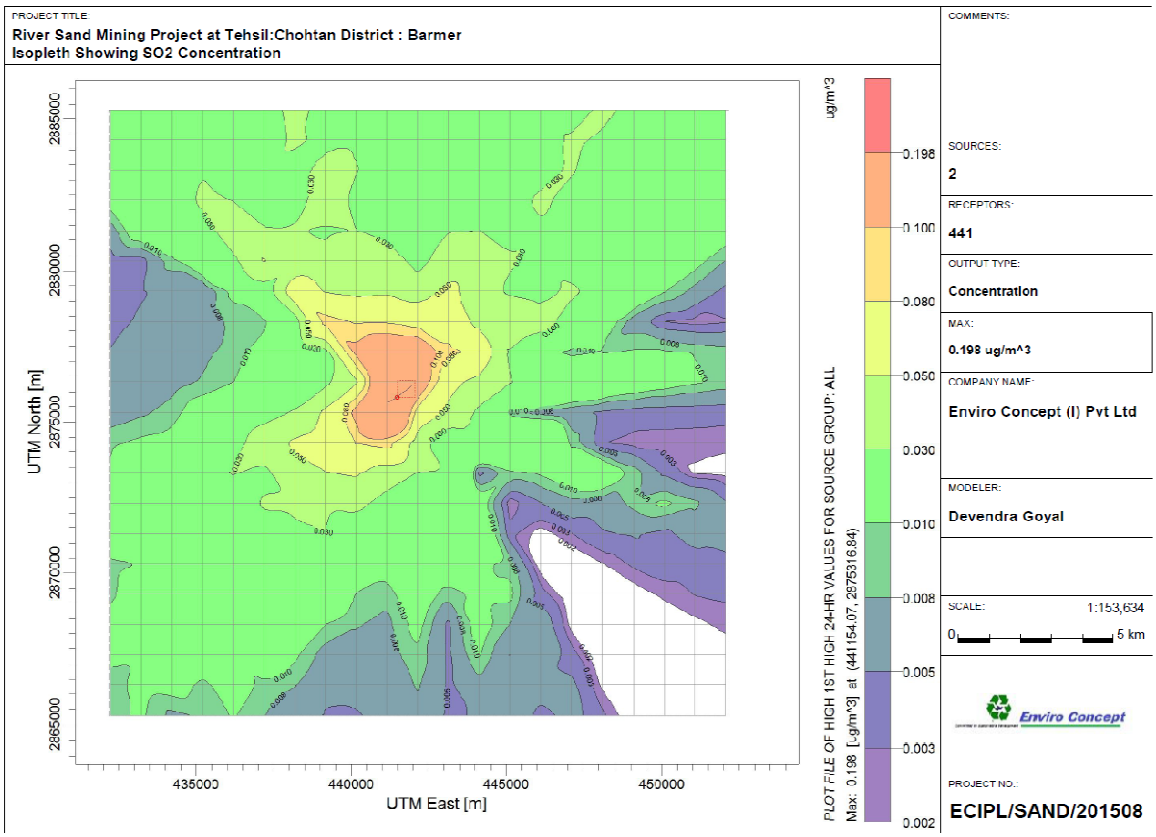


Fig No.5.7 (c) Isopleths showing predicted incremental GLC's of SO_2

5.3.7 Results and Conclusion

The ground level concentrations are computed for 24-hrs average. The maximum ground level concentrations of PM_{10},SO_2 & NO_2 from the different mining activities for study period with EMP are given in Table No 5.7.The cumulative concentration (baseline + incremental) after implementation of the project are tabulated below in Table: 5.7. The maximum GLCs after implementation of the project are likely to be within the prescribed NAAQ standards.

TABLE: 5.7 Cumulative Concentration of Pollutants (Baseline + Incremental)

Sampling Location	Max. Base line conc.(µg/m^3)			Predicted incremental Max. conc. µg/m^3			Cumulative max. conc. µg/m^3			Prescribed Standards in Day Time in µg/m^3		
	$PM1_0$	SO_2	NO_2	$PM1_0$	SO_2	NO_2	$PM1_0$	SO_2	NO_2	$PM1_0$	SO_2	NO_2
Shivpura (Near Lease Area)	64.55	15.47	24.2	3.99	0.19	3.05	68.54	15.66	27.25	100	80	80
Sanwalar	64.55	15.36	24.69	3.95	0.18	3.01	68.5	15.54	27.7			
Akora	64.25	15.9	24.7	0.70	0.05	0.4	64.95	15.95	24.75			
Goliyan	64.55	15.37	24.69	2.96	0.09	1.76	67.51	15.46	24.78			
Ranisar	64.55	15.7	24.65	1.00	0.07	0.7	65.55	15.77	25.35			

From the results of AERMOD 8.2 models, it is concluded that the maximum cumulative concentrations of PM10 both due to mining activities and transportation are expected to be within the prescribed standards for PM10 (68.05 ug/m3 at Village Shivpura near Core Zone area). The contours are spread throughout transportation route as well as around the active mine pits. More no. of active pits with segmented production leads to decreased impact at the pits. The contours near the mine pits in the Shivpura River ranges from 3.50 to 3.99 µg/m³ spread up to a distance of 200 m from the mining pit. All the approach roads and main roads to be used for the transportation activity from all the mining pits have been used to predict impact due to vehicular activity. The maximum impact locations for PM10, SO2 and NO2 incremental concentrations due to mining and road transportation as per the Isopleths are Shivpura & Sanwalar Village Near to Mine Area (on MDR-17). Apart from these locations, incremental concentration in other areas is very insignificant.Apart from the particulate emissions, the gaseous pollutants concentrations shall be transient to the locations and shall continue dispersing. Hence, actual impact on the receptors shall be lesser then predicted. Greenbelt development shall be undertaken phase wise based on the mining activity, which shall ensure the containment of dust particles within the core zone. No significant impact is proposed on the sensitive receptors in the study area like forests and villages in the downwind direction. Vehicular management plan shall be adopted and followed, with use of proper mitigation measures during transportation activity. In addition water spraying and other mitigation measures shall ensure reduction of dust particles and shall pose no significant threat to the receptors. Cumulative concentration calculated after adding the predicted incremental value to the existing ambient air quality baseline value, results to be within the prescribed National Ambient Air Quality Standards.

- The major contribution to the cumulative concentration level is coming from transportation on haul road in comparison to mining activities which are confined to mine lease. The maximum impact of incremental concentration due to loading activity at mine site is confined to limited distance (200-300 m) only. Beyond 200-300m distance the concentration of PM10 due to mining activities is expected to be lower due to settlement of PM10 particles over short distances. The same confirmed by the low predicted concentration levels of PM10 at ambient air quality stations (Figure 5.7 a).
    - The incremental concentration due to transportation is extended over vast area due to long haul of bajri over unpaved roads. However, these concentration levels will be limited to the length of unpaved haul road from the mining lease area until nearest paved roads.
    - The concentration of CO due to vehicle exhaust is negligible due to small number of vehicles plying on haul road.
    - The concentrations of SOx and NOx generated from mining area are expected to be low due to absence of any major source.

5.4 NOISE ENVIRONMENT

The river bed mining projects are mainly not noisy as these are mainly semi-mechanized in nature. Noise level increases due to excavation, handling and transportation of sand and operation of equipment. Since mining is done mechanically, slight increase in noise levels can be expected. Noise pollution can cause significant impact on the environment and subsequently on the humans. Baseline Noise levels are observed to be well within the limits in the monitored villages. However, after applying the mitigation measures noise pollution will be reduced further. At mines, noise is created by movement of machinery & transportation vehicles, etc. The noise level in the working environment are compared with the standards prescribed by Occupational Safety and Health Administration (OSHA-USA) which has been adopted and enforced by the Govt. of India through model rules framed under Factories Act, 1980 and CPCB 2000 norms.

5.4.1 Anticipated Impacts

The proposed sand mining project consists of three major activities as brought out earlier. The following table indicates the impacts due to various activities on Noise Environment:

Table 5.5 Impacts on Noise Due To Various Mining Activities

S. No	Activity	Environmental Impacts
1	Sand Excavation	Slight increase in Noise Levels
2	Sand Loading	Slight increase in Noise Levels
3	Sand Transportation	Slight increase in Noise Level

5.4.2 Impacts Due To Transportation

The river sand produced from the mine is to be consumed by different Construction /Infrastructural projects located at Barmer and adjoining areas. Transportation of mined out mineral from the river bed will be transported by hired/ consumers Dumpers, Tractors, trucks. Total Production during the five years planning 2.24 lac Tonne.About 40 trucks per day will be

required in this mining project. Capacity of each truck is 20 Tonne. The proposed increase in traffic density will not cause significant impact on the traffic since the connecting road and nearby State Highway is capable of handling this increase in traffic density. The speed of dumpers/ trucks on road will be controlled i.e. speed limit 10 kmh / average speed limit 7.5 kmh to control excessive dust emissions. Overloading of transport vehicles will be avoided to minimize the impacts. During transportation of sand by trucks/ tippers through public roads, the truck will be properly covered (tarpaulin sheets/ leak proof) and will in safe speed. The trucks/ tippers will have sufficient free board. In case spillage of sand on public roads will be cleared immediately.

MITIGATION MEASURE

PUC certified vehicles will only permit. Hence there will no significant traffic load on roads due to the project activity.

On-site

Maintenance of Machinery: Regular maintenance of machinery will keep the generated noise level at minimum. All machines will be as per stipulated standards and will be used at their optimum capacity.

Trained Operators: Only trained operators will be allowed to operate machines.

Vegetation: Plantation of trees along the bank will be done to dampen the noise.

I. Hearing Protection: Ear-muffs, ear-plugs, etc. will be provided for hearing protection (if applicable).

II. No working will be carried out in the night hours.

Off-site

The off-site sources are not significantly affect / no impact the noise levels as their distance increases from the site.

5.4. IMPACT ON SOIL ENVIRONMENT

In the mining lease area, there is no soil cover and bajri is exposed.

5.4.1 LANDSCAPE AND LAND USE PATTER

Mining will be carried out by dividing lease area into manageable blocks to ensure scientific and systematic mining of bajri.Collection of bajri will be carried out upto a maximum depth of 3 meters from surface of sand deposit and not less than one meter from the water level of the River channel whichever is reached earlier. Land use of the mine lease area will not be changed permanently. Natural replenishment of bajri during rainy days will be there. Adequate width as safety margin will be left on both sides of river banks during collection of bajri to permit unhindered flow of water.

5.5 SOLID /OB MANAGEMENT

There is no topsoil in the lease area. No overburden and waste is likely to be generated during lease period as the river sand directly loaded in the truck and send to the market.

5.6 BIOLOGICAL ENVIRONMENT

No wildlife sanctuary, national park or biospheres reserve is located within the study area. There will not be any de-vegetation during proposed mining activity. Mining which leads to the removal of channel substrate, re-suspension of streambed sediment, clearance of vegetation, and stockpiling on the streambed, will have ecological impacts. These impacts may have an effect on the direct loss of stream reserve habitat, disturbances of species attached to streambed deposits, reduced light penetration, reduced primary production, and reduced feeding opportunities.

For thousands of years, sand has been used in the construction of roads and buildings. Today, demand for sand continues to increase. Mining operators, in conjunction with cognizant resource agencies, must work to ensure that sand mining is conducted in a responsible manner. Excessive Riverbed sand mining causes the degradation of rivers. Riverbed mining lowers the stream bottom, which may lead to bank erosion. Depletion of sand in the streambed causes the deepening of rivers, and the enlargement of river mouths. Any volume of sand exported from streambeds is a loss to the system.

Excessive Riverbed sand mining is a threat to bridges, river banks and nearby structures. Sand mining also affects the adjoining groundwater system and the uses that local people make of the river. Riverbed sand mining results in the destruction of aquatic and riparian habitat through large changes in the channel morphology. Impacts include bed degradation, bed coarsening, lowered water tables near the streambed, and channel instability. These physical impacts cause degradation of riparian and aquatic biota and may lead to the undermining of bridges and other structures. Continued extraction may also cause the entire streambed to degrade to the depth of excavation.

Sand mining generates extra vehicle traffic, which negatively impairs the environment. Where access roads cross riparian areas, the local environment may be impacted.

5.6.1 Mitigation measures

Re-suspension, turbulence, stream flow, channel substrate and associated species will be disturbed and lost due to proposed mining will disturbed existing pattern but in respect to river area is very minimum / less. The activity will mainly be carried out manually to minimize associate loss, as stated earlier that the settling pit will be created to minimize the adverse impact downstream.

- No mining will be done near to important structure like bridges, dam and others.
- No mining will be carried out during the rainy season to minimize impact on aquatic life.
- As the mining site has no vegetation, thus clearance of vegetation not required.
- The mining activity will employ many heavy vehicles to transport the sand outside the mine to desired destination that cause the loss to riparian habitat. Safe site / site having less impact will be selected for transportation, indigenous / local riparian plants will be planted along boundary to minimize losses due to transportation, all the vehicles will be employed for transportation purpose will be PUC certified
- On closure / during the rainy season the eroded bank will restore / reclaim to minimize negative impacts.

Other Recommended Measures

- Indigenous plants per year will be planted in a scientific manner in order to reduce mining impact.
- No exotic species will be introduced by the RBM project activity at all.
- Ensure better mining management to prevent movement of unstable substrate by creating pit / other suitable structures downstream. By this way impact will be restricted at certain distance.
- As the mining will not be done the stipulated limit, so the chances of river mouth widening, bank widening will be negligible.
- As the river has been swallowed due to mineral deposition by mining activity it will be more channelized than previous. Thus no negative impact on river depth.
- Suitable plant species will plant to minimize damage to riparian habitat etc.

The mining activity will have insignificant effect on the existing flora and fauna.

5.6.2 IMPACT ON FLORA

Plantation will be developed in the mining lease area as per plantation programme. These activities will help to improve the floral cover of the area. The greenery and plantation development will eventually attract micro fauna, birds etc in the area. Assistance will be taken from local forest department in selection of species of plants so that green coverage may improve fast. The varieties would include those plants, which are suitable to the area.

5.6.3 IMPACT ON FAUNA

The mining lease area is in non-forest land where presence of fauna is very rare. As such, there will be no adverse impact of the mining activity on fauna around the mining lease area.

5.7 GREEN BELT DEVELOPMENT

The proposed green belt in the lease area will to be designed taking into consideration the availability of area as the efficacy of green belt in pollution control mainly depends on width of green belt, distance from pollution sources, site of the habitat from working place and tree height & density. While considering the above aspects due care will be taken for selecting suitable characteristics plant species as those fast growing and evergreen trees, trees with large leaf area, locally suitable plant species, those resistant to specific pollutant and those which would maintain the regional ecological balance, soil and hydrological conditions.

The plantation work for green belt development will be carried in consultation with a local forest department which will help minimizing adverse impact on the flora found in the area. Year wise plantation program is given in Chapter 9.

5.8 SOCIO- ECONOMIC ENVIRONMENT

5.8.1 Anticipated Impacts

The project activities will not have any adverse impacts on any of the common property resources of the village communities, as the sand mine lease area is not being used for any purpose by any section of the society in this region. There is no R&R & land acquisition involvement in this project. There is no impact of mining on local residents of the area as habitation is away from the applied lease area. The maximum persons will be employed form nearby villages. There is no source of employment is nearby area in this region and thus the employment will develop by the proposed mining activity in nearby area. The applicant after become lessee will help in maintenance of village kaccha roads with request of local Panchyat Samiti. The lessee will provide maximum assistant to local body on their request. The lessee will develop the plantation along the roads. The lessee will contribute some fund from the income and the fund will use only for the social development of the people in the field of Education and Medical.

Due to differences in geographical locations and climatic conditions, views of respondents and indeed, actual ecological effects of river sand mining, also differed. Results from respondents showed that the single most important effect of river sand mining area is change in river depth and possible change in river bank. Agriculture area located on the river bank may get land erosion problem. This was particularly because agriculture is the predominant economic activity along the river area. Agricultural activities are often undertaken in the rainy season, and during the dry season farmers spend their time in land preparation.

Another significant effect of river sand mining is the abandoned pits serving as a source of breeding grounds for mosquitoes for example, and the resultant spread of malaria and other related diseases. During rainy seasons, the abandoned pits collect water and as a result attract malaria parasites resulting in infection of community people. Other diseases such as cholera, dysentery and diarrhea, among others, are associated with the mining activities.

The important finding gathered was the occurrence of mining activities along rivers and other water bodies. Mining activities along these rivers can retard free flow of the water course. Such direct in-stream mining can alter the channel geometry and bed elevation and may involve extensive clearing, diversion of flow, stockpiling of sediment, and excavation of deep pits. This can also result in significant distortion of the channel morphology, which often causes silting as a result of erosion of the banks and consequent flooding, which may worsen especially during high precipitation. Machinery which is used to extract sand sometimes disturbs the vegetation and further exposes the area to erosion and harsh weather conditions. This can as well cause loss of the protection provided by soil as it filters out pollutants and can further affect aquatic life in such riverine areas.

5.8.2 Mitigation Measures

The following mitigation measures will be taken to solve the problems/points raised by local people during field survey:

- To protect the agricultural area on the river bank an utmost care will be taken while working in such areas where agriculture is practiced. Agricultural fields will be protected by river bolder where ever the possibility of river erosion will be felt.
- To avoid the possibility of spread of malaria due to stagnant water, no pit will be created due to excavation of river sand. However if water is accumulated after the rainy season anti-mosquito treatment like fogging, spread of kerosene etc. will be done in the areas.
- A proper road and transportation net work will be developed for movement of vehicle and machinery. No major changed in the vegetative cover is anticipated. However the development of greenbelt has already been suggested.
- To check the possible change in the river bank, 7.5 meter distance from both side of river will be kept untouched from exaction of sand and a proper slope will be maintained to keep the river bed smooth so that water flow may be not get disturbed
- The geometry of river will not be changed in any case, but if there are any weak spots where that possibility of change of river channel is visible in case of high rainfall, appropriate measures will be taken with the help of hydro-geo-morphologist.

5.8.3 Social and Ecological Effects of Proposed Mining

Due to differences in geographical locations and climatic conditions, views of respondents and indeed, actual ecological effects of river sand mining, also differed. Results from respondents showed that the single most important effect of river sand mining area is change in river depth and possible change in river bank. Agriculture area located on the river bank may get land erosion problem. This was particularly because agriculture is the predominant economic activity along the river area. Agricultural activities are often undertaken in the rainy season, and during the dry season farmers spend their time in land preparation.

Another significant effect of river sand mining is the abandoned pits serving as a source of breeding grounds for mosquitoes for example, and the resultant spread of malaria and other related diseases. During rainy seasons, the abandoned pits collect water and as a result attract malaria parasites resulting in infection of community people. Other diseases such as cholera, dysentery and diarrhea, among others, are associated with the mining activities.

The important finding gathered was the occurrence of mining activities along rivers and other water bodies. Mining activities along these rivers can retard free flow of the water course. Such direct in-stream mining can alter the channel geometry and bed elevation and may involve extensive clearing, diversion of flow, stockpiling of sediment, and excavation of deep pits. This can also result in significant

distortion of the channel morphology, which often causes silting as a result of erosion of the banks and consequent flooding, which may worsen especially during high precipitation. Machinery which is used to extract sand sometimes disturbs the vegetation and further exposes the area to erosion and harsh weather conditions. This can as well cause loss of the protection provided by soil as it filters out pollutants and can further affect aquatic life in such river mine areas.

Another effect of mining is modification of the recharge area for groundwater by changing the land surface of river bed, such as forming depressions so that water no longer flows along original pathways. Such changes may increase or decrease rainwater recharge to groundwater. Shorter flow paths may increase susceptibility to contamination while re-directed flow paths may deplete total recharge of the aquifer.

The project will also provide impetus to industrialization of the area. Where transfer of boulders into bajri is necessary crushing units will come up. It is expected that intending entrepreneurs will venture to set up micro and small scale units in the near future making the area a mixed society, dependent on industry, trade and business. At present agriculture is the main occupation of the people as more than half of the population depends on it. With the implementation of the proposed mining project the occupational pattern of the people in the area will change making more people engaged in industrial and business activities rather in agriculture. Thus there will be a gradual shifting of population from agriculture to mining and industry. Further, the mining and industrial activities in the area may lead to rapid increase in population and thereby urbanization.

5.8.4 Impact on Human Settlement

As the area of operation is in river bed only, hence no habitants in the core zone or buffer zone will be affected and no adverse impact is anticipated to human settlement.Review of secondary data, such as District Census Statistical Handbooks-2011 and the records of National Informatics Center data, for the parameters of demography, occupational structure of people within the general study area of 10 km radius around the project site.

5.8.5 Impact on Local Transport/Infrastructure

The traffic density on the surrounding roads of the mine site is very low and capable of handling of increased traffic. In the proposed mining, the production capacity is less and for transporting of excavated material, less number of vehicles will be required. Hence, the local transport / infrastructure facilities will be capable of handling the increased load due to mining activities.

The total extraction of sand will be 800 TPD. The loading capacity of a truck is 20 ton hence 40 trucks will be used par day. So there will be no impact on local transport infrastructure due to the project.

5.8.6 IMPACT ON CIVIC AMENITIES

The impact of mining on the civic amenities will be substantial after the increase production capacity of the project. With improved transportation facilities there is always a scope for development. The communications facilities have increased and developed in the area and will also further develop in near future.

5.8.9 IMPACTS DUE TO TRANSPORTATION

The sand produced from the mine is to be consumed by different construction/Infrastructural projects located at Barmer and adjoining areas. Transportation of mined out mineral from the river bed will be transported by hired Dumpers, Tractors, and Trucks. Total production from the proposed lease area will be 2.24 LTPA. About 40 trucks per day will be required in this mining project. Capacity of each truck is 20 Ton. The proposed increase in traffic density will not cause significant impact on the traffic since the

connecting road and nearby Highway is capable of handling this increase in traffic density. The trucks will be properly covered with tarpaulin and overloading will not be allowed to avoid spillage on roads. Prepare haulage road with slope ratio of 1:10.

Traffic Management:

Mining will be done by dividing lease area into 1 working blocks.Accordingly; transportation load will be distributed with distance gradient.

- Dedicated water spraying tankers will be deployed on kuccha roads.
- Maintenance of roads will be done.
- To avoid road congestion, peak hours will be avoided. Plantation will be developed on both sides of connecting roads from Lease area to the villages,river banks & in vicinity area.
- Direct village road will be avoided and direct road connecting to the highway will be opted.
- Minimum use of horns and speed limit of 20 km/hr in the village area. Adequate silencers will be provided in all the diesel engines of vehicles.
- Regular maintenance of machinery will be carried out.
- Water sprinkling during transportation over approach roads will be done for suppression of dust.
- Overloading will be prevented.
- It will be ensured that all transportation vehicles carry a valid PUC certificate.

5.8.10. CORPORATE SOCIAL RESPONSIBILITY ACTIVITIES

Welfare Amenities

The total capital cost involved in CSR activities is 5.50 lac per annum. As a corporate responsibility following measures along with budget provision (Table 5.6) is proposed for improving the conditions of persons in and around the project area.

Table 5.6 Detail of CSR Activities

S. No.	Description	Amount Per Year (in lac)
1	Health check up camps for workers & Villagers ▪ Medical Examination ▪ Medical Camps .i.e. Blood Donation,Eye Camp etc ▪ Helping to govt. programs to vaccination / polio/ TB	0.5
2	EHS Programme of the workers ▪ Occupational health and Safety program me of the workers shall be undertaken periodically to observe any contractions due to exposure to dust and take corrective measures if required	0.5
3	Insurance cover of workers & others Facilities a. Insurance b. Drinking water c. first aid box d. welfare facilities	1.0
4	Assistance to local schools/ Hospitals/ Anganbadies etc. ▪ Merit cum need Scholarships to the poor family children's ▪ Contribution to vocational training to needy people ▪ Free distribution of books & uniforms to the students.	1.0
5	Sanitations and Drinking water facilities	1.0

	Construction of toilets & other facilities for Public utilization Helping and contributing to drinking water supply	
6	Skilled Development Programme Training & awareness programmes to enhancement of farming practices Integrated Livestock Development activities Need based training for valuaddition to artisan Training for Truck Drivers and assistance	0.5
7	Assistance to self help groups	1.0
	Total	5.50

5.11 MINE CLOSURE

Mine closure plan is the most important environmental requirement in mineral mining projects. The mine closure plan should cover technical, environmental, social, legal and financial aspects dealing with progressive and post closure activities. The primary aim is to ensure that the following broad objectives along with the abandonment of the mine can be successfully achieved:

- To minimize environmental damage
- To conserve valuable attributes and aesthetics
- To overcome adverse socio-economic impacts
- To create a productive and sustainable after –use for the site, acceptable to mine owners, regulatory agencies and the public
- To protect public health and safety of surrounding habitation.

5.11.1 MINE CLOSURE CRITERIA

The criterion involved in mine closure is defined in relation to following key issues.

- Compatibility with agreed post –mining land use
- Physical stability
- Low risk to biota
- Physical stability
- Re vegetation and other improvements

5.12 STATUATORY REQUIREMENTS

It is accepted that effective resource management cannot be done in isolation. The Department therefore pursues approaches towards coordination and integration where possible, which has led to coordinated regulatory systems.

A regulatory system consists of both statutory and non-statutory components. In the Sectoral-specific strategy for prospecting and mining, the Department participates within an integrated environmental management system which is administered in terms of the Acts and Rules. Other Acts dealing with matters relating to the conservation and protection of the environment and which a holder of a mining authorization must also take cognizance of include *inter alia*, the following:

- The Mines Act, 1952
- The Mines and Mineral (Development and Regulation) Act, 1957
- Mines Rules, 1955
- Mineral Concession Rules, 1960
- Mineral Conservation and Development Rules, 1988
- State Minor Mineral Concession Rules, 1960

- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- The Environment (Protection) Act, 1986
- The Forest (Conservation) Act, 1988
- The Wildlife (Protection) Act, 1972

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CHAPTER- 6
ENVIRONMENTAL MONITORING PROGRAMME

6.0 GENERAL

The regular monitoring of environmental parameters is of immense importance to assess the status of environment during project operations. With the knowledge of baseline conditions, the monitoring programme will serve as an indicator for any deterioration in environmental conditions due to operation of the project, to enable taking up suitable mitigation steps in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by monitoring.

6.1 OBJECTIVES OF MONITORING

- The objectives of monitoring are
- To identify the state of pollution within the ML area.
- Verify effectiveness of planning decisions
- Measure effectiveness of operational procedures
- Confirm statutory and corporate compliance
- Identify unexpected change

6.2 SCOPE OF ENVIRONMENTAL MONITORING PROGRAM

Environmental Monitoring Program includes periodic analysis of air, soil, noise and water, samples. Environmental monitoring will be conducted on regular basis to assess the pollution level in the ML area as well in the surrounding areas. Therefore, regular monitoring program of the environmental parameters is essential to take into account the changes in the environment.

6.3 POST PROJECT MONITORING PROGRAMME

Table 6.1 Post Project Monitoring Programme

S. No	Attributes	Parameters for monitoring	Frequency of monitoring
1	Ambient Air	PM_{10}, $PM_{2.5}$, SO_2, NOx and CO	As per CPCB/ RSPCB requirement
		Vehicle logs	Daily records
2	Ambient Noise Level	Noise levels at Day & night time -Leq dB (A)	As per norms of RSPCB/ MoEF
		Maintain records of vehicles	Periodic during operation phase
3	Water quality and water levels	TDS, Total Hardness, Calcium hardness, Magnesium hardness, Chloride, Fluoride,Sulphate, Nitrates, Alkalinity, Iron, Copper & As per IS 10500:2012 or as Per Condition of EC/CTE Watertable Level Four times in a year.	Periodic during operation phase
4	Maintenance of flora and fauna	Tree,Herbs & Shrubs	Periodic during operation phase
5	Soil quality Monitoring	Physico- chemical parameters i.e. pH, Bulk Density, Soil texture, Nitrogen,Available Phosphorus,Potassium, Calcium,Magnesium, Sodium,Electrical Conductivity,Organic Matter, Chloride	As per norms of RSPCB/ MoEF

6	Sand Replenishment	3-4 Selected locations in Block A.	Pre & Post Monsoon every Year
7	Occupational Health	Medical Examination of workers	Once in Year
7	Socio-Economic	Villages of Core & Buffer area	Once in years through physical survey for detecting any adverse variation and prompt correctives

6.3.1 Air Quality Monitoring

Air quality monitoring is essential for evaluation of the effectiveness of abatement Programmes and to develop appropriate control measures. The proponent will monitor fugitive dust emissions at locations of nearest human habitations and other public amenities located nearest to sources of dust generation, in and around the proposed sand mining project at a frequency of once in a fortnight or any other frequency as stipulated by MoEF and take appropriate air pollution control measures in order to ensure that the concentration of PM_{10}, SO_2 and NOx will be within the limits. The monitoring records will be submitted to MoEF regularly.

Parameters: As per MoEF guidelines, the concentration of Particulate Matter (PM_{10}), Sulphur dioxide (SO_2) and Oxides of Nitrogen (NOx) will be monitored in upwind, downwind and crosswind direction and also covering all sensitive receptors, along with adequate meteorological measurement for proper interpretation of data.

Methodology

Respirable dust sampler with gaseous sampling attachment will be used for monitoring of air quality for parameters viz., PM_{10}, SO_2 and NOx with a sampling frequency of 24 hours duration. Sampling and analysis will be carried out as per IS- 5182:1999 for measurement of air Pollution. PM_{10} will be analyzed gravimetrically, SO_2 will be analyzed by improved west and Gaeke method and NOx will be analyzed as per Jacob & Hochheiser Modified (Na-Aresnite) Method.

The National Ambient Air Quality Standards, MoEF Notification: GSR 826 (E), November 16th, 2009 is made applicable to sand mining project.

6.3.2 Water Quality Monitoring

Water quality monitoring involves periodical assessment of quality of ground water and surface water near the river sand mining project.

All the parameters as given in Part - A of General Standards for Discharge of Environmental Pollutants, GSR 801 (E) Environment (Protection) Rules, 1986 prescribed by CPCB will be analyzed for all the effluents for assessing the overall quality of effluents. Surface water samples will be analyzed for all the parameters as per CPCB Guidelines and ground water samples will be analyzed for all the parameters as per IS-10500.

Methodology: The sample collection, procedures for sample preservation and methods of analysis are followed as per Standard Methods for examination of Water and Waste water analysis published by American Public Health Association (APHA).

Frequency of monitoring: Monitoring of water samples will be done at a frequency of once in each season.

The following standards will be followed for complete analysis of water samples:

Surface water: As per CPCB Guidelines

Ground water: BIS-10500:2012

6.3.3 Noise Level Monitoring

Noise level monitoring will be done for achieving the following objectives:

- To compare sound levels with the values specified in noise regulations
- To determine the need and extent of noise control of various noise generating sources
- Correlation of noise levels with community response to noise levels.
- Noise level monitoring will be done at the work zone to assess the occupational noise exposure levels. Noise levels will also be monitored at the noise generating sources like sand handling arrangements, vehicle maintenance workshop and also nearby villages for studying the impact due to higher noise levels for taking necessary control measures at the source.

Parameters: The noise level recordings will be measured in dB (A) Leq values, where dB (A) denotes the time weighted average of the level of sound in decibels on scale A, which is relatable to human hearing.

Frequency of monitoring: Monitoring frequency for noise levels will be once in a fortnight. MoEF has stipulated that noise levels have to be monitored between 6.00 AM to 10.00 PM for day time and 10.00 PM to 6.00 AM for night time.

6.3.4 Green belt development

Vegetation development is proposed along the bank of river and along road sides of approach roads. While selecting plant species preference will be given for planting native species of the area and shall have soil binding capacity. Proponent will supply saplings to surrounding villagers for green belt development in their villages and encourage the plantation by means of social forestry.

Green belt development as per the scheduled plan will be reviewed every year plantation records will be maintained for period of plantation, area under plantation, length of avenue plantation, type of species density of planted area and survival rate.

6.4 ENVIRONMENTAL MONITORING CELL

Apart from having an Environmental Management Plan, it is also necessary to have a permanent organizational set up charged with the task of ensuring its effective implementation of mitigation measures and to conduct environmental monitoring. In this effect, proponent will assign responsibilities to officers from various disciplines to co-ordinate the activities concerned with management and implementation of environment control measures. An Organ gram of Environment management is shown in figure 6.1. Basically, this department undertakes the monitoring of environmental pollution level by measuring, ambient air quality, water quality, Noise level, etc., either departmentally or appointing external agency whenever required. The Environmental and Safety Department will also looking after for preparation of environment statement, carrying out environment audit, preparation of Consent to establish & Consent to operate.

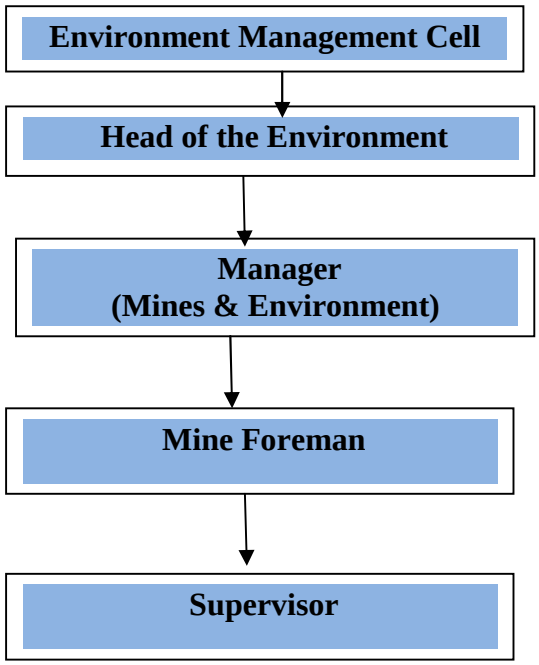
Environmental monitoring cell will be established for monitoring of important and crucial environmental parameters which are of immense importance to assess the status of environment during sand mine operation.

In order to carry out the environmental monitoring, EMC will perform the following activities:

- EMC will oversee that environmental control measures are implemented as per approved action plan.
- Identify and record the constraints in respect of environmental planning and implementation.
- Systematically document and record keeping w.r.t environmental issues.
- Field monitoring and laboratory analysis.
- Monitoring of plantation development.

- Environmental compliance to the regulatory authorities.
- Communication with the concerned departments on the environmental issues.
- Interact and liaison with State/ Central Government departments.
- To monitor compliance of environmental regulations.
- Continual improvement in environmental performance.
- To follow proper documentation and monitoring procedures, for developing better environmental management systems at the mine.
- To keep up with regulatory requirements and arrange for the necessary certificates or consents viz., air and water.
- To conduct yearly environmental monitoring and submit the statement to RSPCB.

Figure 6.1 Organizational Structure of Environmental Management Cell



6.5 REPORTING SCHEDULES OF MONITORED DATA

The monitored data on air quality, water quality, soil quality and noise levels, will be periodically examined for taking necessary corrective measures. The monitored data will be submitted to Rajasthan State Pollution Control Board (RSPCB). The post-project data will be submitted in half-yearly monitoring reports to the same.

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CHAPTER – 7

ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

As per the provisions of Environmental Impact Assessment Notification dated 14-09-2006 published by Ministry of Environment and Forests, Govt. of India; Public Hearing was conducted at 03.00 PM on 17.07.2014, in the premises of Shri Vankal Viratra Temple, Viratra, Village Post: Dhok, Tehsil: Chohtan, District: Barmer, under the Chairmanship of Additional District Collector Shri Harbhan Meena, Zila Parishad, Barmer for, Proposed River Sand Mining Project located at Revenue villages of Tehsil – Chohtan District – Barmer, Rajasthan. Advertisement for conducting public hearing was published on 15.06.2014 in "Hindustan Times" & "Rajasthan Patrika". To start with the proceedings of Public Hearing Shri H.R.Kasana, Regional Officer, Rajasthan State Pollution Control Board, Balotara welcomed all the persons present and gave a brief introduction about the procedure and importance of Public Hearing being conducted under the EIA Notification, dated 14.09.2006 Thereafter representative of Project consultant M/s Enviro Concept (I) Pvt. Ltd, Jaipur Shri Davendra Goyal and Shri Pramod Dagla made a presentation on the proposed project and draft REIA study report. About 46 persons are presented during public hearing and following questions/ issue were raised:-

S. No.	NAME & ADDRESS OF THE PERSON	ISSUES RAISED IN BRIEF	COMMENTS BY PROPONENT	BUDGETARY PROVISION /ACTION PLAN
1	Shri Roop Singh Rathor (Advocate), Village- Chohtan	Why village- Dhok (Chohtan) is selected as a venue for the public hearing for Environmental Clearance, due to its long distance. villagers of surroundings could not come in public hearing. How the pits during mining would be filled? Would these pits interrupt the course of Water?	Venue of public hearing is selected according to the instructions of Administrative Officers (D.M.) and the advertisement of notice for public hearing published in one of the main National and one State language (Local) daily News Papers in advance before 30 days of public hearing. Also announcing through loud speaker and banners in the surrounding villages for more precipitating in the public hearing one day before date of hearing. Mining will be proposed up to max. 3 Mt below river bed, no, reclaimed proposed and course of river would not be interrupted.	Mining will be done systematically & in sequential manner as per Mining Plan & Progressive Mine Closure Plan approved by Department of Mines and Geology, Rajasthan. Mining will be carried out upto a maximum depth of 3 m below river beds or 1.0 Mtr. Above ground water table. Hence, No intersection of ground water table. Mining pits will be replenished naturally during rainy season.

2	Sh. Mohan Lal Soni (Sarpanch), Village-Chohtan	Roads will be damaged due to transportation of bajri by trucks and dumpers. What will be done for maintenance of it?	Roads will be repaired and maintained by lease owner if damage due to sand transportation. Overloading of trucks will not allowed and follows the govt. norms. Requisite penalty impose by concern govt. department if violating the rules for the same.	Roads will be repaired and maintained by lease owner if damage due to sand transportation in consultation of local authorities and villagers Rs. 2.4 Lac per year allocated for the same.
3	Hukum Singh, Village - Chohatan	Local people should get employment in river sand mining and fencing should be done around the river area so that cattle could not go in the river.	Your suggestion would be considered local people would be employed during mining operation. Safety zones / measures would be adopted for cattle and animals. Regional officer said that wire fencing is not possible in such a large area whereas safety zone would be developed. All these works would be done under the supervision of the administration. So that mining could be done properly. A.D.M. said that big heaps of river sand would not be made. Negative aspects should be solved by identifying them.	Preference will be given for employment of local persons. All safety measures are adopted and mining will be done as per Mining act. Temporary fencing and safety zone of about 10.0 Mtr along the lease area also marked and no mining work proposed.
4	Sh. Roop singh rathor (Advocate), Village-Chohata	Where from can we get environmental information?	All information can be obtained from Environmental department or R.P.C.B.	REIA/ EMP and compliance report after Environmental clearance is made available at our concern person.

Written queries/ objection obtained during public hearing are as under:

Report /Objection obtained, During Public Hearing are as follows:-			
Name & Address	Description	RESPONSE/COMMITMENT OF PROJECT PROPONENT	Action Plan
Sh. Mohan Lal Soni, (Sarpanch village	Regarding employment	Only local people would be given employment. Apart of it Indirect employment would given to truck drivers and other peoples.	20 persons will be employed directly and other persons also engaged in-directly in the other associate

panchayat) and Other			activities.
Sh. Ramveer Singh, village-Dhok	Regarding damaging of roads due to river sand (Bajari) transportation.	Over loading should not be done.	Overloading will not permitted and avoiding the transportation from the inside road of village. Repairing of roads damaged by proposed mining activities will be done by proponent time to time, Budgetary provision of Rs. 2.4 Lac per annum allocated for the same.

Table 7.2: Time Bound Action Plan

S.No	Activity	Action to be Undertaken	Budetary Provision in Rs. Per Annum	Time Schedule				
				I	II	III	IV	V
1	Green Belt Development	750 plant per year, Wire fencing, Maintenance, Brushwood protection guard, watering etc.	1.50 Lac					
2	Construction and Maintanance of haul road	Construction and Maintenance of Roads in the Villages near mine lease area with the help of Village Panchyat, State Deptt.	2.4 Lac					
2	Environmental Monitoring	Air, water, soil, Noise Monitoring etc.	4.50 Lac					
3.	Assistance to Local Government School	▪ Scholarship to students ▪ Merit cum need scholarship to the poor family ▪ Free distribution of books & uniforms to the poor students	1.0 lac					

4	Health check up camps for workers and villagers	▪ Medical Examination ▪ Medical Camps for villagers nearby areas .i.e. Blood Donation, Eye Camp etc	1.5 lac					
5	Insurance Cover	a. Insurance b. first aid box d. welfare facilities	0.5 lac					
6	Health Safety	EHS Programme of the workers under CSR	0.5 lac					
7	Medical Checkup & others	Initial & Periodical medical check-up for all workers, First Aid facilities, rest shelter etc	0.40 Lac					
8	Drinking Water & Sanitation	Clean water providing to Nearby village i.e. Shivpura etc	1.0 Lac					

7.2 RISK ASSESSMENT

The present project is a Sand mining project, which is relatively very low risk activity, being surface mining or open cast mining, compared to other mining. The risks associated with the project are not hazardous, but if any, they are only accidents and incidents, associated with mining machinery or transportation activity. This part delineates the risks associated with the project and the prevention measures to avoid or minimize the risk. The mining activities involve certain types of hazards, during operation and close, which can disrupt normal activities abruptly and lead to disaster like fires, inundation, failure of machinery,explosion, to name a few. The impending dangers or risks, which need be investigated addressed, disaster management plan formulated with an aim to taking precautionary steps to avert disaster and to take such action after the disaster, which limits the damage to the minimum. Nevertheless, the following natural/industrial problem may be encountered during the opencast riverbed mining operation at the mine site.

- Inundation is mine pits.
- Failure of Slope of riverbanks.
- Surface fire (Oil).

In order to take care of above hazards/disasters, the following will be strictly followed:

- Entry of unauthorized persons will be prohibited.
- Working of mines as per approved plans.
- All safety precautions and preventions as per DGMS requirement for risk and safety will be strictly followed during all mining operations.
- Regular maintenance of transport vehicles.
- Periodic checking of worthiness of firefighting and first aid provision in the mining area.
- Training and refresher courses for all the employees.

- As a part of disaster management plan, a rescue team will be formed by imparting specialized training to select mining staff.

7.2.1 Inundation Studies

The area experiences worst storms causing rainfall during monsoon season Though no mining activities is envisaged during monsoon season (June to September), yet in the context of the present mine the inundation cannot be ruled out due to flash flood in the catchment during non-monsoon season.

Following precautionary measures shall be undertaken in respect of mining operation during non- monsoon season and before the onset of monsoon.

- The local nalas will not be obstructed/diverted along the boundary of lease area.
- A careful assessment of the danger of inundation from surface water shall be made before onset of monsoon season every year and adequate precautions against such dangers shall be implemented.
- Effectiveness of precautions, obstruction in normal drainage system etc. shall be checked regularly.
- During May no mining pit excavation shall be carried out adjacent to the bank offset line
- Standing orders for withdrawal of persons and mining equipment from mine in case of apprehended danger shall be framed and enforced.

7.2.1 ACTIVITIES WITH POTENTIAL RISKS

None of the risks are of hazardous type, while accidents and incidents can be expected if adequate controls or safety systems are not adopted. The sand excavation and loading on to the trucks by Backhoe can have risks of accidents if human failure or errors are not taken care of. The Accidents, if any, may not be fatal, but are potential to cause temporary or permanent disabilities. Thus, the need for adequate safety at work places is needed. On the other hand, the manual activity of sand mining and sand loading is not associated with accidents, however, some minor incidents like exhaustion, sun-strokes, or other health related incidents may take place, which can be avoided with adequate safety regulations and measures. Transportation of mined sand to the stowing sites is the activity associated with accidents on road and at the project site. However, with effective safety measures the accidents can be avoided and prevented.

7.2.2 SAFETY OF MACHINE USE AT MINING SITE

The major machinery that is used at mining site is only a backhoe vehicle that can excavate sand and load on to the trucks. The area where Backhoe is operated will be manned by appropriate licensed and trained staff to ensure that the vehicle activity is performed as per the safety norms. The vehicle operating condition is ensured every day before the work is initiated, especially with regard to its hydraulic systems, mechanical conditions, and other operating systems. The movement of trucks for loading of sand shall be regulated by a trained inspector who shall be responsible for the safety of vehicle movement and prevention of accidents or incidents associated with the vehicular movement. The staff working with backhoe and on site shall be

trained in first-aid and other safety measures, accident or incident prevention and reporting and communication mechanisms.

7.2.3 SAFETY MEASURES DURING WORKING AT MINING SITE

Occupational safety and health is very closely related to productivity and good employer – employee relationship. Some of the measures proposed for occupational safety and health have been listed below:

- Safety measures will be implemented as per mine act 1952, MMR 1961 mines rules 1955.
- Protective equipment like dust mask, ear plugs/muffs and other equipments shall be provided for use by the work persons.
- Notices warning to prevent inadvertent entry of persons shall be displayed at all conspicuous places and in particular near mine entries.
- Danger signs shall be displayed near the excavations.
- Security guards will be posted.
- Provision of rest shelters for mine workers with amenities like resting, drinking water, and toilets facilities etc. will be provided by lessee.
- Rotation of workers, if necessary.
- First - Aid facilities in the mining area.
- Training of personnel to inculcate safety consciousness through slogans and posters.
- All workers will be subjected to medical examination as per mines rule 1955 both at times of appointment and at least once in five years. Medical camps will be organized for this activity. Insurance of all employees as per the rules will be carried out
- Regular/periodical monitoring of mine environment to ensure the efficacy of various protective measures.

7.2.4 SAFETY MEASURES DURING SAND TRANSPORTATION

Sand transportation from the mining site to the market is a major activity that can have potential risks of road accidents. In order to prevent these, the following safety measures will be proposed:

- The vehicles will be maintained in good condition and checked thoroughly at least once a month by the competent person authorized for the purpose by the management.
- The vehicle drivers and associated staff will have appropriate licenses issued by the concerned authorities.
- All transportation within the main working should be carried out directly under the supervision and control of the management.
- The maximum permissible speed limit will be ensured.
- To avoid danger while reversing the equipments/vehicles especially at the working place/loading points, stopper should be posted to properly guide reversing/spotting operating, otherwise no person should be there within 10 km radius of machine.
- Avoid over-loading of tippers & trucks & consequent spillage on the roads.

7.2.5 POSSIBLE RISKS DUE TO FAILURE OF WASTE DUMP & ITS CONTROL

No waste dump will be created therefore the question of failure of waste dump does not exist.

7.2.6 OTHER POSSIBLE MEASURES TO AVOID RISKS/DISASTER DUE TO RIVER BED MINING.

- Unwanted material including mineral or spillage (if any) will not be stacked on the banks as it will hinder the flow of water in monsoon season.
- The minerals will be mined out in a uniform way so that the river flow/course will not get disturbed.
- 7.5 m offset will also be left against the banks to protect side collapse/scouring and riparian vegetation.

7.2.7 STORAGE OF OIL AND FUEL

- Due care will be taken to avoid oil spillage.
- Oil collecting bins will be placed before taking out oil from drum to prevent spillage on the ground. Storage will not be allowed beyond necessity.
- Sufficient no's of foam type fire extinguishers will be provided
- All equipments deployed in the mine will be provided with fire extinguishers CO_2
- Used oil will be send to Authorized Recycler & Vendors.

7.2.8 MEASURES TO PREVENT DANGEROUS INCIDENTS DURING INUNDATION/ FLOODING

The following activities will be done to minimize the risk are:-

i. During monsoon months and heavy rains the mining operations are ceased.
ii. There should be mechanism/ warning system of heavy rains and flood.

Inundation of flooding is expected and beneficial for these mines as during this time only the mineral reserve gets replenished.

7.9 DISASTER MANAGEMENT PLAN

In order to handle disaster/emergency situations, an organizational chart entrusting responsibility to various project personnel will be prepared with their specific roles during emergency.

7.9.1. Planning

7.9.1.1 Identification and Prevention of Possible Emergency Situations

Possible emergency situations can broadly be classified into vehicle collision, and inundation.

Some of the ways of preventing emergencies are as follows:

- Preparation of a Preventive Maintenance Schedule Programme and also covering maintenance schedules for all mining machinery/equipment and instruments as well as transport vehicles as per recommendations of the manufacturers user manuals.
- Ensuring the compliance of traffic rules strictly along Katcha roads (haul roads) within the mine lease area as well as outside the mine lease area.
- Emergent situation arise due to happening of some incident culminating into an abnormal situation. It implies that sufficient time space running from a few seconds to few minutes is always invariably available to arrest an incident of abnormal situation from turning in to an emergency.

7.9.2. Implementation

Following key personnel, identified for carrying out specific and assigned duties in case of any kind of emergency, shall be available on call on holidays and off duty also.

- Mine Manager
- Personnel Officer
- Foreman
- Senior Mining Mate
- Essential workers

7.9.2.1 Responsibilities of Mine Manager

- To take overall charge at the place of incident and activate the Emergency Preparedness
- Plan according to severity of situation.
- Inform Doctor to be ready for treatment of affected employees and intimate their relatives.
- To depute staff carry out following functions -
- To liaison with District Administration and other Departments and guide their personnel
- To supervise Assembly and Evacuation at all points
- To look after Patients who are bed ridden and any Casualties and give psychological support
- Inform and liaise with project proponent, Police department and District Emergency Authority.
- Arrange for chronological records of emergency to be maintained.
- Issue authorized statements to News Media.

7.9.2.2 Responsibilities of Mines Foreman

- To take immediate charge at the site of incident and ensure that immediate steps as per
- Emergency Preparedness Plan are taken and immediately inform Mines manager.
- Ensure accounting for personnel and rescue of missing persons.
- Control traffic movement in lease premises.

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CHAPTER-8
PROJECT BENEFITS

8.0 GENERAL

The Management and the proponent understand their duty towards the population in general and the management will help in overall socio economic development of the area. The project will provide raw material for infrastructure development, increase employment opportunity and improve the socioeconomic condition of the area.

8.1 BENEFIT OF MINING

- Generating useful economic resource for construction.
- Generating employment and improvement of socio economic conditions of nearby habitats.
- Mining with maintaining river channel.
- Mining with maintaining river bank.

8.2 IMPROVEMENTS IN PHYSICAL AND SOCIAL INFRASTRUCTURE

This will result in following benefits:

- Improvements in physical infrastructure.
- Improvements in Social Infrastructure.
- Increase in Employment Potential
- Prevention of illegal mining.
- During and Post-mining enhancement of green cover.

The socio-economic conditions of the surrounding villages indicate that employment generation is seasonally. The occupational activities are agriculture, cattle rearing and employment in

mines but on daily wages. The mining activity will provide employment to local people which will increase socio- economic status of the area. It will provide direct employment to about 20 people and indirect employment to many more.

The opening of the proposed project will improve the physical infrastructure of the adjoining areas. This will include the following:-

I. Improved road communication due to opening of the proposed project.
II. Strengthening of existing community facilities through the Community Development Programme.
III. Creation of community assets (infrastructure) like provision for drinking water, construction of school buildings, village roads/ linked roads, dispensary & health centre, community centre, market place etc.
IV. Skill development & capacity building like vocational training, income generation programs and entrepreneurship development program.
V. Literacy program, adult education, assists formation of Village Working Group (VWG), Mahila Mandal etc.
VI. Awareness program and community activities, like health camps, medical aids, family welfare programs, immunization camp sports & cultural activities, plantation etc.

There will be some obvious changes in various environmental parameters due to mining activity. Increase socio-economic activities, creation of new employment opportunities, infra-structural development, better educational and health facilities.

Plantation

The management will provide free saplings of shrubs and other trees, etc. to local residents. This will help in enhancing greenery in the area.

Health

Periodic medical checkups as per Mines Act/ and promotional activities will be undertaken. All this will lift the general health status of the residents of the area around mines.

8.3 CONCLUSION

Proposed mining project will not adversely affect the local environment and will be beneficial in generating same for infrastructure and other projects. This project will also help to recruit the semi-skilled & unskilled workers from the nearby villagers. The project activity and the management will definitely support the local panchayat and provide other form of assistance for the development of public amenities in this region. The company management will contribute to the local schools, dispensaries for the welfare of the villagers. Green belt development / Plantation will be taken up in the vicinity of river banks, along the approach roads, around Govt.

building, schools. Hence river bed mining will be beneficial and eco-friendly to the environment and infrastructure.

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9
ENVIRONMENT MANAGEMENT PLAN

9.0 GENERAL

The guidelines for "Impacts and Methodology of Systematic and Scientific Mining in the river bed, for sustainable riverbed mining has been framed by GSI & MoEF, all the points will be taken into consideration while mining activities. Besides resource extraction, ultimate objectives of riverbed mining are:-

1. Protection and restoration of the ecological system,
2. To prevent damages to the river regime,
3. To work out the sediment influx/ replenishment capacity of the river,
4. To restore the riverine configuration (landforms and fluvial geomorphology such as bank erosion, change of river course gradient, flow regime, etc.),
5. To prevent contamination of ground water regime,
6. To prevent depletion of ground water reserves due to excessive draining out of groundwater and
7. To restore the riparian rights and in stream habitats. (GSI)

Environmental management plan details the environmental quality control measures which are proposed for this project to achieve the production (Minor Minerals) by complying with the stipulated standard limit specified by state pollution control board and CPCB. The environment for the mined out river bed area.

Environment Management Plan, which is to be implemented in the project has detailed under the following heads.

- Land Environment
- Air Environment
- Water Environment
- Noise Environment
- Biological Environment including Plantation Development.
- Implementation of EMP and monitoring Programme.

The Environment Management Plan (EMP) is required to ensure sustainable development in the study area. This chapter covers the genesis of pollution, the principal sources of pollution, the nature of pollution, the proposed measures required for meeting the prevailing statutory requirements of dust & gaseous emissions, waste water discharge characteristics, noise levels etc for environmental management purpose in connection with the mining and mining related activities in the study area. For attaining the desired objective of good environmental quality in the study area, several management strategies in different phases are proposed and evaluated.

Preparation of Environmental Management Plan (EMP) is required for formulation, implementation and monitoring of environmental protection measures during and after commissioning of the proposed mining project.

The objectives of EMP are:

- Overall conservation of environment.
- Minimization of dust generation and pollution.
- Judicious use of natural resources and water.
- Safety, welfare and good health of the work men and populace.
- Ensure effective operation of all control measures.
- Vigilance against probable disasters and accidents.

- Monitoring of cumulative and long time impacts.
- Ensure effective operation of all control measures.

9.1 AIR POLLUTION CONTROL

In the proposed mining project, the only pollution occurs from dust (Particulate Matter) during excavation, vehicular traffic, loading / unloading etc. Regular water sprinkling arrangement will be provided in the mining lease area for dust suppression. Speed limit of vehicles will be restricted to 20 kmph in the mine area for the movement of machineries, truck & etc. to control the dust emission.

The following measures will be taken to reduce the impact on the air quality:

- Vehicles will be covered by tarpaulin to reduce spillage on roads.
- Regular checking & Maintenance of vehicles, trucks, dumpers etc, will be conducted and pollution under control (PUC) vehicle will be used during transportation.
- Periodically, water will be sprinkled on haul roads to wet the surface.
- Overloading of transport vehicles will be avoided to prevent spillage.
- Provision of green belt by vegetation for trapping dust.
- Dust mask provided to the workers engaged at dust generation points like excavations, loading and unloading points.
- Periodic air quality survey will be carried out to monitor the quality and for timely corrective actions.
- Road will be properly maintained.

9.1.1 CONTROL OF GASEOUS EMISSIONS

The source of SO_2, NOx & CO will be due to vehicular emissions. This will be controlled by proper & regular maintenance and servicing of vehicles. The emissions of all vehicles used for transport will be in accordance with the MOEF/CPCB norms.

9.1.2 MEASURE TO CONTROL DUST INHALATION

All the above measures will be adopted to prevent dust generation at mining site during excavation activities and to be dispersed in the outside environment. However, for the safety of workers at site, engaged at strategic locations/dust generation points like loading, handling etc., dust masks will be provided. Dust masks will be prevent inhalation of particulate matter thereby reducing the risk of lung diseases and other respiratory disorders among the workers.

9.2 WATER MANAGEMENT & WATER POLLUTION CONTROL

9.2.1 SURFACE WATER

The major source of surface water pollution due to sand mining is insignificant, however, the following measures will be undertaken to prevent water pollution.

- Utmost care will be taken to minimize spillage of sand.
- Mining schedule will be synchronized with the river flow direction and the gradient of the land.
- The washing of trucks and tractor trolleys in the river will be avoided.

- Mining will be avoided during the monsoon season. This will help in replenishment of sand in the river bed.
- Mining will be carried out above the water table.
- Mining will not intersect the river bed water level or ground water table of the area.

9.2.2 GROUND WATER

There will not be any adverse effect on the ground water quality. The minor mineral does not contain any harmful element, which could percolate into the ground and pollute the ground water. Hence, no control measures are required. However, regular monitoring of quality in the existing hand pumps/tube wells in the vicinity will be carried out both with reference to area and times intervals to study the hydrodynamics of the strata.

9.3 NOISE ENVIRONMENT

As there will be no heavy earth moving machinery there will not be any major impact on noise level due to sand mining and other association activities a detailed noise survey has been carried out and results were cross referenced with standards and were found to be well within limits. Drilling & Blasting will not be used for sand mining, hence no possibility of land vibration. The only impact will be due to transportation of sand by trucks and tractor trolleys etc .As the only impact is due to transportation of sand to the to the market though village roads, the following control measures shall be taken to keep the ambient noise levels well within limits:

- Minimum use of horns and speed limit of 20 km in the village area.
- Use of personal protective devices i.e., earmuffs and earplugs by workers, working in high noise areas.
- Timely maintenance of vehicles and their silencers to minimize sound.
- Care will be taken to produce minimum sound during sand loading
- Phasing out of old and worn out trucks.
- Provision of green belts in consultation with forest officer along the road networks.

9.4 LAND ENVIRONMENT

Degradation of land is not a very significant adverse impact of riverbed mining due creation of access roads, mining operations, transportation of mined material. In order to prevent the environmental degradation of leased mine area and its surroundings, the following measures will be taken;

- Safe clearance will be mainly determined by the width of the river bed.
- Creation of ponds and pits on the river bed will not be allowed.
- Operations during daylight only.
- No foreign material should be allowed to remain/spill in river bed and catchment area, or no pits/pockets will be allowed to be filled with such material.
- As the lease area in quite large and long in length systematic extraction will be carried out to prevent seasonal scouring and enhanced erosion.
- 45.0 m radius around the well located in the river bed will not have any mining activity.
- Measures will be taken to prevent the working form crossing safety zones. Cutting the banks and 3.0 m depth limit of the river bed surface.

9.4.1 POST MINING LAND USE

At the end of mining plan period about 46.5 Ha. area will be mined out. Land use at various stages is given in the table below.

Table 9.1 Land Use Pattern of Mining Lease Area at Various Phases

S. No.	Particulars	Present land use (Ha)	At the end of 3rd year (Ha)	At the end of 5th year (Ha)
1	Mining area	0.0	27.90	46.5000
2	Dump area	0.0	0.0	0.0
3	Safety zone: Permanent Roads (1 no.)	0.0435	0.7836	0.7836
4	Infrastructure (office, temp, shelter etc)	-	-	-
5	Mineral Storage	-	-	-
6	Plantation	-	-	-
7	Un worked	54.6365	25.99664	7.3964
Total		54.68	54.68	54.68

9.5 SOIL CONSERVATION

There is no soil over mineralized area; however the receding floods in the monsoon season deposit some clay /soil carried down by river water. It is hardly a few millimeters thick and of not much consequence. Even in the areas of no mining activity the process of deposition in one season and transportation of previously deposited material in the next season takes place along with deposition of fresh material by receding floods. Soil Quality will be monitored in the area surrounding the core zone used for agricultural activity to check for any negative impacts on the soil quality. Year wise plantation activity will be undertaken as proposed in the approved mining plan. Plantation activity will be undertaken in consultation with village Panchayat near the river banks, village roadside to improve the land quality, aesthetics and reduce soil erosion.

9.6 GREEN BELT DEVELOPMENT

Greenbelt development program will be designed within the natural constraints of the river sand area and in particular species selection reflects flora known to be resistant to the local conditions.

A Greenbelt development is necessary for:

1) Landscaping and providing shelter
2) Help in reducing Pollution level
3) Surface air purification by providing oxygen and letting SPM to settle on the leaves.
4) To attenuate noise generation by movement of vehicles and other machinery.
5) Prevent soil erosion to great extent
6) Improve ecological conditions.
7) Improves the aesthetics & beneficially influence the microclimate of the surrounding.

The species selected for plantation will be of mixed type having a combination of fast and slow growing species with an ultimate aim to have triple storey plantation i.e. a combination of species of tall, intermediate and short height in zigzag lining. A list of the species suggested for afforestation is giving for the development of mining site for sustainable environment of area. All these plants and shrubs can be cultivated in less water and have tolerance power of heat and dry conditions of atmosphere.

Table No 9.2 Plant Species for Green Belt Development

TREE		
S. No	Species name	Binomial name
1	Rohira	*Tecomella undulata*
2	Shisham	*Delbergia sisso*
3	Neem	*Azadirachta indica*
4	Peepal	*Ficus religiosa*
5	Meetha Jal	*Salvadora oleoides*
6	Gathbor	*Zizyohus xylopyrus*
7	Siris	*Albizia lebbeck*

The above mentioned plants will be grown in the study area. Number of Plant per hectare will be more than the previous year by compensating the loss of plants. Because plant survival is assumed 70%. 750 Plants are proposed every year and 3750 plants are proposed for five years. Plantation will be developed and maintained up to five years in about 9.37 ha area. The cost assessed is 1,50,000 Rs. Details is shown in the following table:

Table 9.3 Year Wise Plan for Green Belt Development

Year	Plantation	Replacement	Total Plants	Area to be covered in Ha. (Year Wise)
I	750	----	750	1.875
II	750	150	900	1.875
III	750	150	900	1.875

IV	750	150	900	1.875
V	750	150	900	1.875
Total	3750	750	4350	9.375

9.6.2 CONSERVATION METHODS FOR THREATENED PLANT SPECIES

Ecological restoration is about a broad set of activities (enhancing, repairing, or reconstructing degraded ecosystems and optimizing biodiversity returns). In essence, the restoration of mined land is based around ecosystem reconstruction. It is usually a question of the re-establishment of the capability of the land to capture and retain fundamental resources (energy, water, nutrients and species). With this in view, it is proposed to plant the trees and undertake development of green belt in the project area at all possible places. As a trend, the faunal population is on decreasing trend in general. Arrangement of adequate funds has been made for enhancing, repairing, or reconstructing degraded ecosystems and optimizing biodiversity returns.

Suggestion for conservation of Threatened Species

Direct and indirect approach is required to provide effective conservation, which is suggested as under.

- Some provision of rewards for growing maximum threatened plant species.
- Aware the villagers and encourage them to grow threatened plant species in their farms by mentioning their medicinal and economic value.
- Another way to help preserve the endangered species is to create society dedication towards the ecological ethics. All the conservation measures will be implemented with the help of and in the consultation of the state forest department.
- Organized workshop for conservation awareness of threatened plant species. A series of conservation awareness workshops for village and school children should be conducted in the different villages. Interactive discussion will be carried out participants.
- Encourage afforestation activities around by maintaining them.
- Suggest strategies to minimize negative impacts of changing environment in nearby area of

promote conservation.

The lease is in the river bed and devoid of any vegetation. Mining activities will not cause any harm to riparian vegetation cover as the working will not extend beyond the offset left against the banks. It is proposed to have plantation on both sides of the roads & along the bank of river as greenbelt to provide cover against dust dissemination plantation will also be carried out as social forestry programmed in villages school and the areas allocated by the Panchayat / State authorities. Green belts are created not only for the purpose of protecting sensitive areas or to maintain ecological balance but also act as efficient biological filters. Green belt development provides an important tool to address the issue of mitigating the adverse effect of fugitive emission on surrounding environment.

9.6.3 CONSERVATION PLAN FOR SCH-I Fauna

9.6.3.1 CONSERVATION PLAN FOR INDIAN PEAFOWL (*Pavo cristatus*)

The proposed river bed sand mining project situated near villages of Tehsil: Chohatan, District: Barmer, Rajasthan.The geographical location of the project is-

Latitude - 25° 31' 47.6" to 25° 32' 56.8"N
Longitude - 71° 13' 43.9" to 71° 14' 38.9" E

Peacock or Indian peafowl (*Pavo cristatus*) is a familiar and universally known large pheasant. It is a National Bird of India, belongs to Schedule I of the Wildlife (Protection) Act 1972 was reported from the some villages of the study area. The male has a spectacular glossy green long tail feathers that may be more than 60 percent of the bird's total body length. These feathers have blue, golden green and copper colored ocelli (eyes). The long tail feathers are used for mating rituals like courtship displays. The feathers are arched into a magnificent fan shaped form across the back of the bird and almost touching the found on both sides. Females do not have these graceful tail feathers. They have the fan like crest with whitish face and throat, chestnut brown crown and hind neck, metallic green upper breast and mantle, white belly and brown back rump and tail. Their primaries are dark brown.

CLASSIFICATION

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Aves

Order	:	Galliformes
Family	:	Phasianidae
Genus	:	Pavo
Species	:	*Pavo cristatus*
Vernacular name	:	Indian Peafowl

Fig. 9.1: Male and female Peacock in the buffer zone of the study area

9.6.3.2 Study Approach

Buffer zone of the study area has been reported as a habitat of Schedule I species *Pavo cristatus* commonly known as peacock, more effort was made to assess their status in term of movements and habitat use in and around the study area. At first, a detailed biological survey of the core zone and buffer zone (10 km radius from periphery of the proposed river bed sand mining project) was carried out to understand the status distribution of the species in the study area. Also, questionnaire survey was carried out to understand the recent status of peacock sightings and their movements. Overall, 15 people from seven villages were interviewed randomly. The conclusion of the survey discussed the potential sightings & habitat use, and movement and food habits of peacock in the study area.

9.6.3.3 Habitat Use

No any peacock was sighted in the core zone. All the direct sightings of the peacock were located near the human dominated and forest areas. This species is well adapted to natural village environment setting. According to the villagers, peacock is present in both, village and

forest areas. Day time they temporarily move towards the surrounding agriculture areas for feeding while during night time roosts on the trees present in the village.

People of villages pointed out that, some peacocks present in the nearby Hills, hide in the rocky caves in the night time and they never come to villages while some of the roosting on the trees present in the agriculture hedges.

Life Cycle

Call : Kee-ow, Kee-ow, Kee-ow, Ka-an, Ka-an, Ka-an, Kok-kok, Kok-kok, cain-kok

Breeding : April-September (Project area)

Nest site : On ground in undergrowth (wild)

On buildings by semi-feral birds in villages

Body length : 180-230 cm

Weight : 2750-6000 gm

Habitat : In the undergrowth in deciduous forests near streams Tall trees for roosting

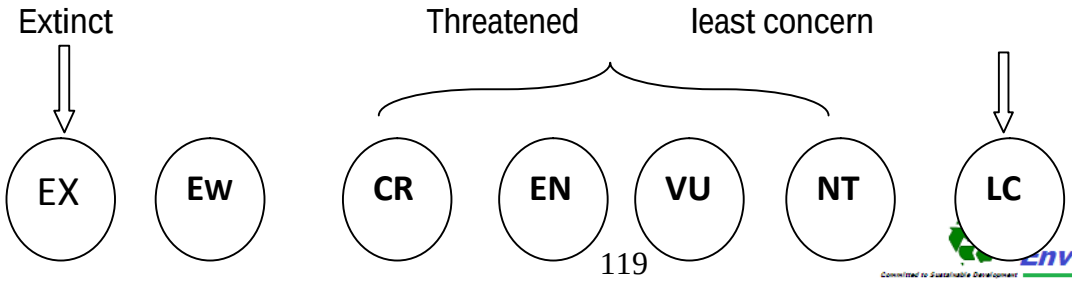
Food Habits

Peafowls are omnivores, eating plant parts, flower petals, seed heads, insects and other arthropods, reptiles and amphibians. In the study area, dense tree canopy cover supports good insect diversity which is very common food for peafowl.

9.6.3.4 Conservation and Relationship with man

The great beauty and popularity of the Indian Peafowl has ensured its protection throughout most of its native ranges. It is a National bird of India. The peafowl is prominent in the mythology and folklore of the Indian people. The Hindus consider the bird to be sacred because of its association with Lord Krishna who used to wear its feather as crown (Mor Mokut). It is also associated with the God Kartikeya, son of the Lord Shiva and Parvati and brother of Lord Ganesh. It is “Vaahan” (transport) of Lord Kartikeya.

CONSERVATION STATUS



IUCN : Least Concern

IWPA : Schedule I

CITES : Not listed

9.6.3.5 Buffer Zone as a Peacock Habitat

Present survey of the peafowl in the buffer zone of the project site cleared that; peafowl is using both, village adjacent habitats and forest habitats of the buffer zone. However, the following points can give an insight on the overall status of peafowl in the study area and thereby plan for better management strategies related to proposed project activities.

People of the surveyed villages were well aware of the habits and habitats of peafowl in the study area. Moreover, local people are against hunting and poaching of the Peacocks. In the buffer zone, peafowl uses agriculture (adjacent to village) and forest habitats as a feeding and breeding ground. Some of the peacocks are taking shelter in the village adjacent habitats while some prefer to rocky forest hills. It clearly indicates that, peafowl normally uses human associated and forest habitats.

From above study, it has been visualized that, the proposed project will not have any significant impact on peacock in terms of their normal movements and other activities. However, it is necessity to take some management options like habitat improvement in the villages located in the vicinity of the project site. So, habitat improvement programme (plantation of local plant species) will be undertaken indifferent villages located in the close vicinity of the project area. Under this programme saplings will be distributed in the nearby villages with the consultation of the local forest department.

Threats

Threats to the peacocks in the area are:

1) Habitat loss, specially the shortage of tall trees in and around the villages for roosting and for providing shade during hot summer months.
2) Shortage of drinking water for the birds during the hot summer days.
3) Casualties caused by eating chemically treated agricultural crop seeds.
4) Illegal hunting by some communities.

In the study area, all the villages surveyed are against hunting or poaching of the people.

Peacock conservation plan has to address these threats.

9.6.3.6 Conservation Measures

Direct and indirect approach is required to provide effective conservation, which is recommended as under:

1. Increasing the tree cover in the buffer area for shelter and roosting of peacocks. This will be achieved by planting of tree groves (a group of trees that grow close together, generally without many bushes or other plants) in buffer area. Some local species such as Neem, Siris, , Shesham, Meetha Jal, Peepal tree etc. will be planted. Planting of tree groves in school compounds in the villages of buffers area will be planted as per the plantation programme.
2. By conducting awareness programmes (community and school level) for conservation of peacocks in the area and also through organizing competitions during "Wildlife Week" and "Van Mahotsave" celebrations.
3. Some provision of rewards to informers for the control of poaching and illegal trade in wildlife.
4. Carrying out census and research projects to know the potential threats and population status of the species.
5. Provision of veterinary care and cages for injured or sick deformed birds.
6. Suggest strategies to minimize negative impacts of changing environment in nearby area of peacock populations and to promote conservation of peacock habitats.
7. Another way to help preserve the endangered species is to create society dedicated to ecological ethics. All the conservation measures will be implemented with the help of and in the consultation of the district forest department, Barmer (Raj.).
8. With the objective of effectively protecting the wild life and to control poaching, smuggling and illegal trade in wildlife and its derivatives, the Government of India enacted Wild Life (Protection) Act 1972. The Act was amended in January 2003 and punishment and penalty for offences under the Act have been made more stringent.

   For above mentioned activities, proponent has proposed a sum of Rs. 3,50,000/- for the "Peacock" conservation plan under the following heads up to three years in consultation of local forest department.

Table No 9.4 Expenditure Budget for Five Years For Peacock Conservation

S. No	Activity	1st year	2nd year	3rd year	4th year	5th year	Budget (INR)
1	*Plantation- approximately 100 saplings/year for five years (@ Rs. 50/- per saplings)*						
Amount Rs.		50,000	50,000	50,000	50,000	50,000	*2,50,000/-*
Villages		Shivpura	Goliyar	Sanwlor	Aakora	Ranisar	
2	*Awareness programme for "Peacock" conservation will be scheduled in a year in five schools*						

	every year.					
Amount Rs.	20,000	20,000	20,000	20,000	20,000	*1,00,000/-*
Schools of	Shivpura	Goliyar	Sanwlor	Aakora	Ranisar	
Total Budget						Rs. 3,50,000/-
(Rupees Three lac and fifty thousand Only)						

All above activities will be carried out with the consultation of local forest department and Gram panchayat of respective villages.

1. Plantation- approximately 200 tree/year plants of local plant species for five years.

Plants species / verities will be suggested by the local forest department and plant saplings will be distributed in project villages as per the above mentioned schedule (year wise). Once the plantation will be

2. Awareness programme for "Peacock" conservation will be scheduled in a year in five (nearest to project site) schools every year.

During awareness programme following activities will be arranged at the various village level schools as mentioned above (year wise),

- "Essay writing on Peacock"
- "Drawing competition (Peacock picture)

Further Suggestions/recommendations:

- ✓ To carry annual census research projects to ecology and habitat use by peacock. By making provision of veterinary care and cages for injured or sick deformed birds

9.6.3.7 CONSERVATION PLAN FOR CHINKARA (*Gazella bennetti*)

CLASSIFICATION

Kingdom	:	Animalia
Phylum	:	Chordata
Class	:	Mammalia
Order	:	Artiodactyla
Family	:	Bovidae
Subfamily	:	Antilopinae
Genus	:	*Gazella*
Species	:	*G. bennettii*

Vernacular name : Chinkara or Indian gazelle

This is the common antelope which found in the vicinity of settlements of ethical communities. The Chinkara is usually seen in small herds comprising not more than 7 or 8 individuals. The expelled bucks are often found in separate herds. Apart from this, single individuals are also a common occurrence (One individual was reported from core zone). The Chinkara, though seen roaming and feeding during daytime in the cultivated fields and generally prefers leaves of *Crotalaria burhia, Zizipus nummularia* and flowers of *Tecomella undulata* in post-monsoon and winter seasons but during summer *Elusine compressa*, *Maytenus emarginata*, *Zizipus nummularia*, *Prosopis cineraria* and *Heliotropium spp*. appear to be the most preferred food. They are maintaining the water balance from the moisture leaden plants and tender parts. This ensures reasonably large contribution to their overall water balance, which supports their presence in the remote desert parts.

Fig. 9.2: A group of Chinkara in the buffer zone of the study area

9.6.3.8 Study Approach

A group of 2-3 individuals were observed in the Buffer zone of the study area has been reported as a habitat of Schedule I species commonly known as Chinkara, more effort was made to assess their status in term of movements and habitat use in and around the study area. At first, a detailed biological survey of the core zone and buffer zone (10 km radius from periphery of the proposed river bed sand mining project) was carried out to understand the status distribution of the species in the study area. Also, questionnaire survey was carried out

to understand the recent status of Chinkara sightings and their movements. Overall, 10 people from five villages were interviewed randomly. The conclusion of the survey discussed the potential sightings & habitat use, and movement and food habits of Chinkara in the study area.

Physical Traits

Standing at a height of 65 cm, Indian gazelle comes across as smaller than many other species of deer. Its coat is covered with smooth and glossy fur, which is reddish-brown in color. The belly of the gazelles is white and they weigh around 23-25 kg. There are dark chestnut stripes on the sides of the face that stretch on from the corner of the eye to the muzzle. The muzzle is also bordered by white stripes. Chinkara also has horns, which have an average length of 30 cm

Behavior

Chinkara is a very shy animal and tries to stay as far from human settlement as possible. It is mainly seen roaming alone in the wild. However, at times, one can see Indian gazelles in small groups, comprising of upto 4 animals. One of the unique characteristics of the Indian gazelle is that it can survive without water for days at a stretch. The need for fluids is met through plants and dewdrops.

Habitat Use

All the direct sightings of the Chinkara were located near the Scrubland, *Prosopis- Ziziphus - Caparis* type habitat. This species is well adapted to natural village environment setting. According to the villagers, Chinkara is present in both, nearby village area and other scrubland areas.

Mating Behavior

There is no fixed breeding season for the gazelles of India. However, they usually mate somewhere around autumn and spring. The gestation period lasts for five and a half months.

Reproduction:

Sexual Maturity: At two years of age.

Life span: Unknown.

Gestation Period: About five to five and a half months.

Young per Birth: Generally 1, but twins have been reported quite frequently.

Food Habits

It changes its food choice time to time and fed on variety of plants like, *Calotropis procera, Calligonum polygonoides, Acacia senegal, Prosopis cineraria, Acacia jacquemontii, Tecomella undulata, Salvadora oleoides* and *Ziziphus nummularia*.

9.6.3.9 Conservation Status

IUCN	:	Least Concern (IUCN ver. 3.1)
IWPA	:	Schedule I
CITES	:	Not listed

Threats

Threats to the Chinkara in the area are:

5) Habitat loss, specially the shortage of scrubland (*Prosopis- Ziziphus type)* in and around the villages for providing shade during hot summer months.
6) Shortage of drinking water for the animal during the hot summer days.
7) Casualties caused by eating chemically treated agricultural crop seeds.
8) Illegal hunting by some communities.

In the study area, all the villages surveyed are against hunting or poaching of the people. Chinkara conservation plan has to address these threats.

9.6.3.10 Conservation Measures

Direct and indirect approach is required to provide effective conservation, which is recommended as under:

1. The awareness about the various laws and acts of Wildlife (Protection) Act, 1972, in the local community is lacking. Proper sensitization regarding the pros and cons of such could divert them from poaching.
2. A proper rehabilitation strategy is a must for various tribal communities actively engaged in poaching, as these tribes do not change their profession even after repetitive confiscation also.
3. Increasing the tree cover in the buffer area for shelter and food for Chinkara. This will be achieved by planting of tree groves (a group of trees that grow close together, generally without many bushes or other plants) in buffer area. Some local species such as Babool, Khejari, Jaal, Peelu Ber trees will be planted. Planting of tree groves in school compounds in the villages of buffers area will be planted as per the plantation programme.

4. By conducting awareness programmes (community and school level) for conservation of Chinkara in the area and also through organizing competitions during "Wildlife Week" and "Van Mahotsave" celebrations.
5. Some provision of rewards to informers for the control of poaching and illegal trade in wildlife.
6. Carrying out census and research projects to know the potential threats and population status of the species.
7. Provision of veterinary care for injured or sick animal.
8. Suggest strategies to minimize negative impacts of changing environment in nearby area of Chinkara populations and to promote conservation of Chinkara habitats.
9. Another way to help preserve the endangered species is to create society dedicated to ecological ethics. All the conservation measures will be implemented with the help of and in the consultation of the district forest department, Barmer (Raj.).
10. Wildlife conservation and its importance is must to teach the school children. The awareness from such level could give better result. Curriculum of environment studies should include more chapters on the local wildlife, rather the national and international issues.

All above activities will be carried out with the consultation of local forest department and Gram panchayat of respective villages.

3. Plantation- approximately 250 tree/year plants of local and native plant species for five years.

Plants species / verities will be suggested by the local forest department and plant saplings will be distributed in project villages as per the above mentioned schedule (year wise).

Awareness programme for "Chinkara" conservation will be scheduled in a year in five (nearest to project site) schools every year.

During awareness programme following activities will be arranged at the various village level schools as mentioned above (year wise),

- "Essay writing on Chinkara"
- "Drawing competition (Chinkara picture)

Further Suggestions/recommendations:

- ✓ To carry annual census research projects to ecology and habitat use by Chinkara.
- ✓ By making provision of veterinary care injured or sick deformed Chinkara.

The proponent has proposed a sum of Rs. 3,35,500/- for the "Chinkara" conservation plan under the following heads:

Table No 9.5 Expenditure Budget for Five Years For Chinkara Conservation

S. No	Work or Activity	Year wise expenditure in Rs.				
		I year	II year	III year	IV year	V year
1	Plantation- 100 trees (Cost of sapling will be changed per year)	5000	6000	7000	8000	9000
2	Digging cost of pit	20000	20000	20000	25000	30000
3	Small water tank or tanka – 50 in number @ 1000/- per tank	60000	15000 (Repair & maintenance cost)	15000 (Repair & maintenance cost)	15000 (Repair & maintenance cost)	15000 (Repair & maintenance cost)
4	One awareness programme for "Chinkara" conservation will be scheduled in 3 months.	7000	7500	8000	8500	6900
5	cash prizes @ 1000 in a year will be awarded to the informer of poachers.	5000	5000	5000	5000	5000
	Total	97000	53500	55000	61500	3,35,500

9.7 SOCIO-ECONOMIC ENVIRONMENT

This project operation will provide livelihood to the poorest section of the society. The overall impact of riverbed mining of sand on the social economics of the area will be a very positive one, as not only it will generate employment opportunities for local population at mine site but also in associated activity i.e. for transportation of mined material, etc. It will also give a good boost to the general economy of the area. The mining activity in the lease area will thus give direct employment to about 20 persons engaged in extraction of sand, loading of material into tractor trolleys and tipper trucks.

9.7.1 ANTICIPATED IMPACTS AND EVALUATION

The results of the field survey conducted based on a questionnaire prepared to understand the knowledge and perception of the people living around the project area, gives a clear idea about the need for the project. The awareness level regarding the proposed mining activity is very high. The proposed mining activity is expected to provide stimulus to socio-economic activities in the region and thereby accelerate further development processes.

9.8 OCCUPATIONAL HEALTH & SAFETY (OHS)

The collection of minor mineral from the river bed does not cause any occupational ill effects.Sand mining does not contain any toxic element. Therefore, the likelihood of any health hazard does not arise due to the mined product per se. However, the process of excavation /

quarrying leads to some health hazards. The dust generated due to excavation loading and movement on Kaccha/riverbed haul road creates air borne dust which has silica contents.Silica content of PM_{10} found very less amount as comparison to standard prescribed by NIOSH.The dust is the main pollutant of concern for the workers engaged in the mining activities. The most significant occupational health impacts are Noise Induced Hearing Loss (NIHL) and Occupational Lung Disease (OLD) like allergic rhinitis and asthma due to inhalation of dust. As per Mines Rules, 1955, Chapter – IV-A, Section 29B, medical examination of employees at the initial stage and periodically, shall be done by a team of qualified medical officers provided by the project proponent. The initial medical examination of every person employed in the mine within a period of five years of the date. Occupational Health Check-up will be organized once a year through qualified medical personnel for detection of occupational diseases amongst staff and workers of the mine for prompt action on devising remedial measures urgently.

S.No	Age	Frequency
1	For employees - <30 years	once in a year
2	Between 31-40 years	once in a year
3	Between 41-50 years	twice in a year
4	Above >50 years	twice in a year

Regular medical check-up camps shall also be arranged for detection of occupational diseases and minor disease in the nearby core area villages. Free check-up and medicine for treatment for their acute and chronic illness shall be provided. Awareness program will be organized for workers.The medical examination schedule & cost is provided in Table No 9.6.

Table No 9.6 Schedule & Cost of Medical Checkup

S.No	Particulars	Cost in Rs.Per Year
1	Initial medical check-up for all workers (20 @ 300 Rs Per Person) for lung function, audiometric test, tuberculosis and pulmonary disease at the time of appointment	6000
2	Periodical check-up for all workers (20 @ 300 Rs Per Person) (Audiometic Test, Eye – Check-up, Lung function and respiratory test, ECG etc)	6000
3	Provision for personal protection equipment like ear plug, dust mask, Helmet shoes etc., for 20 workers	15,000
4	First Aid facilities, rest shelter etc	13,000
Total		40,000

Exposure to Dust

- Exposure to fine particulates is associated with work in most of the dust-generating stages notably from sand handling, and transportation.

- Workers with long term exposure to fine particulate dust are at risk of pneumoconiosis, emphysema, bronchitis, and fibrosis.

Methods to prevent and control exposure to dust include the following:

To minimize the health impacts PPE like dust masks, ear plugs/ muffs and other equipments will be provided for use by the work personnel. All workers will be subjected to Initial Medical Examination as per Mines Rule 1955 at the time of appointment. Awareness program will be conducted about likely occupational health

hazards so as to have preventive action in place.

NOISE:-

1. Since mining operations do not include any major source of generation of noise in the working area thus, noise levels are not of significant levels.However, ear plugs will be provided to all workers in the area.
2. Audiometery test of the workers shall be done regularly & medical health provided wherever required.

9.9 BUDGETARY PROVISION FOR EMP IMPLEMENTATION & MONITORING

It is proposed to invest a capital cost of Rs. 17.30 lac per annum on pollution control, and monitoring systems. The break-up of the investment is given in the below Table-9.7.

Table 9.7 Budgetary provision for Environmental Management Plan

S. No.	Particulars	Frequency	Budgetary Provision in Rs.
1	Water Sprinkling	Regular	5.13
2	Pollution Monitoring i.e Water, Air, Soil & Noise etc.	Half Yearly	4.5
3	Green Belt Development	Per Year	1.5
4	Budget for Conservation of Schedule I Fauna	Per Year	1.37
4	Others (specify) I. Haul road and other roads repair and maintenance	Regular	2.4
	II. Wire fencing at plantation site		0.40
	III. Rainwater Harvesting structure		2.0
		Total 17.30 Lac	17.30

CHAPTER: 10

SUMMARY AND CONCLUSION

10.1 INTRODUCTION OF PROJECT & PROPONENT

Mr. Paras Sethi propose to develop a River Sand mine in, Revenue villages (covering 1 village) of Tehsil: Chohtan, District Barmer, State: Rajasthan having lease area is 54.68 Ha, does not fall in forest land. It has been proposed to collect sand from the river bed, nadi & nallas. River beds and nalas under mining lease areas are owned by Govt. of Rajasthan. Mining lease is award for fresh grant to state Mining Department for a period of 05 years with effect from the date of registration.Mining will be confined to the allotted lease area which lies on the river bed of Shivpura River from which approximately 2.24 lac Tonnes of sand will be excavated and the estimated project cost is Rs. 50 lac.

LOCATION

The mining area is located in one revenue villages of Tehsil: Chohtan, District: Barmer.The mining lease/proposed project area falls in Survey of India Toposheet No 40 O/2, 40 O/3, 40O/6, 40 O/7.

Table No.10.1 Details of Environmental Setting

S. No.	Particulars	Details
1	Location	
a	Village	1 , Shivpura
b	Tehsil	Chohtan
c	District	Barmer
d	State	Rajasthan
e	River name	Shivpura
f	Length of River	3 km
2	Land use at the lease area	River bed, Gair Mumkin Nadi Nallah
3	Nearest habitation	Shivpura
4	Nearest major town	Chohtan

5	Nearest Highway	National Highway: 15
6	Nearest railway station	Barmer (Aerial distance : 27 km)
7	Nearest airport	Jodhpur (Aerial distance : 194 km)
8	Nearest tourist places	Barmer & Jodhpur
9	Defence installations	No, within in 10 km radius
10	Archaeological important	No, within in 10 km radius
11	Ecological sensitive zones	No, within in 10 km radius
12	Reserve Forest	No, within in 10 km radius
14	Seismic zone	Zone-II. No major event is reported in past.

10.1.1 SALIENT FEATURES

The salient features of the project are given below:

Table 10.1 Salient features

S. No.	Particulars	Details
1.	Project Name	River Sand Mining at Revenue village of Tehsil: Chohtan, District: Barmer (Raj)
2.	Proposed Capacity	2.24 LTPA
3	Method of mining	Open cast semi-mechanized
4	Mineable reserves	22.95 Lac Tonnes (As per Approved Mining Plan)
5	Lease Area	54.68 Ha.(River bed,Gair mumkin nadi)
6	Water Requirement	Total Water requirement : 5KLD Domestic water demand : 3 KLD Dust Suppression & Plantation : 2KLD
7	Source of Water	Tanker water supply
8.	Manpower	20
9	Wastewater generation	Nil
10	Solid waste/OB generation	Nil
11	Project Cost	50 Lac
12	EMP costs	17.30 Lac Per Annum
13	Cost towards CSR activities	5.5 Lac Per Annum

10.2 DESCRIPTION OF THE PROJECT

The mining process is opencast semi-mechanized river bed mining of minor minerals. Drilling and blasting is not required as the material is soft in nature. As per MMCR rules 1986 extraction is limited to 3.0 m depth only from the surface area when River bed is dry. Entire stretch of the lease area is around 3.0 km long has been given in one block only for mining operation supervision management and safety. Mineral will be removed in 3.0 m layer only forming one bench. Bench will advance from South west to North East direction in the river. Height of bench will be 3.0 mt. Light weight excavators will be deployed for extraction. Mineral will be loaded in trucks of 20 tones capacity trucks and equipment, earth movers will be on hire basis. There will be no overburden or waste generation because the Bajri is exposed in the river bed.

Working Depth: The ultimate depth of the open cast mine will be 3 m below river bed or above the ground water table whichever is less. Under no circumstances it will intersect with ground water table.

Land: The proposed river sand mining spreads in an area of 54.68 Ha, which is government land.

Water: The water requirement in the mine is 5 KLD for mining activities, dust suppression, drinking purpose and greenbelt development.

Power: All the activities will be carried out only during day time. Hence, no power is required

10.3 ANALYSIS OF ALTERNATIVE SITES

Proposed River sand mining is a site specific project. Mining activities shall be carried out based on local geology and availability of the mineral. ML area is owned by the proposed proponent, which is a government traverse land devoid of any settlements. Hence no alternative sites are envisaged.

10.4 DESCRIPTION OF THE ENVIRONMENT

Baseline environmental studies were conducted to monitor micro-meteorology, ambient air quality, ground and surface water quality, noise levels, present land use pattern, soil quality, biological environment and socio-economic status within a study area of 10 Km. radius around the mining lease area. Baseline environmental data was monitored by M/s Noida Testing Lab, Greater Noida for one full season i.e. Post-Monsoon season, 2013 (October-November-December). The baseline data conforms to the requirement of EIA Notification, 2006 (as amended on 14.09.2006).

(i) Ambient Air Quality

Ambient air quality monitoring has been carried out with a frequency of two days per week at five locations. These are compared with the standards prescribed by Central Pollution Control Board (CPCB) for rural and residential zone. Results revealed that all the monitored parameters like ($PM_{10,}$ $PM_{2.5}$ $NO_{2,}$ SO_2 & CO) were found within the prescribed limit.

(ii) Ground water quality

5 ground water samples have been considered in and around the proposed lease area. The analysis result shows that all the parameters found within the permissible limit.

(iii) Noise Quality

The noise monitoring has been conducted for determination of noise levels at five locations covering 10 km study area. Noise monitoring results found within the permissible limit at all locations

(iv) Ecology

There are no rare endemic, endangered species & threatened species of flora within the study area. However Peafowl & Chinkara of Schedule-I were raveled from the secondary information. There are no national parks, sanctuaries, tiger/ Elephant corridors, migratory route for birds etc. There are no Ecologically Sensitive Areas present in the study area.

(vi) Socio-Economic

The project activities will not have any adverse impacts on any of the common property resources of the village communities, as the sand mine lease area is not being used for any purpose by any section of the society in this region. There is no R & R involvement in this project. No land acquisition in this project. The Project is expected to yield a positive impact on the socio-economic environment. It helps sustain the development of this area including further development of infrastructure facilities.

10.5ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The summary of anticipated adverse environmental impacts due to the proposed project and mitigation measures are given below:-

10.5.1 IMPACT DUE TO AIR POLLUTION AND ITS MANAGEMENT

Air pollution is likely to be caused at various stages of sand mining operations such as excavation, loading, transportation and screening of material. Particulate Matter (PM_{10}) is the main pollutants during Sand mining operations. Most of the dust will be generated from loading, screening and transportation operations. This dust becomes air borne and gets carried away to surrounding areas. The impact on air is mainly localized in nature as the dust particles are not carried to longer distances and the effect is felt within the core zone of the project involving active Sand mining operations.

In order to mitigate fugitive dust emissions and other air emissions from the project activities, the following measures are proposed to be adopted.

1. To avoid fugitive dust emissions at the time of excavation, the mining area will be wetted by water spraying.
2. To avoid fugitive dust emissions sand screening activity will be carried out at mines so as to prevent spreading of dust.
3. Effective dust suppression arrangements will be made at the ground level

4. Sand is transported to the nearest market by road through trucks. The sand will be wetted after loading in to the truck and will be covered by tarpaulin sheets.

5. To minimize the vehicular pollution from the sand transporting vehicles, the following conditions are insisted to permit the vehicles of the transporters:

- The vehicles will be with good engine condition and will be maintain pollution control certificate issued by appropriate authorities.
- Regular maintenance of transport vehicles and monitoring of vehicular emission levels at periodical intervals.

7. Ambient Air quality Monitoring will be carried out at four stations to assess the air quality in and around the project for taking necessary control measures.

8. Green belt development along the access roads at mine premises and near the sand mining site.

10.5.2 IMPACT DUE TO NOISE POLLUTION AND ITS MANAGEMENT

Noise environment in this project will be affected only by the machineries at the site and vehicular transportation. Since mining is done semi-mechanically, slight increase in noise levels can be expected. Baseline Noise levels are observed to be well within the limits in the monitored villages. However, after applying the mitigation measures noise pollution will be reduced further.

In order to mitigate noise generation from the mining activities, the following mitigation measures are proposed:

1 Since the noise generating is only through mechanical equipment and movement of vehicles, strict compliance to periodical maintenance of the vehicle conditions will be insisted.

2. Further, to protect the employees and workmen at the sites of loading and use of Backhoe, necessary safety wear like ear plugs will be provided.

3. Noise monitoring at the work places will be carried out to ensure the compliance.

10.6 ENVIRONMENT MONITORING PROGRAMME

An Environmental monitoring programme has been prepared for the proposed project for periodical assessment of effectiveness of implementation of Environment Management Plan and to take corrective measures in case of any degradation in the surrounding environment.

10.7 PROJECT BENEFIT

The project activity will help in combating the growing demand of sand in the market & hence will help in the economic growth of the country. This project will lead to direct & indirect employment opportunity. Employment is expected during sand excavation, sand transportation, in trade and other ancillary services. Employment in these sectors will be primarily temporary or contractual and involvement of unskilled labor will be more. A major part of this labor force will be mainly from local villagers who are

expected to engage themselves both in agriculture and project activities. This will enhance their income and lead to overall economic growth of the area.

10.8 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Environmental management plan will be proposed for "Sand" mining project to mitigate the anticipate impact during the mining operation. The proponent has prepared an Environmental Management Plan for the proposed sand mining project. The final EIA/EMP of the proposed project will be submitted to Ministry of Environment and Forests (MoEF), New Delhi, for obtaining environmental clearance for the project, in accordance with Environment Impact Assessment (EIA) Notification No. 1533 date 14.09.2006. The Environment Management Plan will be implemented throughout the life of the project and half-yearly monitoring report showing the compliance status of conditions stipulated in Environmental Clearance letter will be submitted to MoEF in every six months.

10.8.1 AIR QUALITY MANAGEMENT

- Vehicles will be covered by tarpaulin to reduce spillage on roads.
- Regular checking & Maintenance of vehicles, trucks, dumpers etc, will be conducted and pollution under control (PUC) vehicle will be used during transportation.
- Periodically, water will be sprinkled on haul roads to wet the surface.
- Overloading of transport vehicles will be avoided to prevent spillage.
- Green belt of trees with good footage on both side of haul road.
- Dust mask provided to the workers engaged at dust generation points like excavations, loading and unloading points.
- Road will be properly maintained.

10.8.2 WATER QUALITY MANAGEMENT

- Mining will be carried out above the water table.
- Mining will not intersect the river bed water level or ground water table of the area.
- Mining schedule will be synchronized with the river flow direction and the gradient of the land.

10.8.3 NOISE MANAGEMENT

- Minimum use of horns and speed limit of 20 km in the village area.
- Timely maintenance of vehicles and their silencers to minimize sound.
- Phasing out of old and worn out trucks.
- Provision of green belts in consultation with forest officer along the road networks.

10.8.4 SOLID WASTE MANAGEMENT

There will be no generation of overburden\ waste material. No backfilling has been proposed in the excavated zone of river to some extent will be replenished by sediment during rainy season.

10.8.5 MANAGEMENT OF LAND USE PATTERN

The total lease area is 54.68 Ha. At the end of mining plan period about 46.5 Ha. area will be mined out.

10.8.6 GREEN BELT DEVELOPMENT & PLANTATION PROGRAMME

It is proposed to plant 750 no's of native species per year along with some fruits bearing and medicinal trees during the five year plan period. The following plant species will be planted according to CPCB guidelines: Cassia fistula(Amaltas), Delbergia sisso(Sisam), Mangifera indica (Mango), Acacia nilotica (Babul), Azadirachta indica(Neem), Albizza lebbek (Siris), Prosopis cineraria (Khejri), Delonix regia (Gulmohar), Phoenix sylvestris (Khajur), Peepal (*Ficus religiosa)* etc.

10.8.7 SOCIO-ECONOMIC ENVIRONMENT

The implementation of the sand mining project will generate both direct and indirect employment. Besides, it will provide a check on existing system of mining operation. Since the quarries will be allotted on lease basis, mining operation will be legally valid and it will bring income to the state exchequer. It will also reduce flooding of river banks, destruction of standing crops, land and property to a great extent. With the implementation of the proposed mining project the occupational pattern of the people in the area will change making more people engaged in industrial and business activities. Further, the mining and industrial activities in the area may lead to rapid increase in population and thereby urbanization. Due to urbanization of the area, employment opportunities will further increase.

10.9 CONCLUSION

There will not be any kind of major pollution due to the mining activity, as proper pollution control measures will be implemented with environment friendly technology. There will be "Zero Water Discharge", as the domestic wastewater generated from the mine office will be disposed off to soak pit via septic tank.

As discussed, it is safe to say that the proposed facilities are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigative technique, as well as to serve as biological indicators for the pollutants released from the premises of "Proposed River sand Mine".

CHAPTER: 11

DISCLOSURE OF CONSULTANT ENGAGED

Name of the Project: River Sand Mining at Revenue Village of Tehsil: Chohtan,District: Barmer Project Proponent : Mr. Paras Sethi , New Delhi		
Nature of consultancy	Name and address of the Consultant/expert	Approvals, if any give reference
EIA/ EMP Organization	Enviro Concept(I) Pvt Ltd 1/3 A, Yudhister Marg,C-Scheme, Jaipur	NABET ACCREDITED vide Minutes of 145th AC Meeting for Initial Accreditation: March 18, 2015 As per QCI NABET 'List of Accredited Consultant Organizations/April 07, 2015', listed in as Accredited consultant, Category 'A' Sl. No. 47
Env. Coordinator	Devendra Goyal	
FAE-LU	Dr. K.N.Joshi	
FAE-AP	Devendra Goyal	
FAE-AQ	Devendra Goyal Ghanshyam Das	
FAE-WP	Mr. A.K.Seth R.K. Kumawat	
FAE-EB	Dr. P.Lata.Sharma AFAE : Pramod Dagla	
FAE-NV	Sanjeev Sharma	
FAE-SE	Dr.K.N.Joshi	
FAE-HG	Dr. M.L.Jhanwar	
FAE-G	Dr. M.L.Jhanwar	
FAE-RH	--	
Soil Conservation	Mr. O.P.Mathur	
FAE-SHW	Mr. Devendra Goyal	
Environmental Monitoring & analysis	M/s. Noida labs Pvt. Ltd. Noida,U.P	
Rainwater Harvesting	---	

I hereby undertake that all the points raised in the TOR issued by MOE&F are complied with I also undertake that the facts given in the EIA/EMP report are factually correct to the best of our knowledge.

EIA Co-ordinator
Enviro Concept (I) Pvt. Ltd.

I hereby accept all the liabilities and obligations associated with the working and results of the above organizations herein with the report.

(Signature & Name of Project Proponent)