

## CHAPTER 1

### INTRODUCTION

#### **1.0 Preamble**

Sand, Bajri and Boulders are the minor mineral and very important material to be used for construction activities eg infrastructure, building construction, highways, roads, townships, multiplexes, foundations of buildings and industrial units etc. No one can think of development without this material. This is basic building material been used throughout the country. Over the millennia, the weathering effect, the flow of water at high velocities in rivers and the pressure of water from the high mountainous reservoirs converted and pushed the hard ground underneath into sand, gravel etc. which travelled as sediments with the flow. This sand, bajri& boulder gets deposited along the river course wherever conditions were favorable. In deep past this settled mineral was not extracted in a quantity in which it is deposited, since due to less population the requirement was not enough. As a result of continuous deposit of sand, bajrietc, the river course continued changing by widening itself, eroding the fields and expanding. This started resulting in floods, inundation and breaking their banks, causing devastation of property and loss of life. There has been a severe impact on every aspect of the environment.

At one side it is basic building material thus directly engaged in development and also generating revenue in terms of royalty to the state government.

Thus there was a need for channelization of rivers for which extraction of sand, bajri& boulders through mining was expedient. The haphazard mining of river bed material being practiced for now long through unregulated, uncontrolled and illegal manner added almost an irreversible damage to the environment, which became a cause of serious concern. Though

sand is very important mineral source for development, but its mining in haphazard and unsystematic manner can result in serious impact to the surrounding thus a well-defined and systematic approach was needed to bring in action to attain the process in systematic and sustainable manner. There was sustainable sand management guideline was issued in year 2016 imperating the holistic approach towards sand mining and management to achieve the sustainable goal.

Mining activities invariably affect the existing environmental equilibrium of the site with both adverse and beneficial effects. Exploitation of mineral deposits, occurring in specific sites, does not leave any choice but to adoption of eco-friendly mining methods compatible with project economics. For sustainable maintenance of environmental commensuration with the mining and related operation, it is imperative to conduct studies on the baseline status of existing environmental attributes and assess the impact on these due to proposed activities, which would assist in formulating well-addressed management plans for sustainable mineral extraction within life of mine.

Carrying out mining linked with so many impacts both positive and negative impacts. Environment impact assessment tool is used to identify these impacts by linking it with baseline analysis of environmental parameters and with provision of mitigation measures to mitigate the negative impacts to the environment.

### **1.1 General Information on Mining of Minerals**

Mining of sand, bajri & boulders from riverbeds and riverbanks across the country has seen an unprecedented rise. Each day truckloads of sand and gravel are extracted for a variety of reasons. One of the most important factors driving up demand in recent years has been the growth of the real estate and construction industries. Sand bajri is an important ingredient in concrete, which is the mainstay of the construction industry in India today. Without concrete,

high rise apartments, big dams, renovation of city buildings, and multi-utility projects would not see light of the day.

The term 'minor mineral' is defined in clause (e) of Section 3 of MMDR Act, 1957: '3 (e) "minor minerals" means building stones, gravel, ordinary clay, ordinary sand other than sand used for prescribed purposes and any other material which the Central Government may, by Notification in the Gazette of India declare to be a minor mineral.

The sand, bajri & boulders are one of the most important construction materials. Ensuring their availability is vital for the development of the infrastructure in the country. There are different sources of sand, bajri & boulder & the most important among them is the river. As the requirement of these construction materials is on rise, they are also very vital for the health, physical character of the river and the different important functions of the river. The extraction of sand, bajri & boulders has to be regulated and done with adoption of required environmental safeguards.

For making available these resources, a mapping of these resources at the district level, identification of appropriate sites for extraction, appraisal of the extraction process, putting in place the required environmental safeguards, and rigorous monitoring of the volume of extracted material is required to ensure sustainability of the entire process.

Sand is naturally occurring granular material composed of finely divided rock and mineral particles between 150 micron to 4.75 mm in diameter (IS 383-1970). Sand is formed by weathering of rocks due to mechanical forces. In the process the weathered rock forms gravel and then sand subsequently. Sand and gravel together known as aggregate, represents the highest volume of raw material used on earth after water. The mining of aggregate has been continuing

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for many years. Now the mining of aggregates has reached a level threatening the environment and ecosystem besides also reaching a level of scarcity that would threaten the economy.

Mining of Sand is the process of removal of sand and gravel. This practice is now becoming an environmental issue as the demand for sand, bajri increases in industry and construction.

Udhamasinghnagar in which the proposed site is located lies in Tarai region of Kumaun Himalayas and forms part of Kailash river basin, which passes through many geological formations comprising of mostly of granite quartzite, silt stone, shale and Phyllite. Therefore the lease area has boulders, sand and bajri of these formations.

Although Sand is necessary for development of country but at the same time its impacts generated during mining activities area inevitable. Hence an environment friendly approach has been considered for preparing this project.

The letter of intent (LoI) for sand, bajri& boulders mine has been issued in favour of Sri Jitendra singh in order to minimize the demand supply gap of river sand, bajri boulders in district and state. The proposed lease area lies in the river bed of river Kailash.

The Mining plan and Progressive Mine Closure Plan has been approved with the conditions stipulated by the Directorate of geology and mining, Uttarakhand.

Similarly ministry of environment & forest , climate change, govt. of India has issued sustainable sand management guideline in 2016 and minimum distance to be maintained for safe mining is given in standard environment condition for sand mining , which is also mentioned in table-

**Table 1.1 Minimum distance from different structures (as per SSMMG 2016)**

<b>S. No.</b>	<b>Particulars</b>	<b>Min Distance as per SSMMG, 2016</b>
1	School	50m
2	Hospital	50m
3	Road(NH)	100m
4	Road (SH)	25m
5	MDR	10m
6	Railway station	100m
7	Chak road	10m
8	Bridge or embankment	200m
9	Water supply irrigation scheme	200m

Lessee got mining plan approved vide letter no. 2488 on dated 08/02/2019. From environment point of view sand, bajri & boulder mining is essential because river has an assimilative capacity to retain certain amount of sand in their channel. This could lead to loss in its natural course and morphology. River once diverted, flows downward of both sides thus creates new water channels. It can devastate its surrounding land such as agriculture land, habitation, forest, waste land as the case may be and can do riparian erosion along both sides of river etc.

To address the rising environmental concerns of present day scenario and important developmental activities it is inevitable that economic development and environmental sustainability must go *hand in hand*. A pragmatic EIA study is the need of the hour. The present

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EIA study report has been prepared in light of the EIA Notification 2006, sustainable sand management guideline 2016, to draw attention on the burning environmental issues related to the present proposal of sand, bajri & boulder mining in Kailash river, and would draw definitive conclusions related to impact of the project along with measures to mitigate the impacts and subdue there negative effects.

Ministry of Environment and Forest, Govt. of India on its order No. L-11011/47/2011-IA.II(M) dated May 18<sup>th</sup> 2012 states as under:

“In order to ensure compliance of the above referred order of the Hon’ble Supreme Court dated 27.2.2012, it has now been decided that all mining projects of minor minerals including their renewal, irrespective of the size of the lease would henceforth require prior environment clearance. Mining projects with lease area up to less than 50 ha including projects of minor mineral with lease area less than 5 ha would be treated as category ‘B’ as defined in the EIA Notification, 2006 and will be considered by the respective SEIAAs notified by MoEF & CC and following the procedure prescribed under EIA Notification, 2006.”.

The EIA Notification 2006, as amended makes it clear that projects in respect of non-coal mine leases, where the lease area is more than equal to 50 hectares would require prior Environmental Clearance from MoEF&CC, while the projects of area less than 50 hectares would be appraised for prior Environmental Clearance at the level of SEIAA, As of now, mining projects of minor minerals with less than 50 hectare of mining lease areas are categorized as Category 'B' as per Notification S.O. 2731 (E ) dated 9th September 2013. Also vide O.M. No. L-11011/47/2011-IA-II (M) dated 24.06.2013, and subsequent amendment dated 15.01.2016 and OM dated 12.12.18.

Notification S.O. 1559 (E ) dated 25th June 2014 provides that "Any project or activity specified in Category 'B' will be appraised at the Central Level as Category 'A', if located in whole or in part within 5 km. from the boundary of: (i) Protected Areas; (ii) CEPI; (iii) ESA; (iv) Inter - state boundaries or international boundaries.

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As per NGT order dated 13 Sept 2018, MOEF& CC Circular dated 12.12.2018 the project comes under category B1 and thus was submitted for issuance of Terms of References for carrying out EIA study

## **1.2 Environmental Clearance**

Sri Jirendra singh is lessee of the proposed mine who intends to produce Sand, bajri& boulder 198000 MTPA, sanctioned Lease area of this mine is 6.0 ha. subsequently the project falls under Category 'B1'. Thus the project will be appraised by State Expert Appraisal Committee of Uttarakhand. Therefore, the lessee will have to take environmental clearance from State expert appraisal committee as per MoEF Notification of EIA, 2006.

## **1.3 Terms of Reference:**

The proposal for environmental clearance was sent to SEIAA, Uttarakhand with the required Form-1 & Prefeasibility Report for issuance of ToR. The Terms of reference was issued on 26.02.2019. Based on the terms of reference issued, detailed EIA study report has been prepared. Compliance of TOR is attached as **Annexure-1**.

## **1.4 Post-Environmental Clearance Monitoring:**

The project proponent shall publish environmental clearance granted for the proposed project along with the environmental conditions and safeguards in two local newspapers of the district or state where the project is located. The project management shall submit half-yearly compliance reports in respect of the stipulated prior environmental clearance terms and conditions on 1st June and 1st December of each calendar year. All such reports shall be public documents.

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### **1.5 Transferability of Environmental Clearance:**

No prior Environmental Clearance was granted for proposed lease. The lessee is applying for first time environmental clearance. In case of transfer of EC to another person it shall be noted that the EC granted shall hold all the conditions as it were and the time limit will remain the same.

### **1.6 Generic Structure of Environmental Impact Assessment Document:**

In reference to EIA Notification dated 14<sup>th</sup> September 2006 as amended December 2009, the present EIA report is prepared as per the generic structure formulated in the Environmental Impact Assessment Guidance Manual for Mining of Minerals:

- Introduction
- Project Description
- Analysis of Alternatives (Technology and site)
- Description of the Environment
- Anticipated Environmental Impact & Mitigation Measures
- Environmental Monitoring Programme
- Additional Studies
- Project Benefits
- Environmental Cost Benefit Analysis
- Environmental Management Plan
- Summary & Conclusion
- Disclosure of Consultants engaged

### **1.7 Identification of Project Proponent:**

#### **Project Proponent:**

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Mr.Jitendra Singh

S/oMr.Aan Singh

R/o Village - Khupital, Khurpankha,

District - Nainital, Uttarakhand

**Address for Correspondence:**

Mr. Jitendra Singh

S/O Mr.Aan Singh

R/O Village - Khupital, Khurpankha,

District - Nainital, Uttarakhand

Designation:Owner

**1.8Environmental Policy of the Project proponent**

Lessee Sri Jitendra singh is committed towards adopting environmentally sustainable project. He is experienced with mining and allied activities thus recognize that the activities have an impact on the environment in terms of mining of minerals, use of raw materials, emissions to air and water, and seek to minimize these as far as is reasonably practicable.

I, Jitendra singh will therefore endeavour to:

- Preventing Environmental Pollution by continual improvement in environmental performance of the Environmental Management Plan.
- Compliance with all environmental legislations, regulations under the EIA Notification, 2006 amendment 2009 and 2016.
- Make efficient use of natural resources by conserving energy and water, minimizing waste, and recycling where possible.
- Duly take care of the requirements in relation to waste management by ensuring the safe keeping, transportation and subsequent recovery or disposal of waste.

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- Use recycled construction materials whenever these can be commercially justified.
- Keep transport use to a minimum and regularly service vehicles to maintain their efficiency.
- Promote environmental awareness amongst employees, local communities and interested parties through proactive communication and training.
- A dedicated employee shall review the suitability and effectiveness of environmental objectives and targets through periodic management review process.
- In case of any non –compliance/violation of environmental norm the incharge of monitoring cell will directly inform to lessee.
- The policy shall be communicated to employees at all levels, local communities and stakeholders for compliance of environmental Terms of References.
- To impart training to employees and motivate them to safeguard the environment.

### **1.9 Brief Description of Project**

The present mining project is owned by Sri Jitendra singh. The lease area lies in the bed of River Kailash located near village-Ukroli, Tehsil Sitarganj & District-Udhamasinghnagar, Uttarakhand. Total Lease area of the mine is 6.0 ha.(Category ‘B’) and proposed production is 1,98,000 MT/year. The letter of intent was issued vide letter No. 1926/VII-1/18/02(74)/2018, dated- 12th Sept 2018 in favour of **Mr. Jitendra Singh S/o Shri Aan Singh**, R/o – Village-Khupital, Khurpankha, District - Nainital, Uttarakhand granted for lease period of 5 years. The lease document is attached as **annexure II**).

## CHAPTER -2

### PROJECT DESCRIPTION

#### 2.0 General

The present proposal is for manual mining in river bed of Kailash river in village Ukroli, tehsil Sitarganj, District Udhamasinghnagar, Uttarakhand. The longitude and latitude of the lease area are given in chapter 2. The lease area is well connected with metalled road. The proposed mining site is approachable by NH-125, site is connected through link road to NH-15. Link road to NH-125 is 12 Km away from proposed mine site. Nearest Railway Station Lalkuan Railway Station:  $\approx 16.5$  Km in West north west direction (crow fly distance). Nearest Airport (Dehra Dun) Airport  $\approx 16.6$  Km in west direction (crow fly distance). Nearest School/College Govt. High School,  $\approx 6.5$  Km in SW.

Udhamasinghnagar District is the food bowl of Uttarakhand State. Prior to its formation, it was part of District Nainital. It was separated out on the basis of physiographical conditions i.e. Tarai. It is also well known for the industries as the geographical location is conducive. Udhamasinghnagar district is famous for its agriculture and irrigation on synchronized patterns from the past as garner of popularity for its productivity in paddy crops in the whole Uttarakhand state, and it is rightly called "Chawal ki Nagari", thus making it importance in bringing out the district groundwater brochure. Udhamasinghnagar district falls in the Tarai region of Kumaon Division. The geographical area of the district is 3055 Km<sup>2</sup> and in aerially it ranks 9th in Uttarakhand state. It is located between latitude 28° 53' N and 29° 23' N and laterally extends between longitudes 78° 45' E and 80° 08' E. The district is bounded by Nainital and Champawat districts of Uttarakhand on the north, Moradabad, Rampur, Bareilly and Phibhit districts of Uttar Pradesh on the south, Bijnor district of Uttar Pradesh on west and Nepal on the east. The Sarada River forms the international boundary between India and Nepal.

The area lies in the Ukroli village, tehsil Sitarganj, Udhamasinghnagar. The Ukroli village where mine is situated is located along the Kailash river. The sand bajri & boulder deposits of

this area are well exposed over the surface. The mineral is of good quality sand deposit which is easily excavated without involving drilling and blasting, thus making the activity environmentally sustainable. The project is being promoted in view to serve construction activities in the region. Lease deed enclosed as **Annexure 1**. The production has been proposed to be 198000 MT/year (for five years period).

## 2.1 Description of the Project

The proposed project is sand, bajri & boulder (minor mineral) mining project which will have the following details:-

**2.1.1 Projected Production for Plan Years** -The rate of production will be 198000MT/year for proposed years.

### 2.1.2 Location Details:

The project pertains to river sand, bajri& boulder mining in village- Ukroli, tehsil Sitarganj district Udhamasinghnagar,Uttarakhand. The details of the location of the lease and land use are given below in the table:

**Table 2.1:Location Details of Mining Lease**

SL No.	Particulars	Description
1	Lease area	6.0 ha.
2	Village	Ukroli
3	Tehsil	Sitarganj
4	District & State	Udhamasinghnagar, Uttarakhand
5	Name of River	Kailash
6	Khasara Numbers	Plot no.04 khasra no. 55mi, 65mi, 69mi & 70mi. (Khasra map is attached as <b>platle no. 2</b> )

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7	Toposheet No	53 O/12		
8	Latitude	<b>Pillar</b>	<b>Latitude (N)</b>	<b>Longitude (E)</b>
9	Longitude	A	29°02'20.31"	79°41'36.28"
		B	29°02'21.93"	79°41'41.71"
		C	29°02'13.91"	79°41'41.33"
		D	29°02'07.97"	79°41'42.17"
		E	29°02'05.09"	79°41'37.32"
10	Mineral	Sand Bajri Boulder (Minor Mineral)		
11	Period of Mining Lease	5 years from date of execution of lease deed The letter of intent is attached as <b>annexure 1)</b>		
12	Category of Land	Govt. Revenue Land (Non Forest Land)		

Location of lease area is shown below in google map



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The google map showing 10 km radius area is attached as **Plate No. 5**

## **2.2 Leasehold Area:**

The leasehold area 6.0 ha. has no pits available presently in the river bed as no mining has been done so far till date. The lease area is devoid of any vegetation. The lease area is river bed area. The land in the both sides of the river is private agricultural land.

## **Land use pattern of the lease area:**

The total sanctioned lease area is 6.0 ha. Entire lease area is river bed and of no agricultural use.

## **2.3 Geology of the area:**

### **Geological Formation**

Piedmont alluvial deposits represent the geology of the study area. Broadly, it can be divided into two formations viz. Bhabar and Tarai. These are characterized by distinct lithology, grain size distribution, variation of degree of sorting etc. a generalized geological succession, of the area.

#### **(i) BHABAR FORMATION:**

Bhabar formation is essentially constituted of alluvial deposits lying on the sloping plains in the Himalayan foothills. It is primarily constituted of unconsolidated sediments like sand, gravel, boulder and clays. The grain size varies from material of sand grade (2 mm) through granules, pebbles, cobbles to boulders size i.e. >256 mm, sometimes the boulders have dimensions in feet. The clays are generally brown in color and clay bed sequences tend to pinch and for the same reason have short lateral continuity.

#### **(ii) TARAII FORMATION:**

The Tarai formation is exposed immediately south of the Bhabar formation, and the name itself being derived from marshy conditions. Tarai formation consists of clays, sandy clays, fine to medium sand and occasional gravels. In this formation there is a dominance of clayey successions over sandy horizons. The granular zones mostly occur as lenses and have inter-tonguing relationships with clastic and non-clastic units.

### **Hydrogeology**

Generally, the groundwater flows from north to south in the study area. Based on the behavior and occurrence of groundwater, the district can be broadly categorized into two broad hydrogeomorphic units namely (1) Bhabar and (2) Tarai, which have significantly different Hydrogeological attributes. The hydrogeological characteristics of Bhabar and Tarai regions are given as under-

(i) **BHABAR ZONE:** Bhabar is highly porous and permeable alluvial tract lying in an elongated form along the Siwalik foothills. It has northwest-southeast elongation and forms a highly potential hydrogeologic unit. Bhabars are poorly sorted, unconsolidated sediments viz., boulders, cobbles, pebbles, and granules, coarse to fine sand, silt and clay. Bhabar is the main intake area close to the Himalayan foothills. Generally, the water table is as deep as 75 m bgl; the water table also shows higher seasonal fluctuation. The hydraulic gradient is approximately 2.97 m/km. The pre-monsoon and post monsoon depth to water level ranges from 2.01 to 5.58 m bgl, and 1.73 to 5.20 m bgl, respectively. Seasonal fluctuation varies from 0.28 to 0.38 m.

(ii) **TARAI ZONE:** Tarai formation lies south of the Bhabar, which comprises predominantly of clays and silts with horizons of well-sorted granular material such as sand, gravel occasionally boulders and cobbles and pebble beds. The groundwater in Tarai zone occurs both in unconfined and confined conditions. In the unconfined aquifer, the depth to water level in pre-monsoon and post monsoon varies from 2.09 to 7.08 m bgl and from 1.99 to 6.89 m bgl, respectively. The seasonal fluctuation varies from 0.09 to 3.56 m.

### **(B) Local Geology**

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Applied area is situated in the bank of river Kailash River. No topsoil is present in the mining area. Sand, bajri & boulder is spread all over the area.

The Surface Geological Map is attached as **Plate no.4**

#### **2.4 Quality of Reserves:**

Sand is deposits are considered to be of good quality and can be used for building material.

#### **Details of Exploration:**

No specific method of exploration is required as the river borne sediments are deposited all along the river bed and are well exposed on the surface. Moreover, these sediments are accumulated/replenished every year during rainy season by river waters to almost more than extracted level depending on the intensity of rains on the upstream side.

#### **Reserves:**

River bed mineral reserves have been estimated as per the standard procedures. The mineable reserves are 9,90,000Tonnes (As per approved mine plan). Mine plan approval letter is attached as **annexure 4**

**Table 2.2: Mineable Reserves**

<b>Year</b>	<b>Minable Reserve</b>
1 <sup>st</sup> Year	198000
2 <sup>nd</sup> Year	198000
3 <sup>rd</sup> Year	198000
4 <sup>th</sup> Year	198000
5 <sup>th</sup> Year	198000
<b>Total</b>	<b>990000</b>

## **2.5 Mining**

Total area of the lease is 6.0 ha, Mining details are discussed below:

### **2.5.1 Manual open cast Mining**

- Manual open cast mining will be undertaken. Loading of dumpers will be done by manual method.
- Mining will be undertaken to a maximum depth of 1.5m.
  - Considering the replenish-able nature of the deposit the depth of excavation will be kept as less as possible.
  - Considering the soft nature of deposit no drilling/ blasting will be required making the mining operations environmentally sustainable.
  - Sand, bajri& boulder occurring on the surface, does not require any development activity, since approach road is already available in the mining area
  - Surface plan is given in Plate Nos. 2.

### **2.5.2 Production Schedule:**

Excavation activities will start after the grant of Environmental clearance. Depending upon the market requirement, approved mine plan about 1,98,000 Tonnes per year of sand, bajri& boulder is proposed to be excavated from the mining area.

Duration of lease will be considered five years from date of execution of lease deed. Ultimate limit will be 1.5 m below existing bed level in river bed as indicated in ultimate plan.

### **2.5.3 Mineable reserves and anticipated life of the mine**

It is presumed that the mineral will be replenished every year in River bed during the rainy season. New mineral will be added every year.

#### **2.5.4 Mode of Transportation of Mineral:**

The excavated material may be directly loaded into trucks, dumpers, tippers and tractor-trolleys and send to the destination wherever it is required for construction and other purposes. Buffer stockpiles may also be formed by manual means, or by trucks may deposit the sand in a pile gradually building a large pile that the trucks drive on top of to deposit more sand.

Transportation of sand, bajri& boulder from the mine is a process to deliver mined out material to the location where it is going to be used. Collected/mined out sand, bajri& boulder will be loaded into trucks and transported to its destination where the sand, bajri& boulder will ultimately be used. Sufficient space will be left for loading of trucks.

As far as possible transportation will not be done through the villages & all efforts will be made to divert the transport wherever possible. In circumstances where transportation of mineral from village roads becomes inevitable, Sarpanch will be asked for his consent.

#### **2.5.5 Equipment Details:**

Excavation is typically performed by manual means. The excavated material may be directly loaded into trucks.No heavy earth moving machinery will be deployed for mining purpose. Only manual mining will be used for excavation, loading/unloading purpose.

#### **2.5.6 Waste Generation:**

There is no overburden in river bed, total mining will be restricted up to 1.5m depth. No soil cover is present. All the material collected from the mine is saleable. For municipal solid waste management during mining there shall be separate bins to collect solid waste generated by daily human activities i.e. wrappers, foils, leftover food material etc.

## **2.6 General Features**

### **2.6.1 Surface Drainage Pattern**

The Kailash river enters in Udhamasinghnagar district. District Udhamasinghnagar has a dense network of the drainage pattern. The rivers of the district belongs to the Ganges drainage system. Of these, Sarada, Kosi, Gola and Phikka river and their tributaries are Sawaldehy, Bour, Nandhour, Bhak, Kailash etc. drain the district. The unique feature of the area is debouching of major rivers into the plains from Lower Himalayas. The overall flow direction of these rivers generally north-south trend or northeast-southwest and flows to south till its confluences with the Ganga River. The major rivers are perennial, whereas their tributaries originating from sub-Himalayan zone are ephemeral and remain dry during the non-monsoon seasons. The overall drainage pattern in the study area are sub dendritic to sub parallel.

### **2.6.2 Vehicular Traffic Density**

The lease is spread over an area of 6.0 ha. ha encompassing river bed land. Roads shall be used for transportation of mineral. While mining, 825 ton/day river sand, bajri & boulder will be produced and then transported by tractors having 9 tonne capacity.

### **2.6.3 Power, water supply and other infrastructure required:**

Diesel is used as motive source of primary energy for mining. Diesel will be used in dumpers & trucks. Diesel will be outsourced from nearby diesel pumps. Mostly the trucks shall be sent by the consumers for loading of mineral.

Mine shall work in day time only thus electricity for mining operations will not be required during night.

#### 2.6.4 Water Requirement

As per Working Group Rural Domestic Water & Sanitation Demand there will be provision of Drinking water @ 30LPCD (SOURCE-CPHEEO), Suppression of dust is 1.5 KLD, Thus for 164 workers there will be requirement of 5 KLD Water. The water requirement has been summarized below:

**Table 2.3: Water Requirement**

S.No.	Water consumption Detail	Water Requirement in KLD
1.	Water for sprinkling	1.5KLD
2.	Domestic/drinking	5.0 KLD
3.	Green belt development & miscellaneous	0.5 KLD
	<b>Total</b>	<b>7.0KLD</b>

#### Source of Water:

Water shall be provided to the workers with the help of hired tankers. Water will be sourced from existing bore well/tube wells in the respective nearby villages where mining will be carried out. Water shall be stored in storage tanks from where it will be used by workers.

#### 2.6.5 Infrastructure Provisions:

There is provision of ancillary facilities such as Canteen cum rest shelters, first aid center & at the time of commencement of the project. A temporary office of Manager 5m x3m shall be provided outside near the lease area. Additional room for other supervisory staff is also proposed at each mine. Biotoilets will be provided which will keep on shifting as per activity shift. Waste shall be disposed off in vermi-composting sites identified and used at the time of mine working.

#### 2.7 Manpower Requirement

There will be employment opportunity for 164 people involved in the mining project.

**Table 2.4: Details of Employment**

<b>S.No.</b>	<b>Category</b>	<b>Numbers</b>
1	Manager-1 <sup>st</sup> Class	1
2	Supervisory staff	1
3	Skilled Personnel	10
4	Un- skilled	152
<b>Total</b>		<b>164</b>

## **2.8 Project Implementation Schedule**

The mining process will commence soon after getting Environmental Clearance from MoEF as per EIA notification 2006. The estimated project cost will be Rs1.28crores. The details of expenses are given below

<b>Project particulars</b>	<b>Expenses in Rs.</b>
Manager/supervisor	480000
Manpower- skilled	1200000
unskilled	9120000
Fuel costing	144000
Water requirement	1680000
Biotoilet	50000
Waste collection bins	5000
Haul road maintenance	50000
Air/water/soil/noise monitoring	100000
<b>Total</b>	<b>1,28,29,000</b>

## **CHAPTER – 3**

### **ANALYSIS OF ALTERNATIVES**

#### **3.0 General**

Occurrence of mineral is site specific activity therefore does not provide choice for alternative location. The Lease was granted by, government of Uttarakhand.

#### **3.1 ANALYSIS OF ALTERNATIVE TECHNOLOGY**

Mining techniques have transformed dramatically since mining began thousands of years ago. With the development of new technologies many advanced methods have been adopted, yielding more extraction and least environmental impacts. That commitment involves an intense drive to improve the safety and health of workers, and lifting the economic and environmental performance of mining operations. Mining methods are constantly changing and improving as companies forge new technologies to enhance rates of extraction and minimize impacts such as noise, dust, land and water disturbance. The major mining methods in use are open cast mining.

##### **(I) OPEN-CAST MINING**

Open-cast mining known as surface mining is most effective when the mineral deposit is close to the surface. The mining process is fundamentally different between the soft-rock and hard-rock operations. The techniques involve with (or) without blasting depending on the hardness of the rock, and removing surface layers of soil and rock to reach the deposit. In some cases, a separation process will be used to eliminate waste by-products.

#### **3.2 SELECTION OF MINING METHODOLOGY**

After the complete analysis of various technologies, the nature of material to be excavated that are in practice, the mine will be operated by opencast manual method. No other alternative

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technology is required because of the soft nature of the mineral. Lessee will use eco-friendly measures to minimize the impact on the surrounding environment. No drilling\blasting is required as the material is loose in nature.

## CHAPTER 4

### DESCRIPTION OF ENVIRONMENT

#### **4.0 General**

Baseline environmental scenario is intrinsic part of environmental management planning for EIA study. Baseline study reflects the existing environmental scenario of the project site and 10 km radius buffer zone. Proposed mining lease area depicts the existing environmental conditions of air, noise, water, soil, biological and socio-economic environment. The proposed project is a B<sub>1</sub> category project hence 10 km radius has been considered as buffer zone.

#### **Study Area**

Study area of “Ukroli” Sand Mine for baseline study covers the total area covering a 10 Km radius from the mine lease periphery. Further the study area has been divided into two zones namely “Core Zone” and “Buffer Zone”. Core zone comprises of the mine lease area within the mine lease boundary while the area around the mine lease periphery covering 10 Km radius area constitutes the Buffer Zone.

#### **Geographical Location of the study Area**

The mine lease area 6.0 ha which falls in Village - Ukroli, tehsil sitarganj district udhamasinghnagar, Uttarakhand. It is located in river bed of Kailash river. The proposed mining site is approachable by link road to NH-125. SH 37 is 17 km away from lease area. Uttra Pradesh and uttarakhand state boundary is 20km away from lease area. Pantnagar railway station is 17 km away from lease area (crow fly distance). Nearest Airport (pantnagar) Airport ≈ 22 Km in west direction (crow fly distance). Nearest School/College Govt. High School 6.8 Km SW. Geographical location of mine lease area is covered under Survey of India Toposheet No. 53 O/12 (H44N/12). Study

area map covering a radius of 10 Km around the lease periphery is enclosed as **Plate no.-3**

#### **4.1 Land environment**

##### **4.1.1 Physiography of the area:**

The applied lease area has slope towards South. Highest point is at 232mRL in the NE corner of the area where as lowest point 229mRL is in the SW corner of the area. The physiographic features are shown in **Plate No. 3**.

##### **4.1.2 Geology of the area:**

#### **Geological Formation**

Piedmont alluvial deposits represent the geology of the study area. Broadly, it can be divided into two formations viz. Bhabar and Tarai. These are characterized by distinct lithology, grain size distribution, variation of degree of sorting etc. a generalized geological succession, of the area.

##### **(i) BHABAR FORMATION:**

Bhabar formation is essentially constituted of alluvial deposits lying on the sloping plains in the Himalayan foothills. It is primarily constituted of unconsolidated sediments like sand, gravel, boulder and clays. The grain size varies from material of sand grade (2 mm) through granules, pebbles, cobbles to boulders size i.e. >256 mm, sometimes the boulders have dimensions in feet. The clays are generally brown in color and clay bed sequences tend to pinch and for the same reason have short lateral continuity.

##### **(ii) TARAI FORMATION:**

The Tarai formation is exposed immediately south of the Bhabar formation, and the name itself being derived from marshy conditions. Tarai formation consists of clays, sandy clays, fine to medium sand and occasional gravels. In this formation there is a dominance of clayey

successions over sandy horizons. The granular zones mostly occur as lenses and have inter-tonguing relationships with clastic and non-clastic units.

#### **4.1.3 Hydrogeology**

Generally, the groundwater flows from north to south in the study area. Based on the behavior and occurrence of groundwater, the district can be broadly categorized into two broad hydrogeomorphic units namely (1) Bhabar and (2) Tarai, which have significantly different Hydrogeological attributes. The hydrogeological characteristics of Bhabar and Tarai regions are given as under-

(i) **BHABAR ZONE:** Bhabar is highly porous and permeable alluvial tract lying in an elongated form along the Siwalik foothills. It has northwest-southeast elongation and forms a highly potential hydrogeologic unit. Bhabars are poorly sorted, unconsolidated sediments viz., boulders, cobbles, pebbles, and granules, coarse to fine sand, silt and clay. Bhabar is the main intake area close to the Himalayan foothills. Generally, the water table is as deep as 75 m bgl; the water table also shows higher seasonal fluctuation. The hydraulic gradient is approximately 2.97 m/km. The pre-monsoon and post monsoon depth to water level ranges from 2.01 to 5.58 m bgl, and 1.73 to 5.20 m bgl, respectively. Seasonal fluctuation varies from 0.28 to 0.38 m.

(ii) **TARAI ZONE:** Tarai formation lies south of the Bhabar, which comprises predominantly of clays and silts with horizons of well-sorted granular material such as sand, gravel occasionally boulders and cobbles and pebble beds. The groundwater in Tarai zone occurs both in unconfined and confined conditions. In the unconfined aquifer, the depth to water level in pre-monsoon and post monsoon varies from 2.09 to 7.08 m bgl and from 1.99 to 6.89 m bgl, respectively. The seasonal fluctuation varies from 0.09 to 3.56 m

#### **4.1.4 Drainage of the area-**

The rivers of the district belong to the Ganges drainage system. Of these, Sarada, Kosi, Gola and Phikka river and their tributaries are Sawaldeh, Bour, Nandhour, Bhak, Kailash etc. drain the district, shown in Fig. 2. The unique feature of the area is debouching of major rivers into the

plains from Lower Himalayas. The overall flow direction of these rivers generally north–south trend or northeast–southwest and flows to south till its confluences with the Ganga River. The major rivers are perennial, whereas their tributaries originating from sub-Himalayan zone are ephemeral and remain dry during the non-monsoon seasons. The overall drainage pattern in the study area sub dendritic to sub parallel.

#### **4.1.5 Seismicity of the area**

The area under study falls in Zone-IV (High Risk), according to the Indian Standard Seismic Zoning Map.

#### **4.1.6 Land use study**

Information on land use/ land cover is the basic prerequisite for land resource evaluation, environmental assessment, utilization and management. As a precursor, it is necessary to understand the 'cause and effect' of the transformations through scientific studies. The scope of the present study is limited to mapping the current land use / land cover pattern, their assessment, spatial distribution and extent using remote sensing and GIS techniques. The land environment will mainly deal with the land use, land cover within and buffer zone.

Since the mining is carried out by opencast manual method, studies on land environment of eco-system plays an imperative role in identifying susceptible issues and taking appropriate action to uphold ecological equilibrium in the region. The main objective of this section is to provide a baseline status of the study area covering 10km radius around the proposed mine site so that temporal changes due to the mining activities on the surroundings can be assessed in future.

The methodology used for present LU/LC of study area is shown in **Figure 4.1** and is detailed below:

##### **4.1.6.1 Methodology**

The LULC maps were generated using Sentinel-2 satellite data for the date 22-may-

2018, blue, green, red and Near Infra-Red (NIR) bands are stacked and resampled at a spatial resolution of 10 m. Object oriented classification method was implemented in e-Cognition 9.2 software. In this classification approach the image is divided into objects by using multi-resolution segmentation. As this is a supervised classification algorithm sample objects are selected for all the classes from the segmented image. The mean of the selected bands are used as object features for differentiating classes from each other. Finally, nearest neighborhood classification algorithm is applied. Certain anomalies in classified output are removed using manual editing tool. The results were then exported as ESRI shape files into ArcGIS 10.1 and area calculation for different classes was done. The final map was prepared using ArcGIS layout view by adding all the layers and map information like North arrow, scale bar, legend and the title for the map.

The present land use map is of buffer 10 km around the project site which covers an area of approximately 327.83 sq. km. As you can see from the map the area is mainly consist forest which covers an area of 238.48 sq. km which is more than 72 percent of the total area. This is followed by area agriculture and fallow land which cover an area of 29.63 and 26.52 respectively. Another major land cover class is river bed covering an area of 15.65 sq. km. The other class making up the land use are built up covering an substantial area of 6.9 sq. km this includes industrial and residential area and major roads which are can be identified using this 10 m spatial data. Degraded forest i.e. is the scrub land has an percentage area of 2.41 this is quite low keeping in mind that the 10 Km buffer zone is a highly forest area. Other classes which are mapped are river and waste land these have an percentage area of 0.3 and 0.50 respectively.

Based on the methodology developed for the present land use/ land cover, categories have been grouped under the following major land use/land cover categories

**a) Land Use Core Zone:** The land is river bed area entire area will be used for sand bajri boulder mining. No area left for green belt and statutory slope/safety barrier. 6.0 ha area will be available for mining.

**b) Land use Buffer zone:**

The land use distribution in the buffer zone was studied 10Km radius (from periphery) of project site.

#### 4.1.6.2 Land use details

Its is given in the table given ahead.

**Table 4.1: Land Use Distribution**

<b>S No.</b>	<b>Category</b>	<b>Area in Sq Km</b>	<b>Area In Ha</b>	<b>%age</b>
1	Agriculture Land	26.5223	2652.23	8.09
2	Fallow Land	29.6321	2963.21	9.04
3	Built-up, Rural	6.98	698.16	2.13
4	forest Land	238.48	23848.04	72.74
5	River Sand Area	15.65	1565.02	4.77
6	Scrub Land	7.92	792.09	2.42
7	Water Bodies, River/Canal	1.0	100.19	0.31
8	Waste land	1.64	164.36	0.5
	<b>Total</b>	<b>327.83</b>	<b>32783.33</b>	<b>100.00</b>

#### **Forest land:**

Forest land includes around 23848 ha. area that covers around 72.74% of total area.

#### **Built-up:**

Built-up land includes the urban or rural settlements. The major built-up area is about 698.16 hectares which is 2.13 percent of the total 10 km radius study area.

#### **Agricultural land:**

Based on topographical maps and ground truth. The land use is mainly agricultural. The total agricultural area is about 2652.23 hectares which is 8.09 percent of the total study area.

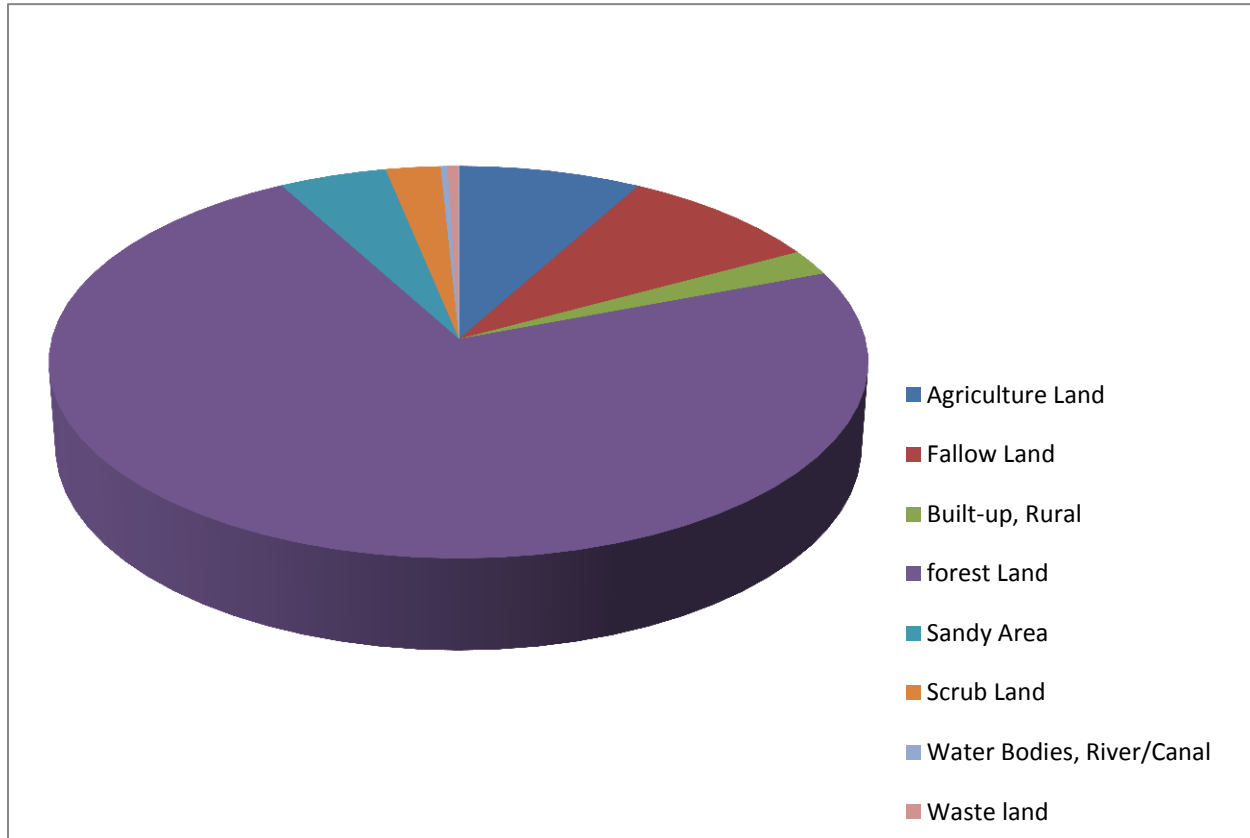
#### **Fallow land:**

Based on topographical maps and ground truth. Fallow land their area extent have been extracted. The fallow land area is about 2963.21 hectares which is 9.04 percent of the total 10 km radius study area.

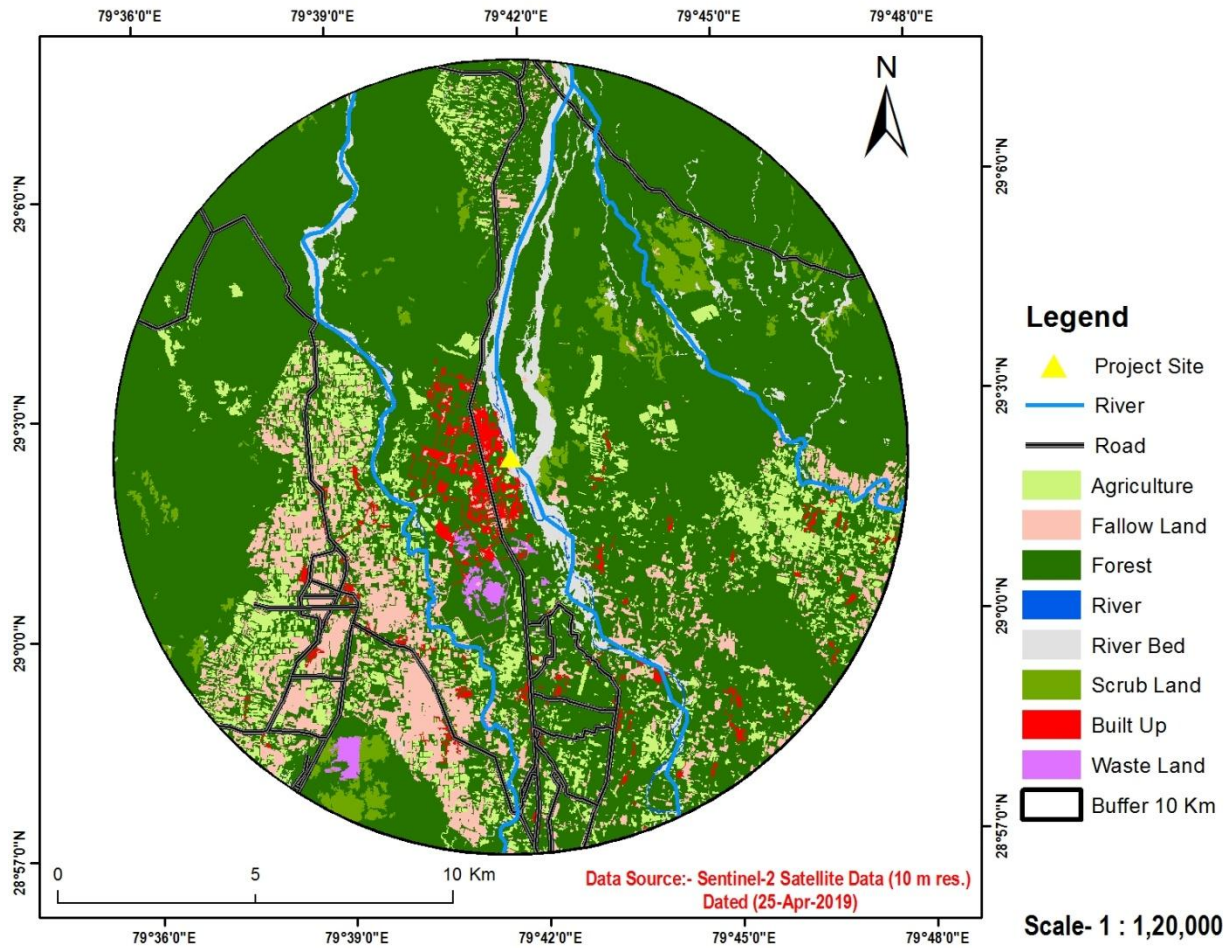
#### **Water Bodies:**

Based on topographical maps and ground truth. Water bodies their area extent have been extracted. This area is about 100.195 hectares which is 0.31 percent of the total 10 km radius study area.

**Figure 4.1: Land use Map of 10 Km Buffer Zone**



**Land Use Land Cover Map of 10 Km Buffer Zone at Village Ukroli, Tehsil Sitarganj, District Udham Nagar, U.K., Area- 6.00 ha. M/s Jitendra Singh, R/O Village Khupital, Tehsil Khurpankha, District Nanital, U.K.**



**Figure 4.3: Land use Map**

#### 4.1.7 Soil quality:

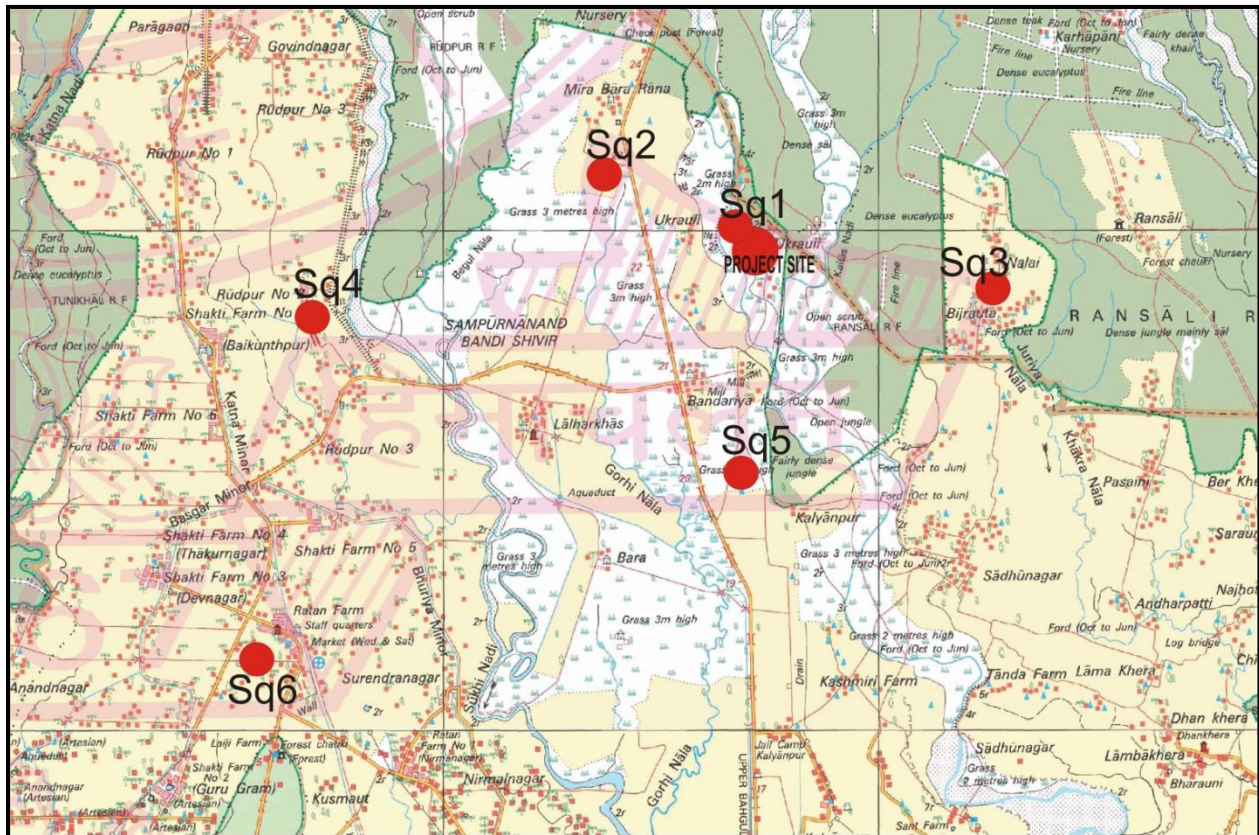
Soil quality of the area was studied as per standard procedure the discussion is given ahead

##### 4.1.7.1 Soil monitoring locations

Soil quality of the area was assessed on the basis of monitoring of soil at six locations. The soil quality locations selected were same as air quality sample locations. The sampling of soil was done as per following monitoring locations-

**Table: 4.1.2 Soil monitoring locations**

Locations Code	Locations	Distance from the mine (km)
SQ1	Near Project site	
SQ2	Mirabararana	1.5Km NW
SQ3	Nalai	2.5Km EE
SQ4	Rudpur	4 Km W
SQ5	Lalarkhas	1.8Km W
SQ6	Shaktifarm	5.5Km SW



Sampling of soil was done by Augur method in which soil was dug upto a depth of 15cm. Surface soil were removed and then soil were mixed properly and then quartering was done on a clean surface. The samples were kept for air drying in laboratory and then analysis was done.

**4.1.7.2 Soil quality Results:-**

Sl. No.	Parameters		Results						Test Method
			S1	S2	S3	S4	S5	S6	
1.	pH		7.56	7.18	7.21	7.20	7.20	7.36	IS:2720(Part-26)
2.	Conductivity (µmhos/cm)		346.00	344.00	371.00	370.00	373.00	335.00	IS:2720(Part-21)
3.	Sodium (as Na)(mg/kg)		55.10	53.50	50.36	50.34	50.42	39.36	STP/SOIL
4.	Water holding capacity (%)		34.50	34.10	30.00	30.00	30.03	28.00	STP/SOIL
5.	Potassium (as K) (mg/kg)		237.40	238.60	235.52	234.50	234.50	242.52	STP/SOIL
6.	Texture	Sand (% by mass)	62.00	62.00	68.00	67.00	69.00	61.00	STP/SOIL
		Clay (% by mass)	15.00	15.00	18.00	18.00	17.00	16.00	STP/SOIL
		Silt (% by mass)	23.00	23.00	14.00	15.00	14.00	12.00	STP/SOIL
7.	Calcium (as Ca)(mg/kg)		156.00	150.00	148.00	146.00	142.00	146.00	STP/SOIL
8.	Magnesium (as Mg) (mg/kg)		68.50	54.60	63.72	63.70	65.73	59.62	STP/SOIL
9.	SAR		0.98	1.05	1.00	1.00	1.00	1.00	STP/SOIL
10.	CEC(meq/100gm)		2.20	2.88	2.15	2.13	2.10	2.15	STP/SOIL
11.	Available Phosphorus(as P),(mg/kg)		12.40	15.10	11.71	11.73	11.71	12.61	STP/SOIL
12.	Organic carbon (%)		0.46	0.51	0.42	0.44	0.42	0.42	STP/SOIL
13.	Porosity(% by mass)		40.10	48.70	40.00	40.00	41.00	41.00	STP/SOIL
14.	Permeability (cm/hr)		1.84	1.96	1.85	1.88	1.87	1.85	STP/SOIL
15.	Bulk Density(kg/cm <sup>3</sup> )		1.18	1.28	1.14	1.16	1.18	1.14	STP/SOIL
16.	TKN%		0.02	0.01	0.02	0.02	0.02	0.02	STP/SOIL

The pH of the area was found between 7.18 to 7.56 i.e. slightly alkaline in nature. The texture of soil in all sampled locations were found of three types loam clay and sandy in texture. The water holding capacity was found between 28 to 34.5 % among all samples monitored. The sodium content was reported to be in the range of 39.36 to 55.10 mg/1000g. Available phosphorous was found in range between 11.71 to 15.10mg/Kg and the organic carbon is found to be in range of 0.42 to 0.51 %.

## **4.2 WATER ENVIRONMENT**

### **4.2.1 Water Quality**

Surface and groundwater samples were collected from different sources within the study area and some important physical and chemical parameters were considered for depicting the baseline status of the study area.

### **4.2.2 Ground Water Quality Assessment**

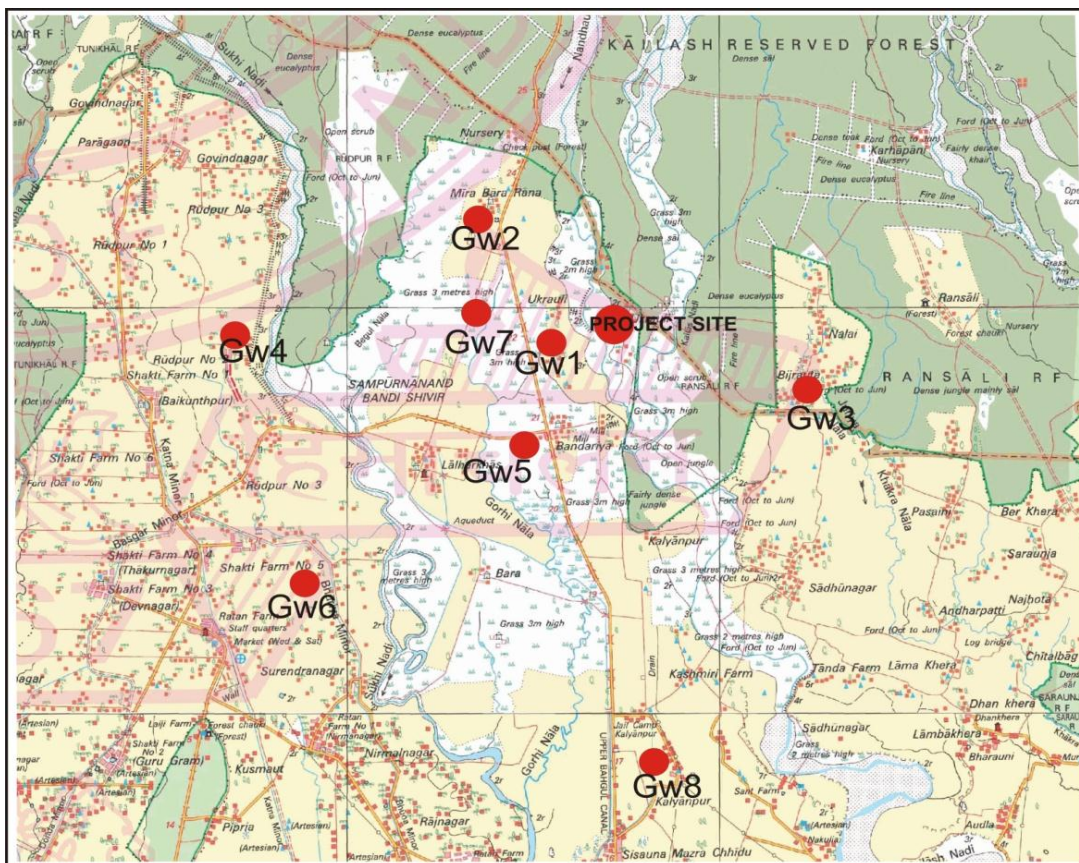
Selected water quality parameters for water resource of the study area have been used for describing the water environment and assessing the impacts. About 8 ground water samples were collected in the study area to assess the water quality. Water samples also drawn from the hand pumps

Surface water samples were drawn from KailashRiver and from ponds of nearby villages. Sampling locations for water samples are shown in table4.2.1 & 4.2.2.The water samples collected from the above locations were analyzed for important major and minor ions, and the analytical results of the water samples were compared with CPCB drinking water standards.

**Table 4.2.1: Water Sampling Locations**

Location Code.	Sample collected from	Distance from Site (km)
GW – 1	Handpump Near Lalarpatti village	0.6KM SW
GW – 2	Hand Pump Near Mirabara Rana	1.5Km NW
GW – 3	Hand Pump Near Nalai	2.5Km E
GW-4	Hand Pump Near Rudpur	4 Km W
GW-5	Hand Pump Near Lalarkhas	1.8Km W
GW-6	Hand Pump Near Shakti Farm	5.5Km SW
GW-7	Hand Pump Near Ukroli	0.7Km W
GW-8	Hand Pump Near Kalyanpur	4.0Km S

GW-Ground water, SW-Surface water



#### 4.2.2.1 RESULTS OF GROUND WATER QUALITY-

The results of ground water quality are given ahead-

**TABLE 4.2.2 (A): ORGANOLEPTIC & PHYSICAL PARAMETERS**

S.NO.	Parameter	Test Method	Results			Unit	Requirement (Acceptable Limit)	Permissible Limit in absence of alternate source
			GW-1	GW-2	GW-3			
1.	Colour	IS-3025(P-04)	<1.00	<1.00	<1.00	Hazen Unit	5	15
2.	Odour	IS-3025(P-05)	Agreeable	Agreeable	Agreeable	-	Agreeable	Agreeable
3.	Taste	IS-3025(P-07 & 08)	Agreeable	Agreeable	Agreeable	-	Agreeable	-
4.	Turbidity	IS-3025(P-10)	<1.0	<1.00	<1.00	NTU	1	5
5.	pH value	IS-3025(P-11)	7.23	7.78	7.81	-	6.5-8.5	-
6.	Total dissolve solid ( TDS)	IS-3025(P-16)	384	462	358	mg/l	500	2000

**TABLE 4.2.2 (B): Ground Water Quality**

#### GENERAL PARAMETERS CONCERNING SUBSTANCES UNDESIRABLE IN EXCESSIVE AMOUNTS

S.NO.	Parameter	Test method	Result			Unit	Requirement (Acceptable Limit)	Permissible Limit in absence of alternate source
			GW-1	GW-2	GW-3			
1.	Aluminium (as Al)	IS: 3025 (P- 55)	<0.01	<0.01	<0.01	mg/l	0.03	0.2
2.	Total Ammonia	IS: 3025 (P- 34)	<0.10	<0.10	<0.10	mg/l	0.5	No Relaxation
3.	Anionic Detergents (as MBAS)	Annex K of IS-13428	<0.10	<0.10	<0.10	mg/l	0.2	1.0
4.	Barium (as Ba)	IS: 15302	<0.10	<0.10	<0.10	mg/l	0.7	No Relaxation
5.	Boron (as B)	IS: 3025 (P- 57)	<0.10	<0.10	<0.10	mg/l	0.5	1.0
6.	Calcium (as Ca)	IS: 3025 (P- 40)	33.67	42.22	26.22	mg/l	75	200
7.	Chloramines (as Cl <sub>2</sub> )	IS: 3025 (P- 26)	<1.00	<1.00	<1.00	mg/l	4.0	No Relaxation
8.	Chloride (as Cl)	IS: 3025 (P- 32)	12.30	22.80	18.40	mg/l	250	1000
9.	Copper (as Cu)	IS : 3025 (P-42)	<0.05	<0.05	<0.05	mg/l	0.05	1.5

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10.	Fluoride (as F)	IS: 3025 (P-60)	0.36	0.48	0.26	mg/l	1.0	1.5
11.	Free Residual Chlorine	IS: 3025 (P-26)	BDL	BDL	BDL	mg/l	0.2	1.0
							To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l.	
12.	Iron (as Fe)	IS: 3025(P-53)	0.084	0.062	<0.10	mg/l	0.3	No Relaxation
13.	Magnesium (as mg)	IS: 3025 (P-46)	18.47	25.56	15.22	mg/l	30	100
14.	Manganese (as Mn)	IS: 3025 (P-59)	<0.10	<0.10	<0.10	mg/l	0.1	0.3
15.	Mineral Oil	Clause 6 of IS: 3025	<0.50	<0.50	<0.50	mg/l	0.5	No Relaxation
16.	Nitrate (as NO <sub>3</sub> )	IS: 3025 (P- 34)	2.41	3.68	2.66	mg/l	45	No Relaxation
17.	Selenium (as Se)	IS: 3025 (P- 56)	<0.01	<0.01	<0.01	mg/l	0.01	No Relaxation
18.	Silver (as Ag)	Annex J IS: 13428	<0.05	<0.05	<0.05	mg/l	0.1	No Relaxation
19.	Sulphate (as SO <sub>4</sub> )	IS: 3025 (P- 24)	27.65	36.87	24.88	mg/l	200	400
20.	Sulphide(as H <sub>2</sub> S)	IS-3025 (P-29)	<0.05	<0.05	<0.05	mg/l	0.05	No Relaxation
21.	Alkalinity ( as Ca CO <sub>3</sub> )	IS: 3025 (P- 23)	162	190	154	mg/l	200	600
22.	Total Hardness (as CaCO <sub>3</sub> )	IS: 3025 (P- 21)	144	164	130	mg/l	200	600
23.	Zinc (as Zn)	IS: 3025 (P- 49)	0.098	0.22	0.048	mg/l	5.0	15
24.	Phenolic Compound as (C <sub>6</sub> H <sub>5</sub> OH)	IS: 3025 (P- 43)	BDL	BDL	BDL	mg/l	0.001	0.002

**TABLE 4.2.2 (C): GROUND WATER QUALITY:Parameters Concerning Toxic Substances:**

S.NO.	Parameter	Test method	Results			Unit	Requirement (Acceptable Limit)	Permissible Limit in absence of alternate source
			GW-1	GW-2	GW-3			
1.	Cadmium (as Cd)	IS-3025(P-41)	<0.001	<0.001	<0.001	mg/l	0.003	No Relaxation
2.	Cyanide (as CN)	IS-3025(P-27)	<0.01	<0.01	<0.01	mg/l	0.05	No Relaxation
3.	Lead ( as Pb)	IS-3025(P-47)	<0.01	<0.01	<0.01	mg/l	0.01	No Relaxation
4.	Mercury (as Hg)	IS-3025(P-48)	<0.001	<0.001	<0.001	mg/l	0.001	No Relaxation
5.	Molybdenum (Mo)	IS-3025(P-2)	<0.05	<0.05	<0.05	mg/l	0.07	No Relaxation
6.	Nickel (as Ni)	IS-3025(P-54)	<0.01	<0.01	<0.01	mg/l	0.02	No Relaxation
7.	Poly Nuclear	APHA 6440	<0.0001	<0.0001	<0.0001	mg/l	0.01	0.05

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	Aromatic Hydrocarbons							
8.	Poly Chlorinated biphenyls	APHA 6440	<0.0001	<0.0001	<0.0001	mg/l	0.05	No Relaxation
9	Total Arsenic (as As)	IS-3025(P-37)	<0.01	<0.01	<0.01	mg/l	0.01	0.05
10	Total Chromium (as Cr)	IS-3025(P-52)	<0.05	<0.05	<0.05	mg/l	0.05	No Relaxation

**TABLE 4.2.2 (C): Ground Water Quality: Microbial Study Results**

		MICROBIOLOGICAL RESULT				
S.No.	Parameter	Test Method	Results			Requirements as per IS-10500:2012
			GW-1	GW-2	GW-3	
1.	<i>Escherichia coli</i>	IS-1622	Absent	Absent	Absent	Absent/100ml
2.	<i>Coliform Bacteria</i>	IS-1622	Absent	Absent	Absent	Absent/100ml

**TABLE 4.2.2 (D): GROUND WATER QUALITY ORGANOLEPTIC & PHYSICAL PARAMETERS**

S.NO.	Parameter	Test Method	Result			Unit	Requirement (Acceptable Limit)	Permissible Limit in absence of alternate source
			GW-4	GW-5	GW 6			
1.	Colour	IS-3025(P-04)	<1.00	<1.00	<1.00	Hazen Unit	5	15
2.	Odour	IS-3025(P-05)	Agreeable	Agreeable	Agreeable	-	Agreeable	Agreeable
3.	Taste	IS-3025(P-07 & 08)	Agreeable	Agreeable	Agreeable	-	Agreeable	-
4.	Turbidity	IS-3025(P-10)	<1.00	<1.00	<1.00	NTU	1	5
5.	pH value	IS-3025(P-11)	7.76	7.76	7.02	-	6.5-8.5	-
6.	Total dissolve solid (TDS)	IS-3025(P-16)	508	456	345	mg/l	500	2000

**TABLE 4.2.2 (E): Ground Water Quality  
General Parameters Concerning Substances Undesirable in Excessive Amounts**

S.NO.	Parameter	Test method	Results			Unit	Requirement (Acceptable Limit)	Permissible Limit in absence of alternate source
			GW-4	GW-5	GW-6			
1.	Aluminium (as Al)	IS: 3025 (P- 55)	<0.01	<0.01	<0.01	mg/l	0.03	0.2
2.	Total Ammonia	IS: 3025 (P- 34)	<0.10	<0.10	<0.10	mg/l	0.5	No Relaxation
3.	Anionic Detergents (as MBAS)	Annex K of IS-13428	<0.10	<0.10	<0.10	mg/l	0.2	1.0
4.	Barium (as Ba)	IS: 15302	<0.10	<0.10	<0.10	mg/l	0.7	No Relaxation
5.	Boron (as B)	IS: 3025 (P- 57)	<0.10	<0.10	<0.10	mg/l	0.5	1.0
6.	Calcium (as Ca)	IS: 3025 (P- 40)	62.20	56.22	26.52	mg/l	75	200
7.	Chloramines (as Cl <sub>2</sub> )	IS: 3025 (P- 26)	<1.00	<1.00	<1.00	mg/l	4.0	No Relaxation
8.	Chloride (as Cl)	IS: 3025 (P- 32)	38.20	46.80	10.68	mg/l	250	1000
9.	Copper (as Cu)	IS : 3025 (P-42)	<0.05	<0.05	<0.05	mg/l	0.05	1.5
10.	Fluoride (as F)	IS: 3025 (P-60)	0.54	0.18	0.29	mg/l	1.0	1.5
11.	Free Residual Chlorine	IS: 3025 (P-26)	BDL	BDL	BDL	mg/l	0.2	1.0
							To be applicable only when water is chlorinated. Tested at consumer end.	

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							When protection against viral infection is required, it should be minimum 0.5 mg/l.	
12.	Iron (as Fe)	IS: 3025(P-53)	<0.10	<0.10	0.062	mg/l	0.3	No Relaxation
13.	Magnesium (as mg)	IS: 3025 (P-46)	25.65	16.60	16.22	mg/l	30	100
14.	Manganese (as Mn)	IS: 3025 (P-59)	<0.10	<0.10	<0.10	mg/l	0.1	0.3
15.	Mineral Oil	Clause 6 of IS: 3025	<0.50	<0.50	<0.50	mg/l	0.5	No Relaxation
16.	Nitrate (as NO <sub>3</sub> )	IS: 3025 (P- 34)	5.84	3.18	2.02	mg/l	45	No Relaxation
17.	Selenium (as Se)	IS: 3025 (P- 56)	<0.01	<0.01	<0.01	mg/l	0.01	No Relaxation
18.	Silver (as Ag)	Annex J IS: 13428	<0.05	<0.05	<0.05	mg/l	0.1	No Relaxation
19.	Sulphate (as SO <sub>4</sub> )	IS: 3025 (P- 24)	78.20	61.26	30.26	mg/l	200	400
20.	Sulphide(as H <sub>2</sub> S)	IS-3025 (P-29)	<0.05	<0.05	<0.05	mg/l	0.05	No Relaxation
21.	Alkalinity ( as Ca CO <sub>3</sub> )	IS: 3025 (P- 23)	226	172	152	mg/l	200	600
22.	Total Hardness (as CaCO <sub>3</sub> )	IS: 3025 (P- 21)	196	160	132	mg/l	200	600
23.	Zinc (as Zn)	IS: 3025 (P- 49)	0.78	0.25	0.078	mg/l	6.0	15
24.	Phenolic Compound as (C <sub>6</sub> H <sub>5</sub> OH)	IS: 3025 (P- 43)	BDL	BDL	BDL	mg/l	0.001	0.002

**TABLE 4.2.2 (F): Ground Water Quality (Parameters Concerning Toxic Substances:**

S.NO.	Parameter	Test method	Results			Unit	Requirement (Acceptable Limit)	Permissible Limit in absence of alternate source
			GW-4	GW-5	GW-6			
1.	Cadmium (as Cd)	IS-3025(P-41)	<0.001	<0.001	<0.001	mg/l	0.003	No Relaxation
2.	Cyanide (as CN)	IS-3025(P-27)	<0.01	<0.01	<0.01	mg/l	0.05	No Relaxation
3.	Lead ( as Pb)	IS-3025(P-47)	<0.01	<0.01	<0.01	mg/l	0.01	No Relaxation
4.	Mercury (as Hg)	IS-3025(P-48)	<0.001	<0.001	<0.001	mg/l	0.001	No Relaxation
5.	Molybdenum (Mo)	IS-3025(P-2)	<0.05	<0.05	<0.05	mg/l	0.07	No Relaxation
6.	Nickel (as Ni)	IS-3025(P-54)	<0.01	<0.01	<0.01	mg/l	0.02	No Relaxation
7.	Poly Nuclear Aromatic Hydrocarbons	APHA 6440	<0.0001	<0.0001	<0.0001	mg/l	0.01	0.05
8.	Poly Chlorinated biphenyls	APHA 6440	<0.0001	<0.0001	<0.0001	mg/l	0.05	No Relaxation
	Total Arsenic (as	IS-3025(P-37)	<0.01	<0.01	<0.01	mg/l	0.01	0.05

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	As)							
	Total Chromium (as Cr)	IS-3025(P-52)	<0.05	<0.05	<0.05	mg/l	0.05	No Relaxation

**TABLE 4.2.2 (G): GROUND WATER QUALITY:MICROBIAL STUDY RESULTS**

MICROBIOLOGICAL REQUIREMENT RESULT						
S.No.	Parameter	Test Method	Results			Requirements as per IS-10500:2012
			GW-4	GW-5	GW-6	
1.	<i>Escherichia coli</i>	IS-1622	Absent	Absent	Absent	Absent/100ml
2.	<i>Coliform Bacteria</i>	IS-1622	Absent	Absent	Absent	Absent/100ml

**TABLE 4.2.2 (H): GROUND WATER QUALITYORGANOLEPTIC & PHYSICAL PARAMETERS**

S.NO.	Parameter	Test Method	Results		Unit	Requirement (Acceptable Limit)	Permissible Limit in absence of alternate source
			GW-7	GW-8			
1.	Colour	IS-3025(P-04)	<1.00	<1.00	Hazen Unit	5	15
2.	Odour	IS-3025(P-05)	Agreeable	Agreeable	-	Agreeable	Agreeable
3.	Taste	IS-3025(P-07 & 08)	Agreeable	Agreeable	-	Agreeable	-
4.	Turbidity	IS-3025(P-10)	<1.00	<1.00	NTU	1	5
5.	pH value	IS-3025(P-11)	7.88	7.30	-	6.5-8.5	-
6.	Total dissolve solid ( TDS)	IS-3025(P-16)	488	536	mg/l	500	2000

**TABLE 4.2.2 (I): GROUND WATER QUALITY  
GENERAL PARAMETERS CONCERNING SUBSTANCES UNDESIRABLE IN EXCESSIVE AMOUNTS**

S.NO.	Parameter	Test method	Results		Unit	Permissible Limit in absence of alternate source
			GW-7	GW-8		
1.	Aluminium (as Al)	IS: 3025 (P- 55)	<0.01	<0.01	mg/l	0.2
2.	Total Ammonia	IS: 3025 (P- 34)	<0.10	<0.10	mg/l	No Relaxation
3.	Anionic Detergents (as MBAS)	Annex K of IS- 13428	<0.10	<0.10	mg/l	1.0
4.	Barium (as Ba)	IS: 15302	<0.10	<0.10	mg/l	No Relaxation
5.	Boron (as B)	IS: 3025 (P- 57)	<0.10	<0.10	mg/l	1.0
6.	Calcium (as Ca)	IS: 3025 (P- 40)	36.22	51.28	mg/l	200
7.	Chloramines (as Cl <sub>2</sub> )	IS: 3025 (P- 26)	<1.00	<1.00	mg/l	No Relaxation
8.	Chloride (as Cl)	IS: 3025 (P- 32)	15.48	26.80	mg/l	1000
9.	Copper (as Cu)	IS : 3025 (P-42)	<0.05	<0.05	mg/l	1.5
10.	Fluoride (as F)	IS: 3025 (P-60)	0.33	0.024	mg/l	1.5
11.	Free Residual Chlorine	IS: 3025 (P-26)	BDL	BDL	mg/l	1.0
12.	Iron (as Fe)	IS: 3025(P-53)	0.078	0.083	mg/l	No Relaxation
13.	Magnesium (as mg)	IS: 3025 (P-46)	14.22	18.46	mg/l	100
14.	Manganese (as Mn)	IS: 3025 (P-59)	<0.10	<0.10	mg/l	0.3
15.	Mineral Oil	Clause 6 of IS: 3025	<0.50	<0.50	mg/l	No Relaxation
16.	Nitrate (as NO <sub>3</sub> )	IS: 3025 (P- 34)	2.88	3.12	mg/l	No Relaxation
17.	Selenium (as Se)	IS: 3025 (P- 56)	<0.01	<0.01	mg/l	No Relaxation
18.	Silver (as Ag)	Annex J IS: 13428	<0.05	<0.05	mg/l	No Relaxation
19.	Sulphate (as SO <sub>4</sub> )	IS: 3025 (P- 24)	42.62	132.60	mg/l	400
20.	Sulphide(as H <sub>2</sub> S)	IS-3025 (P-29)	<0.05	<0.05	mg/l	No Relaxation
21.	Alkalinity ( as CaCO <sub>3</sub> )	IS: 3025 (P- 23)	190	226	mg/l	600

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22.	Total Hardness (as CaCO <sub>3</sub> )	IS: 3025 (P- 21)	176	192	mg/l	600
23.	Zinc (as Zn)	IS: 3025 (P- 49)	0.102	0.118	mg/l	15
24.	Phenolic Compound as (C <sub>6</sub> H <sub>5</sub> OH)	IS: 3025 (P- 43)	BDL	BDL	mg/l	0.002

**TABLE 4.2.2 (J): GROUND WATER QUALITY Parameters Concerning Toxic Substances:**

S.NO.	Parameter	Test method	Results		Unit	Requirement (Acceptable Limit)	Permissible Limit in absence of alternate source
			GW-7	GW-8			
1.	Cadmium (as Cd)	IS-3025(P-41)	<0.001	<0.001	mg/l	0.003	No Relaxation
2.	Cyanide (as CN)	IS-3025(P-27)	<0.01	<0.01	mg/l	0.05	No Relaxation
3.	Lead ( as Pb)	IS-3025(P-47)	<0.01	<0.01	mg/l	0.01	No Relaxation
4.	Mercury (as Hg)	IS-3025(P-48)	<0.001	<0.001	mg/l	0.001	No Relaxation
5.	Molybdenum (Mo)	IS-3025(P-2)	<0.05	<0.05	mg/l	0.07	No Relaxation
6.	Nickel (as Ni)	IS-3025(P-54)	<0.01	<0.01	mg/l	0.02	No Relaxation
7.	Poly Nuclear Aromatic Hydrocarbons	APHA 6440	<0.0001	<0.0001	mg/l	0.01	0.05
8.	Poly Chlorinated biphenyls	APHA 6440	<0.0001	<0.0001	mg/l	0.05	No Relaxation
	Total Arsenic (as As)	IS-3025(P-37)	<0.01	<0.01	mg/l	0.01	0.05
	Total Chromium (as Cr)	IS-3025(P-52)	<0.05	<0.05	mg/l	0.05	No Relaxation

**TABLE 4.2.2 (K): GROUND WATER QUALITY:MICROBIAL STUDY RESULTS**

MICROBIOLOGICAL REQUIREMENT RESULT					
S.No.	Parameter	Test Method	Results		Requirements as per IS-10500:2012
			GW-7	GW-8	
1.	<i>Escherichia coli</i>	IS-1622	Absent	Absent	Absent/100ml
2.	<i>Coliform Bacteria</i>	IS-1622	Absent	Absent	Absent/100ml

### **Baseline Quality**

- The pH limit fixed for drinking water samples as per IS-10500 Standards is 6.5 to 8.5 beyond this range the water will affect the mucus membrane and or water supply system. During the study period, the pH was varying for ground waters from 7.02 to 7.88. The pH values for all the samples collected in the study area during study period were found to be within the limits.
- The desirable limit for total dissolved solids as per IS-10500 Standards is 500 mg/l whereas the permissible limits in absence of alternate source is 2000mg/l, beyond this palatability decreases and may cause gastro intestinal irritation. In ground water samples collected from the study area, the total dissolved solids are varying from 345 mg/l to 536mg/l. the TDS of the samples were within the permissible limit of 2000 mg/l.
- The desirable limit for chlorides is 250 as per IS-10500 Standards whereas permissible limit of the same is 1000 mg/l beyond this limit taste, corrosion and palatability are affected. The chloride level in the ground water samples collected in the study area were ranging from 10.68mg/l to a maximum of 46.80mg/l, the chloride samples are within the desirable limits.
- The desirable limit as per IS-10500 Standards for hardness is 300 mg/l whereas the permissible limit for the same is 600 mg/l beyond this limit encrustation in water supply structure and adverse effects on domestic use will be observed. In the ground water samples collected from the study area, the hardness is varying from 130mg/l to 196mg/l.
- Fluoride is the other important parameter, which has the desirable limit of 1mg/l and permissible limit of 1.5 mg/l. In the ground water samples of study area the fluoride value were in the range of 0.13 to 0.21 mg/l..

Overall all the samples collected from the study area were found to be fit for consumption, Most of ground water samples are well within the permissible limits. Most of the heavy metals in all samples are below detectable limits.

### 4.2.3 Surface Water Quality

Surface water quality was assessed on 8 locations. The detail of sampling locations are given ahead-

**TABLE 4.2.3 (A): SURFACE WATER QUALITY STUDY**

Location Code.	Sample collected from	Distance from Site (km)
SW – 1	Kailash River Upstream	Onsite
SW – 2	Kailash River Downstream	Onsite
SW – 3	Surface water Near Lalarkhas	100m S
SW-4	Surface water Near Ukroli	100m W
SW-5	Surface water upstream Near Mirabara rana	3.5 Km NW
SW-6	Surface water downstream Near Mirabara rana	3.3 Km NW
SW-7	Surface water Near Rajnagar	4 Km SW
SW-8	Surface water Near Rudpur	3.5 Km W



**TABLE 4.2.3 (B): Surface Water Quality Study**

<b>RESULTS</b>						
<b>(A)</b>						
<b>S.No.</b>	<b>Parameter</b>	<b>Test Method</b>	<b>Results</b>			<b>Units</b>
			<b>Onsite (Kailash River Upstream)</b>	<b>Onsite (Kailash River Downstream)</b>	<b>SW-2</b>	
1.	pH	IS:3025(Part-11)	7.84	7.32	7.02	
2.	Temperature	IS:3025(Part-9)	23.5	23.5	23.2	<sup>0</sup> C
3.	Turbidity	IS:3025(Part-10)	<1.0	<1.0	<1.0	NTU
4.	Conductivity @25 <sup>0</sup> C	IS:3025(Part-14)	317	336	252	μS/cm
5.	Sulphate (SO <sub>4</sub> )	IS:3025(Part-24)	22.0	26.2	18.6	mg/l
6.	Nitrate (NO <sub>3</sub> )	IS:3025(Part-34)	BDL	BDL	BDL	mg/l
7.	Total Hardness(as CaCO <sub>3</sub> )	IS:3025(Part-21)	132	142	116	mg/l
8.	Chloride(as Cl)	IS:3025(Part-32)	56.0	62	47.6	mg/l
9.	Fluoride (as F)	APHA 4500F	0.17	0.18	0.12	mg/l
10.	COD (as O <sub>2</sub> )	APHA-5220 B	BDL	BDL	BDL	mg/l
11.	Iron (as Fe)	IS:3025(Part-53)	0.054	0.056	0.038	mg/l
12.	Dissolve Oxygen	IS-3025(Part-38)	6.6	6.5	6.5	mg/l
13.	Total Dissolved Solid	IS:3025(Part-16)	205	220	154	mg/l
14.	BOD (3 days at 27 <sup>0</sup> C)	IS:3025 (P-44)	BDL	BDL	BDL	mg/l
15.	Calcium (as Ca)	IS:3025(Part-40)	32.63	35.62	18.60	mg/l
16.	Magnesium (as Mg)	IS:3025(Part-46)	14.64	16.10	5.90	mg/l
17.	Arsenic (as As)	IS:3025(Part-37)	BDL	BDL	BDL	mg/l
18.	Lead (as Pb)	IS:3025(Part-47)	BDL	BDL	BDL	mg/l
19.	Copper (as Cu)	IS:3025(Part-42)	BDL	BDL	BDL	mg/l
20.	Zinc (as Zn)	IS:3025(Part-49)	0.060	0.066	0.030	mg/l
21.	Manganese (as Mn)	IS:3025(Part-59)	BDL	BDL	BDL	mg/l
22.	Total Chromium (as Cr)	IS:3025(Part-52)	BDL	BDL	BDL	mg/l
23.	Sodium (as Na)	IS:3025(Part-45)	22.6	24.2	11.75	mg/l
24.	Potassium (as K)	IS:3025(Part-45)	1.8	1.84	0.78	mg/l
25.	Total Alkalinity (as CaCO <sub>3</sub> )	IS:3025(Part-23)	128	128	76.8	mg/l
26.	Phosphate (as P)	IS:3025(Part-31)	0.12	0.14	0.065	mg/l
27.	Nitrite (as NO <sub>2</sub> )	IS:3025(Part-34)	BDL	BDL	BDL	mg/l

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28	Total Suspended Solid	IS:3025(Part-17)	4.50	5.26	3.18	mg/l
29	Faecal Coliform	IS-1622	$1.4 \times 10^3$ no./100 ml	$1.2 \times 10^3$ no./100 ml	$0.60 \times 10^3$ no./100 ml	>1600M PN/100 ml
30	Total Coliform	IS-1622	$2.4 \times 10^3$ no./100 ml	$2.1 \times 10^3$ no./100 ml	$1.76 \times 10^3$ no./100 ml	MPN/10 OML

**TABLE 4.2.3 (C): Surface Water Quality Study**

<b>TABLE 4.2.3 (C): Surface Water Quality Study</b>						
(A)	<b>Results</b>					
S.No.	Parameter	Test Method	Results			Units
			SW-4	SW-5	SW-6	
1.	pH	IS:3025(Part-11)	7.48	7.10	7.18	
2.	Temperature	IS:3025(Part-9)	26.8	23.0	23.2	<sup>0</sup> C
3.	Turbidity	IS:3025(Part-10)	<1.0	<1.0	<1.0	NTU
4.	Conductivity @25 <sup>0</sup> C	IS:3025(Part-14)	326	294	306	μS/cm
5.	Sulphate (SO <sub>4</sub> )	IS:3025(Part-24)	35.6	20.8	23.1	mg/l
6.	Nitrate (NO <sub>3</sub> )	IS:3025(Part-34)	BDL	BDL	BDL	mg/l
7.	Total Hardness(as CaCO <sub>3</sub> )	IS:3025(Part-21)	168	121	130	mg/l
8.	Chloride(as Cl)	IS:3025(Part-32)	70.8	48.2	52.2	mg/l
9.	Fluoride (as F)	APHA 4500F	0.18	0.14	0.15	mg/l
10.	COD (as O <sub>2</sub> )	APHA-5220 B	BDL	BDL	BDL	mg/l
11.	Iron (as Fe)	IS:3025(Part-53)	0.050	0.042	0.044	mg/l
12.	Dissolve Oxygen	IS-3025(Part-38)	6.1	6.8	6.6	mg/l

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13.	Total Dissolved Solid	IS:3025(Part-16)	232	190	204	mg/l
14.	BOD (3 days at 27 <sup>0</sup> C)	IS:3025 (P-44)	BDL	BDL	BDL	mg/l
15.	Calcium (as Ca)	IS:3025(Part-40)	33.6	26.40	27.62	mg/l
16.	Magnesium (as Mg)	IS:3025(Part-46)	12.60	12.32	13.60	mg/l
17.	Arsenic (as As)	IS:3025(Part-37)	BDL	BDL	BDL	mg/l
18.	Lead (as Pb)	IS:3025(Part-47)	BDL	BDL	BDL	mg/l
19.	Copper (as Cu)	IS:3025(Part-42)	BDL	BDL	BDL	mg/l
20.	Zinc (as Zn)	IS:3025(Part-49)	0.052	0.048	0.050	mg/l
21	Manganese (as Mn)	IS:3025(Part-59)	BDL	BDL	BDL	mg/l
22	Total Chromium (as Cr)	IS:3025(Part-52)	BDL	BDL	BDL	mg/l
23	Sodium (as Na)	IS:3025(Part-45)	46.2	18.2	19.6	mg/l
24	Potassium (as K)	IS:3025(Part-45)	1.80	1.40	1.48	mg/l
25	Total Alkalinity (as CaCO <sub>3</sub> )	IS:3025(Part-23)	126	106	114	mg/l
26	Phosphate (as P)	IS:3025(Part-31)	0.32	0.08	0.09	mg/l
27	Nitrite (as NO <sub>2</sub> )	IS:3025(Part-34)	BDL	BDL	BDL	mg/l
28	Total Suspended Solid	IS:3025(Part-17)	12.30	3.40	3.40	mg/l
29	Faecal Coliform	IS-1622	2.20×10 <sup>3</sup> no./100 ml	0.80×10 <sup>3</sup> no./100 ml	0.88×10 <sup>3</sup> no./100 ml	>1600M PN/100 ml
30	Total Coliform	IS-1622	4.56×10 <sup>3</sup> no./100 ml	2.8×10 <sup>3</sup> no./100 ml	2.6×10 <sup>3</sup> no./100 ml	MPN/10 OML

**TABLE 4.2.3 (D): SURFACE WATER QUALITY STUDY**

S.No.	Parameter	Test Method	Results		Units
			SW-7	SW-8	
1.	pH	IS:3025(Part-11)	6.92	6.88	
2.	Temperature	IS:3025(Part-9)	23.4	22.8	<sup>0</sup> C
3.	Turbidity	IS:3025(Part-10)	<1.0	<1.0	NTU
4.	Conductivity @25 <sup>0</sup> C	IS:3025(Part-14)	268	256	μS/cm
5.	Sulphate (SO <sub>4</sub> )	IS:3025(Part-24)	20.5	17.6	mg/l
6.	Nitrate (NO <sub>3</sub> )	IS:3025(Part-34)	BDL	BDL	mg/l
7.	Total Hardness(as CaCO <sub>3</sub> )	IS:3025(Part-21)	128	110	mg/l
8.	Chloride(as Cl)	IS:3025(Part-32)	56.8	38.8	mg/l
9.	Fluoride (as F)	APHA 4500F	0.14	0.10	mg/l
10.	COD (as O <sub>2</sub> )	APHA-5220 B	BDL	BDL	mg/l
11.	Iron (as Fe)	IS:3025(Part-53)	0.043	0.034	mg/l
12.	Dissolve Oxygen	IS-3025(Part-38)	6.4	6.6	mg/l
13.	Total Dissolved Solid	IS:3025(Part-16)	162	178	mg/l
14.	BOD (3 days at 27 <sup>0</sup> C)	IS:3025 (P-44)	BDL	BDL	mg/l
15.	Calcium (as Ca)	IS:3025(Part-40)	20.32	22.32	mg/l
16.	Magnesium (as Mg)	IS:3025(Part-46)	6.84	8.42	mg/l
17.	Arsenic (as As)	IS:3025(Part-37)	BDL	BDL	mg/l
18.	Lead (as Pb)	IS:3025(Part-47)	BDL	BDL	mg/l

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19.	Copper (as Cu)	IS:3025(Part-42)	BDL	BDL	mg/l
20.	Zinc (as Zn)	IS:3025(Part-49)	0.034	0.032	mg/l
21	Manganese (as Mn)	IS:3025(Part-59)	BDL	BDL	mg/l
22	Total Chromium (as Cr)	IS:3025(Part-52)	BDL	BDL	mg/l
23	Sodium (as Na)	IS:3025(Part-45)	12.8	14.2	mg/l
24	Potassium (as K)	IS:3025(Part-45)	0.84	1.05	mg/l
25	Total Alkalinity (as CaCO <sub>3</sub> )	IS:3025(Part-23)	80.6	90.2	mg/l
26	Phosphate (as P)	IS:3025(Part-31)	0.072	0.06	mg/l
27	Nitrite (as NO <sub>2</sub> )	IS:3025(Part-34)	BDL	BDL	mg/l
28	Total Suspended Solid	IS:3025(Part-17)	3.22	2.80	mg/l
29	Faecal Coliform	IS-1622	0.78×10 <sup>3</sup> no./100 ml	0.72×10 <sup>3</sup> no./100 ml	>1600M PN/100 ml
30	Total Coliform	IS-1622	2.02×10 <sup>3</sup> no./100 ml	1.86×10 <sup>3</sup> no./100 ml	MPN/10 OML

### Surface Water Results

The surface water sample was collected from kailash river upstream and downstream and 6 other location.

**pH:** The pH value of surface water samples was between 6.88- 7.84 and always meets the drinking water desirable standard.

**Total Hardness:** Total hardness value of surface water samples was between is 110-168 mg/l Hardness value is within the acceptable limit of 200 mg/l.

**Total Dissolved Solids (TDS):** TDS of surface water samples was between 154 -232 mg/l and meets permissible limit of 500 mg/l.

**Calcium:** Calcium content in surface water samples was between is 20.32 -32.62 mg/l and found within the acceptable limit of 75 mg/l.

**Magnesium:** Magnesium content in surface water samples was between is 5.9-16.10 mg/l and found within the acceptable limit of 75 mg/l.

**Fluoride:** Fluoride content of surface water samples was between is 0.10 – 0.18 mg/l and meets the acceptable limit of 1 mg/l for potable water.

**Total Alkalinity:** Total alkalinity of surface water samples was between is 76.8 - 128 mg/l and meets within the permissible limit 600 mg/l.

**Sulphate:** Sulphate content in surface water samples was between is 17.6 – 35.6 mg/l and meets the acceptable limit of 200 mg/l for potable water.

## **4.3 Air environment**

### **4.3.1 Meteorological Conditions**

Meteorology is the key to understand the air quality. The essential relationship between meteorology and atmospheric dispersion involves wind in the broadest sense. Wind fluctuations over a very wide range of time, accomplish dispersion and strongly influence other processes associated with them.

### **4.3.2 Climate And Rainfall**

The climate varies from Sub-tropical and sub-humid with three distinct seasons i.e. summer, monsoon (rainy season) and winter. The rainy season starts from the month of middle June to September end, and followed by the winter season, which starts from the end of October and goes up to February. The winter rains are generally experienced in late December or early January, which brings down the temperature and that's how December and January are the

coldest months in the district. The summer season starts from March and it goes up to June. The hottest months of the year are May and June. The maximum temperature in the district goes up to 42°C during the summers and the minimum temperature is between 1 and 4°C, further north of the district, the temperature comes down to 0.4°C in winter season. Rainfall, spatially, is highly variable depending upon the altitude. The intensity of the rainfall increases from south to north and the amount of rainfall decreases in generally from west to east. About 90% of the rainfall received during the monsoon period, and the remaining 10% of the rainfall in non-monsoon period. The average annual rainfall is 1296.85 mm (Year; 2004).

### **4.3.3 Ambient Air Quality**

The ambient air quality was monitored in the impact area as per MoEF guidelines. The study area represents mostly rural environment. The prime objective of the baseline air quality study was to assess the ambient air quality of the mining lease area.

### **4.3.4 Methodology Adopted For the Study**

The baseline status of the ambient air quality has been assessed through a scientifically designed ambient air quality network. The design of monitoring network in the air quality assessment has been based on the following consideration.

Meteorological parameters-

- Topography of the study area
- Representative of regional background air quality for obtaining baseline status
- Representative of likely impact areas.

Ambient Air Quality Monitoring (AAQM) stations were set up at 6 locations with due consideration to the above mentioned points. AAQM locations were selected in downwind and upwind direction of the proposed mining lease area covering core and buffer zones. The details of the monitoring stations are given in the table.

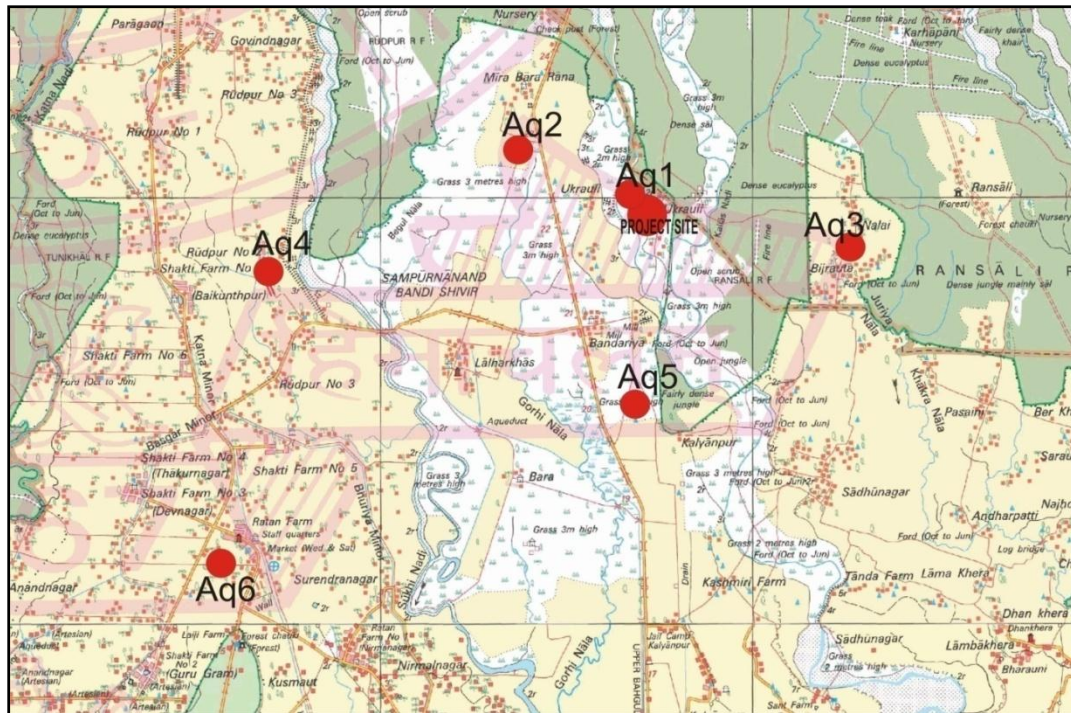
Ambient air quality monitoring was carried out twice a week with a frequency of 24 hours for 12 weeks during the study period. The common air pollutants namely Particulate Matter

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(PM<sub>2.5</sub>), Particulate Matter-10 (PM<sub>10</sub>), Sulphur-dioxide (SO<sub>2</sub>) and Oxides of Nitrogen (NO<sub>x</sub>), has been measured through a planned field monitoring.

**Table-4.3.1: Location of Ambient Air Quality monitoring stations**

Locations Code	Locations	Distance with respect to the mine (km)
AQ1	Project Site	onsite
AQ2	Mirabararana	1.5Km NW
AQ3	Nalai	2.5Km EE
AQ4	Rudpur	4 Km W
AQ5	Lalarkhas	1.8Km W
AQ6	Shaktifarm	5.5Km SW



#### 4.3.5. Results of Air Quality

**Table-4.3.2: Ambient Air Quality results in the Study Area (PM<sub>2.5</sub>)**

Location Code	Name of the Station	Min	Max	Average
AQ1	Onsite	39.24	56.26	47.44
AQ2	Mirabararana	40	60.04	51.08
AQ3	Nalai	42.97	58.95	50.96
AQ4	Rudpur	43.74	56.74	48.9
AQ5	Lalarkhas	39.21	54.26	47.01
AQ 6	Shaktifarm	39.21	53.26	47.01

**Table-4.3.3: Ambient Air Quality results in the Study Area (PM<sub>10</sub>)**

Location		PM <sub>10</sub> (µg/m <sup>3</sup> )		
Code	Name of the Station	Min	Max	Average
AQ1	onsite	68.26	81.32	73.93
AQ2	Mirabararana	65.05	78.1	71.03
AQ3	Nalai	66.73	77.46	72.09
AQ4	Rudpur	67.71	77.45	72.69
A Q5	lalarkhas	70.25	81.47	74.6
AQ6	shaktifarm	70.25	83.34	74.6

**Table-4.3.4: Ambient Air Quality results in the Study Area (SO<sub>2</sub>)**

Location		SO <sub>2</sub>		
Code	Name of the Station	Min	Max	Average
AQ1	Onsite	10.25	15.62	12.5
AQ2	Mirabararana	11.4	16.25	14.06
AQ3	Nalai	20.11	25.54	22.4
AQ4	Rudpur	10.65	16.65	13.8
AQ5	Lalarkhas	11.26	16.65	14.54
AQ 6	Shaktifarm	11.26	16.65	14.54

**Table-4.3.5: Ambient Air Quality results in the Study Area (NO<sub>2</sub>)**

Location		NO <sub>2</sub> (µg/m <sup>3</sup> )		
Code	Name of the Station	Min	Max	Average
AQ1	Onsite	18.74	28.14	22.63
AQ2	Mirabararana	21.49	32	26.01
AQ3	Nalai	34.34	39.54	37.11
AQ4	Rudpur	19.86	31.47	25.94
AQ5	lalarkhas	12.84	30.08	22.26
AQ6	shaktifarm	12.84	30.08	22.26

## **Baseline Scenario**

### **a) Particulate Matter (PM<sub>2.5</sub>)**

Fine particles include all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes. In general some of the important sources of particulate matter are mines. The following sources of particulate matter in the study area are identified:

- ✓ Emission due to vehicular movement
- ✓ Dust generation from ground or other mining operations

PM<sub>2.5</sub> recorded within the study area was in the range of 39.21 µg/m<sup>3</sup> to 60.04µg/m<sup>3</sup> with the average value ranging between 47.01µg/m<sup>3</sup> to 51.08µg/m<sup>3</sup> were compared with the National Ambient Air Quality Standards (NAAQS) and found that all sampling stations recorded in the study area are within the applicable limits i.e., 60µg/m<sup>3</sup> for PM<sub>2.5</sub> for industrial, residential, rural and other areas.

### **b) Suspended Particulate Matter (PM<sub>10</sub>)**

Suspended particulate matter in general terms is the particulate matter in suspension in ambient air. It includes dust, smoke etc. In general some of the important sources of suspended particulate matter are mining. The following sources of suspended particulate matter in the study area are identified:

- ✓ Emission due to vehicular movement
- ✓ Dust generation from ground or other mining operations

PM<sub>10</sub> recorded within the study area was in the range of 65.06µg/m<sup>3</sup> to 83.34µg/m<sup>3</sup> with the average value ranging between 71.03µg/m<sup>3</sup> to 74.6µg/m<sup>3</sup>.

The 24 hourly average values of PM<sub>10</sub> were compared with the National Ambient Air Quality Standards (NAAQS) and found that all sampling stations recorded in the study area are within the applicable limits i.e., 100 µg/m<sup>3</sup> for PM<sub>10</sub> for industrial, residential, rural and other areas.

### **c) Sulphur Dioxide (SO<sub>2</sub>)**

Sulphur dioxide gas is an inorganic gaseous pollutant. Sulphur dioxide emissions are expected to be emitted wherever combustion of any fuel containing sulphur takes place. The sulphur in the fuel will combine with oxygen to form sulphur dioxide. Emissions from domestic/consumption of fuel (diesel etc) has also been identified. Sulphur dioxide in atmosphere is significant because of its toxicity; sulphur dioxide is capable of producing illness and lung injury. Further it can combine with water in the air to form toxic acid aerosols that can corrode metal surfaces, fabrics and the leaves of plants. Sulphur dioxide is an irritant to the eyes and respiratory system. Excessive exposure to sulphur dioxide causes bronchial asthma and other breathing related diseases as it affects the lungs.

SO<sub>2</sub> recorded within the study area was in the range of 10.25 to 25.54 µg/m<sup>3</sup> with the average value ranging between 12.5 µg/m<sup>3</sup> to 14.54 µg/m<sup>3</sup>.

The 24 hourly average values of SO<sub>2</sub> were compared with the National Ambient Air Quality Standards (NAAQS) and it was found that all sampling stations recorded values are below the applicable limits 80 µg/m<sup>3</sup> for industrial, residential, rural and other areas.

### **d) Oxides of Nitrogen (NO<sub>2</sub>)**

The important sources of oxides of Nitrogen are from utilities and auto exhaust due to vehicular movement in mine lease area. The following sources of oxides of nitrogen in the study area are identified.

✓ **Emissions from vehicular movements in the study area.**

Oxides of Nitrogen in the presence of sunlight will undergo reactions with a number of organic compounds to produce all the effects associated with photochemical smog. NO<sub>2</sub> has inherent ability to produce deleterious effects by themselves like toxicity. It causes asphyxiation when its concentration is great enough to reduce the normal oxygen supply from the air.

NO<sub>2</sub> recorded within the study area was in the range of 12.84µg/m<sup>3</sup> to 39.54µg/m<sup>3</sup> with the average value ranging between 22.26µg/m<sup>3</sup> to 37.11µg/m<sup>3</sup>.

The 24 hourly average values of NO<sub>2</sub> were compared with the National Ambient Air Quality Standards (NAAQS) and it was found that all sampling stations recorded values are below the applicable limits 80 µg/m<sup>3</sup> for industrial, residential, rural and other areas.

#### **4.4 NOISE ENVIRONMENT**

Noise is one of the most undesirable and unwanted by-products of our modern life style. It may not seem as insidious or harmful as air and water pollutants but it affects human health and well-being and can contribute to deterioration of human well-being in general and can cause neurological disturbances and physiological damage to the hearing mechanism in particular. It is therefore, necessary to measure both the quality as well as the quantity of noise in and around the proposed site.

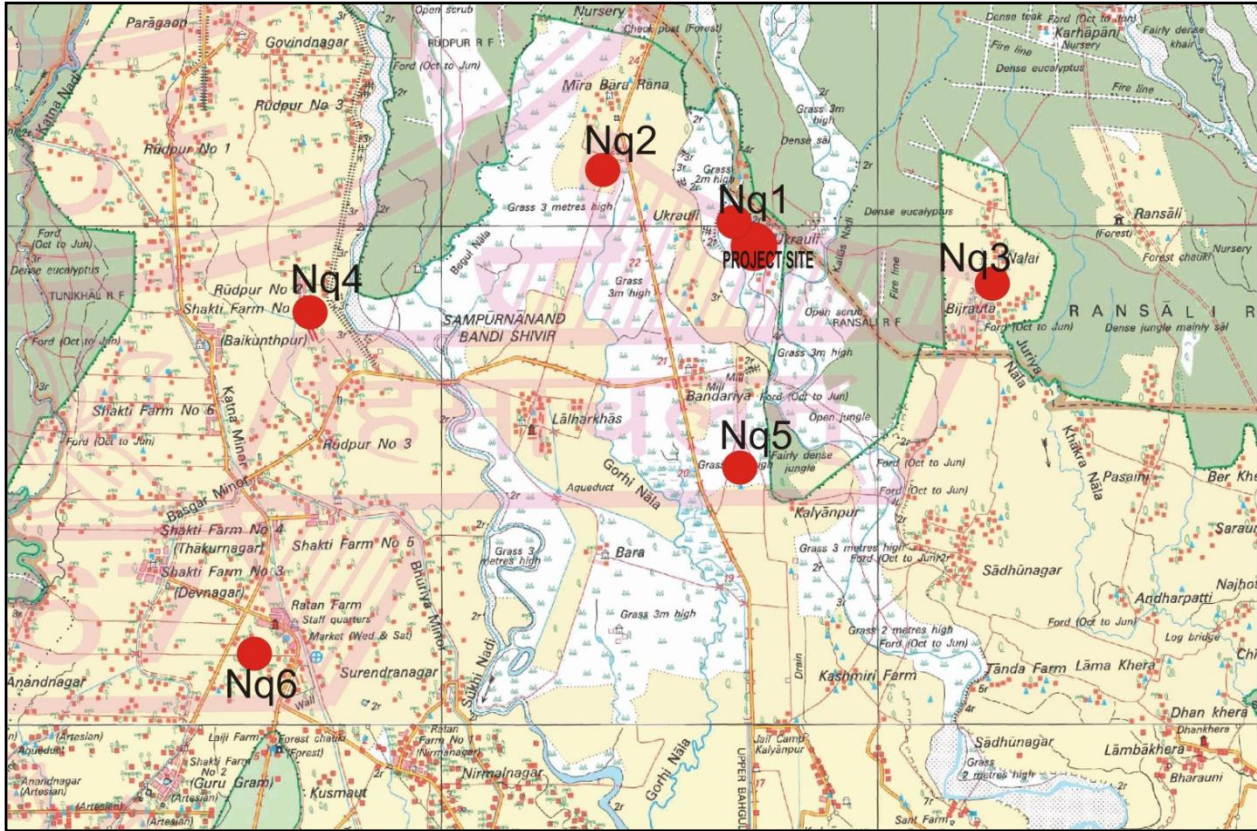
##### **4.4.1 Source of Noise**

The main sources of noise in the study area are vehicular traffic, machinery used for loading and unloading.

##### **4.4.2 Noise level in the Study Area**

The baseline noise levels have been monitored at 6 locations within the study zone, using a sound level meter and noise level measurement locations were identified for assessment of existing noise level status, keeping in view the land use pattern, industrial area, Silence Zone, residential areas in villages etc., if available within 10 km radius of the study area. The day levels

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have been monitored during 6.00 AM to 10.00 PM and night noise levels, during 10.00 PM to 6.00 AM. The noise monitoring stations are shown in Figure 3.3 and represented in Table 3.7.

**Table 4.4.1: Monitoring Locations**

Locations Code	Locations	Distance with respect to the mine (km)
NQ1	Project site	
NQ2	Mirabararana	1.5Km NW
NQ3	Nalai	2.5Km EE
NQ4	Rudpur	4 Km W
NQ5	Lalarkhas	1.8Km W
NQ6	Shaktifarm	5.5Km SW

#### 4.4.3 Ambient Noise Standards

Ministry of Environment & Forests (MoEF) has notified the noise standards vide gazette notification dated February 14, 2000 for different zones under the Environment Protection Act (1986). These standards are **given in Table-4.8**

**Table 4.4.2 Ambient Quality Standards in respect of Noise**

Area Code	Category of Area	Noise Db (A) Leq	
		Daytime*	Night time*
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Note:

1. Daytime is from 6.00am to 10.00 pm and Nighttime is from 10.00 pm to 6.00 am.
2. Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

#### 4.4.4 Noise quality results

**Table 4.4.3: Noise Levels in the study area – Db (A)**

S. No	Test Parameters	Results						Units	Requirement (as per CPCB Guidelines Limits in dB (A) Leq		
		N1	N2	N3	N4	N5	N6		Category of Area/ Zone	Day Time	Night Time
1.	L <sub>day</sub> (6.0 AM TO 10.0 PM)	57.8	55.5	54.6	55.5	56.1	58.5	dB(A)	Industrial Area	75	70
									Commercial Area	65	55
2.	L <sub>night</sub> (10.0 PM TO 6.0 AM)	40.2	38.6	36.8	38.2	40.0	34.3	dB(A)	Residential Area	55	45
									Silence Zone	50	40

The values of noise observed in some of the areas are primarily owing to vehicular traffic and other anthropogenic activities. Assessment of hourly night time Leq (Ln) varies from 34.3 to 40.0 dB (A) and the hourly daytime Leq (Ld) varies 54.6 to 58.5 dB (A)

#### **4.5 BIOLOGICAL ENVIRONMENT**

Biological environment is one of the most important components to be taken care for carrying out environment impact assessment study. Mining has been the major reason of degradation of environment since long back. The selection of site is one of the important aspects for ensuring sustainability of the environment. Therefore with proper assessment of impacts of mining over biological environment can be studied and accordingly mitigation measures can be proposed.

Study of flora and fauna and of the study area is based on primary survey and secondary data available through forest departments and data available over web portal of forest departments. Primary survey data collected has been verified with secondary data.

##### **4.5.1 Objective of the study-**

The study was carried out to fulfill following objectives.

- To collect the primary data based on filed survey
- To collect secondary data available through latest research paper and web portal of forest department
- The objective of the study is to ensure the natural ecological balance of the environment in the study area.
- To prepare list of endangered, threatened and vulnerable species in the study area.
- To plan the impact of mining over the concerned species noticed in the region.

##### **4.5.2 Scope of the study**

- To assess the flora and fauna of core zone (project site) & buffer zone (study area)

- To assess the species protected by specific legislation (Rare, endangered & critically endangered endemic & vulnerable species)

### **Approach of the study**

To carry out the study following tasks were undertaken-

- Site visit to the site
- Desk study
- Core zone buffer zone field survey

#### **4.5.3 (a) Methodology adopted during survey for fauna**

Following methodologies were adopted for assessment of different flora and fauna species-

01- Birds were studied during dawn

02- Nocturnal animals and borrowing animals were studied after dusk

03- To study other animals during morning and evening time

04- Random sightings were also done for ex. For reptiles stone lifting was done, rock crevices and wall space of structures in and around site were checked. Amphibians were checked near stagnant water bodies. Birds were studied by taking several trials in the area.

05- Direct and indirect evidences were kept in mine while field survey, indirect evidences may include like pugmarks, nests and other signs

06- Photo-documentation of the species

#### **4.5.3 (b) Methodology of study of flora**

The flora of the core zone and buffer zone was surveyed. The local people were consulted for collection of flora of the region. The information was also verified with forest department persons. Random survey was done and field sheet was prepared.

#### **4.5.4 Flora Core zone**

Core zone is devoid of any significant vegetation.

#### **4.5.5 Fauna of core zone-**

It's a river bed area no faunal species were reported in the region, only cattles were found roaming over for grazing purpose.

#### **4.5.6 Flora of buffer zone-**

##### **Table 4.5.1-Trees**

<b>Sl no.</b>	<b>Botanical name</b>	<b>Common name</b>
1	<i>Eucalyptus globulus</i>	Safeda
2	<i>Diospyros malabarica</i>	Gaab
3	<i>Ehretia laevis</i>	Chamror
4	<i>Emblica officinalis</i>	Amla
5	<i>Casearia tomentosa</i>	Chilla
6	<i>Bridelia retusa</i>	Khaja
7	<i>Buchanania latifolia</i>	Piyar
8	<i>Dalbergia sissoo</i>	Shisham
9	<i>Malabaricum</i>	Red silk cotton tree
10	<i>Celtis tetrandra</i>	Khirk
11	<i>Cassia fistula</i>	Amaltas
12	<i>Ficus bengalensis</i>	Banyan tree
13	<i>Ficus glomerata</i>	Goolar
14	<i>Kydia calycina</i>	Pulia
15	<i>Lagerstroemia parviflora</i>	Dhaura
16	<i>Morus alba</i>	White mulberry
17	<i>Semecarpus anacardium</i>	Billar
18	<i>Schleichera trijuga</i>	Lac tree
19	<i>Grewia tiliifolia</i>	Dhaman
20	<i>Ficus religiosa</i>	Peepal
21	<i>Ficus racemosa</i>	Umber
22	<i>Terminalia belerica</i>	Bahera
23	<i>Sterculia urens</i>	Kulu
24	<i>Putranjiva roxburghii</i>	Putranjiva
25	<i>Syzygium cerasoides</i>	Rai jamun
26	<i>Schleichera oleosa</i>	Kusum
27	<i>Mallotus philippensis</i>	Kumkum tress
28	<i>Glochidion assamicum</i>	Bhoma
29	<i>Ougeinia oojeinensis</i>	Sandan
30	<i>Terminalia tomentosa</i>	Asan
31	<i>Syzygium cumini</i>	Jamun
32	<i>Tectona grandis</i>	Teak
33	<i>Terminalia alata</i>	Saaj
34	<i>Pterocarpus marsupium</i>	Bijasal
35	<i>Shorea robusta</i>	Sal
36	<i>Stereospermum suaveolens</i>	Podal
37	<i>Themeda arundinacea</i>	Kappor ghass

38	<i>Garuga pinnata</i>	Kharpat
39	<i>Madhuca indica</i>	Mahua
40	<i>Mangifera indica</i>	Mango
41	<i>Trewia nudiflora</i>	Pindar
42	<i>Terminalia arjuna</i>	Arjun

**Table 4.5.2: Shrubs/grasses/herbs**

Sl no.	Botanical name	Common name
01	<i>Bauhinia vahlii</i>	Malu
02	<i>Vetiveria zizanioides</i>	Khus
03	<i>Saccharum spontaneum</i>	Kaans
04	<i>Acacia pennata</i>	Biswal
05	<i>Flemingia semialata</i>	Ban chola
06	<i>Murraya koenigii</i>	Mitha neem
07	<i>Randia dumetorum</i>	Mainaphal
08	<i>Ardisia solanacea</i>	Bisi
09	<i>Holarrhena antidysenterica</i>	Kutaja
10	<i>Ageratum conyzoides</i>	Jungli pudina
11	<i>Themada arundinacea</i>	Tarlac grass
12	<i>Clerodendrum infortunatum</i>	Bhant
13	<i>Phragmites karka</i>	Nal
14	<i>Glycosmis pentaphylla</i>	Ban nimbu
15	<i>Tamarix dioica</i>	Nona jhau
16	<i>Dioscorea belophylla</i>	Turar

#### 4.5.7 Fauna of buffer zone

**Table 4.5.3:Mammals**

Mammals			
	Common name	Zoological name	Schedule of species
1	Dog	<i>Cuon alpinus</i>	-
2	Cow	<i>Bos taurus</i>	-

3	Nilgai	<i>boselophus tragacamelus</i>	III
4	Indian porcupine	<i>hystux indica</i>	IV
5	cat	<i>felis catus</i>	-
6	chital	<i>axis axis</i>	III
7	grey mongoose	<i>herpestres edwardsii</i>	II

**Table 4.5.4: Aves**

	<b>Aves</b>		
	<b>Common name</b>	<b>Zoological name</b>	<b>Schedule of species</b>
1	Black kite	<i>milvus migrans</i>	-
2	emerald dove	<i>chalcophaps indica</i>	IV
3	black drongo	<i>dicrurus macrocerus</i>	IV
4	indian roller	<i>Coracias benghalensis</i>	IV
5	Indian cuckoo	<i>cuculus micropterus</i>	IV
6	peacock	<i>pavo ceistatus</i>	I
7	wood pecker	<i>dendrocopus cathpharius</i>	IV
8	bulbul	<i>pycnonotus cafer</i>	IV
9	crow	<i>corvus splendens</i>	V
10	columba livia	<i>pigeon</i>	IV
11	koel	<i>eudynamys scolopaceus</i>	IV
12	kite	<i>milvus migrans</i>	IV
13	maina	<i>acridotheres tristis</i>	IV
14	baya	<i>ploceus philipinus</i>	IV
15	parakeet	<i>psitacula krameri manilensis</i>	IV
16	spotted dove	<i>streptopelia chinensis</i>	IV

**Table 4.5.5:Amphibians**

<b>Amphibian common name</b>	<b>Zoological name</b>	<b>Schedule of species</b>
Frog	<i>Rana tigrina</i>	IV
Toad	<i>Bufo bufo</i>	IV

**Table 4.5.6: Reptiles**

<b>Reptiles</b>		
<b>Common name</b>	<b>Zoological name</b>	<b>Schedule of species</b>

chameleon	<i>chameleo calyptratus</i>	
krait snake	<i>bungarus caeruleus</i>	IV
house lizard	<i>hemidactylus flaviviridis</i>	
indian cobra	<i>Naja naja</i>	II
Indian garden lizard	<i>calotes versicolor</i>	IV

**Table 4.5.7: Insects**

<b>Insects</b>	
<b>Common name</b>	<b>Zoological name</b>
house fly	<i>Musca domestica</i>
honey bee	<i>apis indica</i>
dragonfly	<i>agarian sp</i>
wasps	<i>vespa orientalis</i>

As per wild life protection act 1972 and subsequent amendment most of the species reported in the study area are schedule III & IV. Only one species Peacock (*pavo cristatus*) has been found to be in schedule I. Its conservation will be done while mining activity.

Peacock conservation plan is attached as **Annexure 7**.

## **4.6-SOCIO ECONOMIC ENVIRONMENT**

### **4.6.1 Introduction:**

The present proposal is for mining of Sand, bajri boulder mine (minor mineral). The mine is located in Village Ukroli, Tehsil-sitarganj in District Udham Singh Nagar, Uttarakhand. Entire lease area comprises sand, bajri & boulder and is Government land as per revenue records.

### **4.6.2 Objective of Study**

The purpose of this study is to obtain baseline socio-economic data in and around the mining project site. The study will be done specifically, as per TOR no. 47/SEAC dated 26/02/2019.

#### 4.6.3 Approach & Methodology Adopted For Conducting Socio Economic Study

The socio-economic survey has been conducted by team experts. The socio-economic scenario in the study area (10 kms radius area) of the Ukroli Sand, bajri & boulder mine is based on secondary data compiled from census data, 2011. Primary verification has been carried out during field visits using sample site survey.

#### 4.6.4- Study Area

- i) The study area is 10km radius area of the proposed mining project. Topographical map, Google earth maps and OSM sheet maps have been used to identify the villages in 10km radius.
- ii) The study area of this mine occupies in two districts of UP.

The study area comprise of 10km radius buffer zone. It is found that 75 villages has been found in the study area. 45 villages lie in district udham singh nagar and 30 villages lie in district Nainital.

#### 4.6.5 Demographic Features of Study Area

A study was undertaken with respect to demography, occupational pattern, literacy rate and other important socio-economic indicators of these districts to reveal the socio-economic structure of the entire project area. The summary is given below:

**Table 4.6.2 Demographic Features & work profile of the study area based on Census data 2011**

Name Of Village	No. of Households	Total Population	Sex Ratio	% of SC	% of ST	Overall Literacy %	Male Literacy %	Female Literacy %	Total Population	Total Worker	Total Male Worker	Total Female Worker	Total Main Worker	Total Margin Worker
Ukroli	183	1062	927	79.60%	0.50%	75.80%	89.70%	59.90%	1062	32.00%	88.80%	11.20%	89.10%	10.90%
MirabaraRana	6	26	529	19.20%	0.00%	66.70%	68.80%	62.50%	26	42.30%	100.00%	0.00%	90.90%	9.10%
Lalarpatti	19	88	956	15.90%	0.00%	96.20%	100.00%	91.70%	88	35.20%	96.80%	3.20%	90.30%	9.70%
Lalarkhas	62	489	270	29.90%	2.00%	85.20%	86.40%	80.40%	489	63.60%	99.40%	0.60%	99.00%	1.00%
Rudpur	800	4317	933	0.50%	0.00%	70.50%	80.30%	59.80%	4317	35.50%	79.20%	20.80%	71.80%	28.20%

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Govind Nagar	846	4580	937	0.20%	0.00%	67.00%	76.30%	56.90%	4580	42.00%	66.80%	33.20%	97.10%	2.90%
Baikunthpur	1153	6095	891	6.50%	0.00%	69.30%	78.80%	58.50%	6095	37.40%	78.20%	21.80%	96.90%	3.10%
Surendra Nagar	322	1733	923	0.00%	0.00%	74.70%	84.10%	64.70%	1733	33.90%	81.30%	18.70%	96.30%	3.70%
Tegor Nagar	607	3196	910	0.60%	0.00%	76.60%	86.40%	65.70%	3196	43.20%	68.40%	31.60%	82.60%	17.40%
Sisona	704	4157	978	13.40%	56.50%	74.80%	84.80%	64.50%	4157	29.60%	83.00%	17.00%	83.10%	16.90%
Tiliyapur	668	3792	997	37.40%	0.00%	76.00%	85.60%	66.30%	3792	37.60%	71.00%	29.00%	84.40%	15.60%
Gurugram	839	4591	892	23.10%	0.00%	70.00%	80.40%	58.10%	4591	49.20%	64.10%	35.90%	69.10%	30.90%
Pipalia	123	648	1097	0.80%	0.00%	70.00%	79.90%	60.40%	648	30.70%	86.90%	13.10%	94.00%	6.00%
Dev Nagar	629	3275	924	2.50%	0.00%	69.10%	78.50%	58.90%	3275	52.00%	64.70%	35.30%	84.50%	15.50%
Arvind Nagar	859	4347	853	0.00%	0.00%	70.80%	80.10%	60.20%	4347	38.40%	75.70%	24.30%	69.60%	30.40%
Raj Nagar	484	2567	936	0.40%	0.00%	69.30%	79.00%	59.00%	2567	38.70%	73.00%	27.00%	89.00%	11.00%
BaruwaBagh	233	1343	894	23.20%	24.10%	73.80%	81.10%	65.80%	1343	48.80%	57.90%	42.10%	50.50%	49.50%
Nakulia	603	3819	973	2.30%	47.20%	60.80%	69.50%	52.10%	3819	28.10%	91.00%	9.00%	98.20%	1.80%
Nirmal Nagar	815	4504	938	1.20%	0.00%	68.20%	81.00%	54.40%	4504	46.10%	62.70%	37.30%	82.60%	17.40%
Kushmoth	145	654	952	6.70%	0.00%	61.10%	69.30%	52.80%	654	33.30%	77.10%	22.90%	39.90%	60.10%
PrahladPalsia	9	38	1000	0.00%	0.00%	79.40%	88.20%	70.60%	38	39.50%	93.30%	6.70%	66.70%	33.30%
Donda	186	839	881	0.00%	0.00%	60.30%	75.20%	43.50%	839	31.50%	83.30%	16.70%	39.80%	60.20%
Basgar	273	1566	972	9.70%	0.00%	69.00%	79.60%	58.20%	1566	36.10%	71.70%	28.30%	42.00%	58.00%
Kalyanpur	370	1782	989	37.50%	3.20%	82.40%	91.50%	73.40%	1782	35.40%	68.60%	31.40%	70.00%	30.00%
Bawanpuri	219	1143	981	7.20%	34.60%	80.40%	89.20%	71.50%	1143	49.90%	54.40%	45.60%	43.50%	56.50%
Chaumhala	92	524	912	9.20%	82.60%	82.50%	86.40%	78.30%	524	31.70%	86.70%	13.30%	99.40%	0.60%
Nalai	162	1020	1000	7.20%	36.80%	77.00%	88.70%	65.40%	1020	39.50%	67.20%	32.80%	96.30%	3.70%
Bhitaura	237	1481	870	1.80%	0.00%	53.10%	60.70%	44.30%	1481	41.90%	73.50%	26.50%	84.80%	15.20%
Ranshali	135	680	838	0.00%	0.00%	57.90%	67.10%	46.80%	680	23.80%	94.40%	5.60%	98.10%	1.90%
Bichai	99	530	900	0.00%	24.90%	65.20%	79.30%	50.00%	530	40.20%	73.70%	26.30%	33.30%	66.70%
Bichuwa	373	2119	988	0.00%	37.70%	58.90%	65.30%	52.20%	2119	50.60%	55.30%	44.70%	92.70%	7.30%
TharuTisor	292	1666	908	52.20%	36.00%	77.90%	87.50%	67.40%	1666	32.40%	79.20%	20.80%	51.20%	48.80%
Haraiya	120	677	957	0.00%	66.50%	73.00%	79.00%	66.40%	677	54.90%	50.30%	49.70%	100.00%	0.00%

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4	Pahsheni	147	845	1017	0.00%	46.70%	68.00%	77.30%	58.60%	845	43.10%	62.90%	37.10%	72.80%	27.20%
5	Tikuri	440	2527	1018	0.00%	21.50%	71.50%	83.20%	60.00%	2527	25.70%	93.80%	6.20%	50.20%	49.80%
6	LambaKhera	147	952	947	0.00%	58.20%	70.30%	80.00%	60.00%	952	62.10%	52.30%	47.70%	51.30%	48.70%
7	Bharauni	206	1233	973	0.60%	75.70%	82.00%	89.20%	74.60%	1233	41.30%	68.00%	32.00%	73.70%	26.30%
8	Saronja	304	1520	949	0.00%	43.40%	66.10%	77.30%	54.30%	1520	52.20%	52.70%	47.30%	83.70%	16.30%
9	Kaithulia	227	1188	967	0.00%	24.40%	62.50%	72.90%	52.40%	1188	36.20%	67.40%	32.60%	81.20%	18.80%
0	Audala	9	45	875	0.00%	0.00%	61.40%	69.60%	52.40%	45	31.10%	100.00%	0.00%	100.00%	0.00%
1	Magarsara	210	1320	985	4.10%	75.80%	73.70%	82.60%	64.70%	1320	40.80%	68.80%	31.20%	99.40%	0.60%
2	Sadhu Nagar	361	2045	997	25.70%	60.30%	71.90%	80.50%	63.50%	2045	64.70%	53.20%	46.80%	46.60%	53.40%
3	Dohari	114	684	864	66.40%	0.00%	80.50%	90.90%	68.50%	684	20.50%	91.40%	8.60%	85.00%	15.00%
4	Bereya	203	1119	923	0.60%	54.90%	78.20%	87.10%	68.40%	1119	46.50%	63.80%	36.20%	88.50%	11.50%
5	Dhayanpur	236	1377	1007	0.70%	56.10%	62.70%	74.00%	51.60%	1377	42.30%	52.30%	47.70%	37.70%	62.30%
6	Jaipur	34	179	884	0.00%	0.00%	78.50%	84.00%	72.10%	179	69.30%	55.60%	44.40%	94.40%	5.60%
7	Indrapur	45	241	854	0.00%	0.00%	84.60%	95.00%	72.00%	241	53.10%	53.10%	46.90%	93.00%	7.00%
8	MallaPachauliya	113	545	866	21.50%	0.00%	86.90%	94.20%	77.70%	545	37.20%	83.30%	16.70%	62.10%	37.90%
9	LakhanMandi	133	687	914	28.50%	0.00%	79.10%	87.90%	69.20%	687	34.90%	73.80%	26.30%	100.00%	0.00%
0	DubelaBera	20	103	943	29.10%	0.00%	80.00%	91.50%	67.40%	103	44.70%	56.50%	43.50%	93.50%	6.50%
1	MallaChorgaliya	55	297	967	8.10%	0.00%	82.00%	92.20%	71.70%	297	47.10%	57.10%	42.90%	75.70%	24.30%
2	LakhanmandiKhola Bazar	104	486	921	18.30%	1.20%	82.80%	91.80%	72.50%	486	38.10%	80.50%	19.50%	96.20%	3.80%
3	Bhawanipur	25	127	841	0.80%	0.00%	86.70%	90.90%	81.50%	127	56.70%	54.20%	45.80%	97.20%	2.80%
4	Harkishanpur	52	289	979	6.60%	0.00%	85.80%	97.60%	74.40%	289	48.80%	43.30%	56.70%	90.80%	9.20%
5	DeopurDanai	31	158	816	13.90%	0.00%	87.80%	96.10%	77.40%	158	49.40%	59.00%	41.00%	97.40%	2.60%
6	KatanNayagaon	184	903	967	31.80%	0.00%	82.00%	89.10%	74.90%	903	52.40%	55.40%	44.60%	72.30%	27.70%
7	KatanKhanwal	57	297	954	36.00%	1.30%	71.70%	81.70%	61.00%	297	48.80%	57.90%	42.10%	94.50%	5.50%
8	BechpurPargai	18	95	1021	24.20%	0.00%	86.80%	97.30%	76.90%	95	29.50%	67.90%	32.10%	85.70%	14.30%
9	HaripurMahtoliya	14	63	909	0.00%	0.00%	82.80%	89.70%	75.90%	63	96.80%	50.80%	49.20%	100.00%	0.00%
0	Gobindpur	60	304	1054	20.70%	0.00%	76.80%	85.00%	68.70%	304	66.80%	47.80%	52.20%	80.30%	19.70%

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1	Umedpur No1	6	39	1294	0.00%	0.00%	89.20%	100.00%	80.00%	39	92.30%	47.20%	52.80%	97.20%	2.80%
2	ChorgaliaTallaAmkhera	77	380	939	19.20%	0.00%	79.40%	90.40%	67.30%	380	45.00%	67.30%	32.70%	65.50%	34.50%
3	TallaPachaunia	48	305	1047	37.00%	0.00%	82.50%	89.70%	75.50%	305	38.70%	55.90%	44.10%	85.60%	14.40%
4	Umedpur No2	28	162	1025	0.00%	0.00%	87.10%	92.90%	81.40%	162	50.00%	51.90%	48.10%	98.80%	1.20%
5	Madanpur	32	158	795	6.30%	0.00%	82.00%	86.30%	77.30%	158	62.00%	49.00%	51.00%	79.60%	20.40%
6	DevpurSanwal	8	29	813	0.00%	0.00%	100.00%	100.00%	100.00%	29	65.50%	63.20%	36.80%	100.00%	0.00%
7	ChorgaliaKotaliya	17	95	1111	0.00%	0.00%	75.30%	84.60%	65.80%	95	18.90%	88.90%	11.10%	66.70%	33.30%
8	Dharamgarh	54	293	890	78.80%	0.00%	81.30%	88.10%	73.60%	293	32.10%	72.30%	27.70%	47.90%	52.10%
9	Parasurampur	29	159	916	9.40%	0.00%	87.90%	93.20%	82.40%	159	49.10%	56.40%	43.60%	98.70%	1.30%
10	PachuwaKhera	39	220	930	0.00%	0.00%	82.40%	89.50%	75.00%	220	90.50%	51.30%	48.70%	99.50%	0.50%
11	Daulabadpur	19	109	946	4.60%	0.00%	94.60%	100.00%	88.90%	109	24.80%	92.60%	7.40%	63.00%	37.00%
12	Dharampur	24	110	803	0.00%	4.50%	88.60%	96.60%	78.30%	110	22.70%	92.00%	8.00%	68.00%	32.00%
13	Gangapur	16	54	800	0.00%	0.00%	88.60%	87.50%	90.00%	54	44.40%	79.20%	20.80%	83.30%	16.70%
14	MukhaniKharku	37	209	866	8.10%	0.00%	86.40%	95.00%	76.70%	209	32.50%	75.00%	25.00%	75.00%	25.00%
15	Ghoosapur	17	107	911	18.70%	0.00%	89.60%	100.00%	78.30%	107	42.10%	66.70%	33.30%	88.90%	11.10%
		<b>16667</b>	<b>91406</b>	<b>933</b>	<b>10.40%</b>	<b>16.10%</b>	<b>71.50%</b>	<b>81.00%</b>	<b>61.20%</b>	<b>91406</b>	<b>40.80%</b>	<b>69.20%</b>	<b>30.80%</b>	<b>78.40%</b>	<b>21.60%</b>

### Cropping Pattern:

Agriculture is the primary occupation of the people as it justifies the title of “Chawal ki Nagari”. About 64% of the total work force is engaged in farming the very fertile land (Tarai formation). Khariff and Rabi are two major cropping seasons. The main Khariff crops are rice, soyabean, Urd, Moong and till, and the Rabi crops are wheat, barley, Gram, Masoor, Mustard, Sunflower. It is observed in the study area that the rice crop is grown three times in a year. The total reported area in district is 279455 ha, out of which 84717 ha are occupied by the forests. Net sown area in the district is 149523 ha and gross sown area is 246481 ha. Area had sown more than once in the

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district is 96561 ha. District Udhamasinghnagar Area under Rabi and Khariff crops are 97973 ha and 139928 ha respectively. 8580 ha is reported under the Zaid crop. The sugarcane crop is also grown in very intensively as it is a cash crop. (Source: district ground water brochure)

### **Primary survey**

As per the primary field survey the results suggest that following parameters were found satisfactory-

### **Housing facility-**

Housing facility in the villages in buffer zone was found as approximate 40% houses were reported to be pucca house with good condition. And semi-pucca houses were reported about 30% and rest 30% were kachcha houses. It shows a comparatively good picture of the area.

### **Drinking water facility-**

Drinking water in the area is easily available in about 80% houses the borewell supply was there and in rest 20% houses community supply.

### **Electricity**

The electricity availability is better in the region as 98% of houses are having electric connection with sufficient hours of power supply.

### **Education**

Educational status of the people in the villages of buffer zone was found improving. About 75% of adults were found to be educated. The percentage of kids for schooling was found better.

### **Economic status-**

No. of households above poverty line were found more (70%) and rest 30% were found below poverty line.

## CHAPTER 5

### ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

#### 5.0 General

The mining of sand is on the rise to meet its ever increasing demand in the construction sector. It is now widely realized that, in spite of the short term benefits, the indiscriminate sand, bajri& boulder mining from the rivers is detrimental to these life sustaining systems, in the long run. Moreover, the effects of sand, bajri& boulder mining may not be visible immediately because it requires continuous monitoring and takes a decade or more to surface and propagate the effects along the river channel in measurable units. In other words, mining may continue for years without apparent effects upstream or downstream, only to have geomorphic effects manifest later during high flows. Similarly, rivers are often said to have 'long memories', meaning that the channel adjustments to in stream extraction or comparable perturbations may persist long after the activity has ceased.

Sand, bajri& boulder mining like any anthropogenic activity in the environment produces impacts, modifying it to a status which is considered adverse or beneficial according to the damage or improvement it brings about in physical, chemical and biological status of air, water, land including biota and socio-cultural lifestyles and economy of the population it affects. Generally, the environmental impacts can be categorized as either primary or secondary. Primary impacts are those which can be attributed to the project. The secondary impacts are indirect or induced and typically include the associated investments and change in socio economic pattern by the proposed actions. In the present study, baseline environmental scenario was established through environmental monitoring data for the period of March to May 2019.

The environmental impact assessment of activities of project proponent comprises the following for proposed production of mineral 1,98,000 Tonnes per year of river sand bajri & boulders. The key environmental problems arising due to proposed project of river sand, bajri boulder mining are as follows:

## **5.1 LAND ENVIRONMENT**

The land Predictions of impact of mining activity on land environment are based on the nature of activities and associated aspects of environment.

### **5.1.1 Anticipated Impact of sand mining in river bed:**

It is evident that the total land in the Lease area is 6.0 ha. falling in the core zone is very less as against total area of buffer zone. As discussed in Chapter-2 there will be no mining in the water body. It is proposed that mining will be confined only upto 1.5 depth in river bed. However, mining activity could impose threat to land environment in following possible ways.

- Soil erosion due to excessive undercutting of river banks.
- Changes in channel slope and velocity.
- Possible alteration in channel bed morphology.

### **5.1.2 Mitigation Measures:**

In order to prevent the environmental degradation of mine lease area and its surroundings, the following measures shall be taken;

- No under cutting of river banks and creation of ponds and pits on the river bed will be permitted. The mining in the river bed will be done upto approved depth of 1.5m.
- Mining will be carried out in scientific manner to avoid overcutting of river banks.
- Excavation will start in the blocks from upstream side to downstream side this will not obstruct the movement of water, if any, during monsoon period. Thus, no modification in channel morphology is proposed.
- Slope and gradient of channel will not be disturbed due to proposed mining operation. Bank side natural slope will not be disturbed.

## 5.2 Water Environment-

Excavation of sand, bajri & boulder within stream bed has a direct impact on the stream's physical characteristics such as geometry, gradient, substrate composition and stability, depth, velocity and sediment transport. Kailash river is perennial types of river water flows in rivers but due to eastward movement of the river sand is exposed. The river gets a huge amount of water and sand in the monsoon season which contributes in replenishment of the river.

**Table 5.1: Water management**

S.No.	Water consumption Detail	Water Requirement in KLD
1.	Water for sprinkling	1.5 KLD
2.	Domestic/drinking	5.0 KLD
3.	Gardening & Miscellaneous	0.5 KLD
	<b>Total</b>	<b>7.0 KLD</b>

Total Water requirement of the project is 7.0 KLD. Water shall be sourced from the existing bore wells/ tube wells from the nearby village situated nearby the proposed mining area with the help of water tankers.

### 5.2.1 Anticipated impact on water environment

- Water Consumption during project activity will be 7.0 KLD
- Impact on water quality:

#### Ground Water Quality:

- Highest pH among all locations in study area was observed 7.88.
- Maximum Chloride among all locations in study area was observed at - i.e. 46.8mg/l it helps in disinfection of water.
- Maximum hardness among all locations in study area was observed at i.e. 196 mg/l. Hardness can effect on human health by increasing dermal diseases.

Surface Water Quality: The maximum pH of Kailashriver was observed at upstream side of Project site i. e. 7.84. BOD values were reported BDL in 10.0 mg/l at Kailash River at downstream side of Kailash river near project site.

All the above parameters including metals concentration were under prescribed limits but project activity could enhance them.

- Alteration of flow pattern/modification of river bed
- Mine seepage and impact on Ground water regime
- Impact on surface water bodies

### **5.2.2 Mitigation Measures:**

- Project shall not affect ground water qualities because the mineral to be excavated is inert and free from toxic chemicals. However BOD value could increase a little if proper measures for domestic waste disposal are not taken care. There will be proper disposal of waste water to prevent it to pour with the stream water.
- No proposal for pumping of water either from river or tapping the groundwater is envisaged.
- The shallow depth of activities in river bed mining will not involve any high risk accident due to side falls/collapse.
- Biotoilets will be provided for the workers at site.
- There will not be any adverse impacts on surface hydrology and ground water regime. Mining of river sand is confined up to 1.5m depth from surface of channel or above the ground water table whichever is less. Thus no ground water pollution is expected as the mining operation will not intersect the ground water table.
- No liquid waste will be generated due to mining or any other way so there is no possibility of pollution of water resources due to liquid waste. No contamination of ground water is envisaged.
- During period of mining, no diversion or modification of any part of the river is proposed.
- To prevent silt being carried during monsoon period, a series of plants would be planted at riparian zone (erosion prone).

- No mining will be done during monsoon period. However, during non-monsoon period if rain occurs, rainwater will be collected in pit and will be utilized in the green area.

### **5.3 AIR ENVIRONMENT**

Dust shall be generated during mining activities will be from various sources like excavation of sand, bajri & boulders loading and unloading activities which generate fugitive dust harmful to the human health and environment. Apart from this, vehicular movement within and around the mining activity will also generate huge quantity of dust. The proposed mine activity proposes to use hand tools, spades & shovels etc which act as sources generating dust pollution along with movement of vehicles within the mining area acting as line sources.

#### **5.3.1 Anticipated Impact on Air Environment**

The primary air pollutant of concern at mining site is particulate matter. There are established standards as per the NAAQS. A variety of mining operations emit particulate, usually as fugitive dust (as opposed to emissions from stacks), and relatively simple controls are often sufficient.

- Loading/unloading of mineral, and Trucks & trolleys all these shall be the major source of air pollution.
- The model suggests that due to increase in traffic load there will be possibility of increase in gaseous emissions from internal combustion engines giving rise to a reduction in air quality.
- Average values of PM<sub>10</sub> levels were maximum at Lalarkhas & shaktifarm which is 74.6 $\mu\text{g}/\text{m}^3$  & minimum in mirabararana as 71.03 $\mu\text{g}/\text{m}^3$ . The project can cause contribution to dust due to increased traffic density & haulage of mineral.
- Maximum average value of SO<sub>2</sub> level was 25.54 $\mu\text{g}/\text{m}^3$  near Nalai site & the maximum average value for NO<sub>x</sub> was observed to be 37.11  $\mu\text{g}/\text{m}^3$  near Nalai site.

Mining in the lease area is proposed in river bed. While carrying out mining in the river bed there will be sufficient moisture content in the sand, which will help in controlling the dust dispersion to a large extent. Air Pollution occurs due to generation of dust. This will be mainly from transport of material with the help of truck & tippers.

- SO<sub>2</sub> level and NO<sub>x</sub> level were below limit value at each location.
- PM<sub>10</sub> values could increase due to project activity because there shall be increase in dust due to mining.
- These villages are prime areas where minor pollution occurs this is why values of Air quality parameters were found more but under prescribed permissible limits.

### **5.3.2 Mitigation Measures**

The excavation and lifting of mineral will be done manually in river bed. Process of mining will be excavation through manual means. Therefore, the dust generated is likely to be insignificant as there will be no requirement of drilling & blasting. The air pollution sources are the road transport network of the trucks. Following mitigation measures are follows:

- Water sprinkling will be done regularly on the haul roads. This will reduce dust emission.
- To check/reduce the impact of dust, plantation will be done.
- Speed limits will be enforced to reduce airborne fugitive dust from vehicular traffic.
- Spillage from the trucks will be prevented by covering tarpaulin over the trucks.
- Deploying PUC certified vehicles to reduce their emissions.
- Monitoring to ensure compliance with emission limits would be carried out during operation.
- Plantation of trees along the road & on riparian zone (in the restricted area), a long haul road to help to reduce the impact of dust in the nearby villages.
- Dust mask provided to the workers engaged at dust generation points like excavations and loading points.
- Major sources of air pollution are the road transport network of the trucks and loading vehicles. To check emission problem regular maintenance of vehicles will be done and PUC certificate will be obtained for all vehicles and mining machinery.

- Utmost care will be taken to prevent spillage of sand, bajri& boulder from the trucks/tractor trolleys.
- Overloading will be prevented. The trucks/tractor trolleys will be covered by tarpaulin sheet while transportation.

## **5.4 NOISE ENVIRONMENT**

The noise levels are dependent upon the deployment of mining machinery and transport vehicles in the area. Ambient noise level in the core zone is likely to increase from transportation activities.

### **5.4.1 Impacts on Noise Environment**

The impact of noise will be restricted in the working area only. The main sources of noise in the mine are classified as follows:

- Transportation (Dumpers, Trucks, Tippers & other vehicles.).
- The ambient noise level during the baseline study at the proposed project site was within permissible limit of the standard of Residential area (~55 dB (A)). During night the noise level at the project site was observed within night time noise standards of 45.0.0 dB (A).

### **5.4.2 Mitigation Measures:**

It is clear by the base line data of noise quality that the area falls in residential area where rural population is less and the noise levels were found under permissible limits. However, when the project starts noise levels are likely to increase. In order to protect the workers from higher noise levels, project proponent will adopt the following noise abatement measures.

- The vehicles will be maintained in good running condition so that noise level could be reduced to minimum possible level.
- Plantation of trees will be done to dampen the noise and also arrests dust.
- Imposition of speed limit on vehicles near residential areas.

- Truck drivers will be instructed to make minimum use of horns while passing nearby the residential area.
- Noise generated by these equipment's shall be intermittent and does not cause much adverse impact.
- Periodical monitoring of noise will be done.

## **5.5 BIOLOGICAL ENVIRONMENT**

### **5.5.1 Impacts on Biological Environment**

#### **(A)Flora:**

- The core zone does not comprise of forest area. Though there are forests in the buffer zone. The forests are dominated by herbs and shrubs, and are not ecologically diverse.
- In core zone there is no vegetation.

#### **(B)Fauna:**

- The area does not form part of eco-sensitive areas like National Park, Wildlife Sanctuary, Biosphere Reserves or Tiger Reserves in 10 km radius . Likewise the area does not form part of the migratory route of any wildlife species.
- Mining may drive away the wild life from their habitat, and significantly affect wildlife.
- Noise generation due to vehicles may affect avifauna.

### **5.5.2 Mitigation Measures:**

- Measures for green belt development will enhance the vegetation and afforestation in core zone in agricultural land. Emphasis will be given on native plant species & plants of economic importance.
- Haul roads will be sprinkled with water which would reduce the dust emission, thus avoiding damage to the crops.
- No mining will be carried out during the monsoon season to minimize impact on aquatic life which is mainly breeding season for many of the species.

- No discard of food, polythene waste etc will be allowed in the core zone. No night time mining will be done which may catch the attention of wild life.
- Minimized noise pollution will have less adverse effect on avifauna and they will thrive in the area. However, no bird's habitats like nesting, breeding and foraging patterns are noticed in the core zone. Local birds are noticed crossing over the banks in search of food.

## **5.6 SOCIO-ECONOMIC ENVIRONMENT**

The impact of mining industry on socio-economic scenario has both the facets. On one hand it may degrade the fertile land leading to reduced agriculture income besides causing displacement. On the other hand being a commercial activity it provides opportunity for both direct & indirect employment. In the present case, the lease area is basically a river bed. As a matter of fact, the community will be benefited by the direct & indirect employment most of them will be skilled, semi –skilled& unskilled mine workers as mentioned earlier there will be around 164 personnel most of them will be skilled and unskilled mine workers supervisory staffs. 80% staff will be employed with from the local villages. The indirect employment will be far reaching it can create indirect employment scope for about 100 persons. It can also facilitate developing of indirect employment opportunities mainly for organized workshops and spare parts dealers' network.

### **5.6.1 Anticipated Impact:**

- Impact on economic status of the people.
- Positive impacts on present status of livelihood in the area
- The conglomeration of sand along river stretch will be removed hence avoid overflowing of water in river.
- Due to the overloading of trucks approach roads will get damaged and this may cause problem to locals.
- During the loading & unloading of mining material the dust particles may suspend in the air. This intern may affect the health of the people.

- Sometimes drivers play loud music which creates sound pollution in the nearby helm.
- Carcinogenic emissions cause lung cancer & other respiratory disorders.

#### **5.6.2 Mitigation Measures:**

- Over loading of trucks will not be allowed.
- The music will not be allowed to play during the transportation of material.
- Regular water spraying on roads and storage dumps
- The ID proof of the each employee will also be kept as a record.
- **Skill based training** to locals employed people is being imparted which will be further expanded as the employment grows after the expansion of the plant .The training record of the workers should be maintained with certificate.

### **5.7 MINE WASTE MANAGEMENT:**

#### **5.7.1 River Bed**

This is sand, bajri & boulder mining where no sub-grade material shall be produced and all mineral excavated will be sold to the dealers. In the proposed river bed mining there is no waste generation as the mineral is exposed in the river bed and it will be directly excavated by manual means. No waste other than negligible amount of silt and clay, which gets deposited as crust material on the bed, may be generated. This will be deposited in the designated sites and shall be used for plantation purpose simultaneously.

For municipal solid waste management during mining there shall be separate bins to collect solid waste generated by daily human activities i.e. wrappers, foils, leftover food material etc.

#### **5.7.2 Solid Waste Management**

- No solid waste except the municipal solid waste will be generated which is proposed to be collected in separate bins placed onsite. Silt generated if any during river bed mining will be used to develop green cover by planting local trees and bushes in the area.

- Unwanted material including mineral or spillage (if any) will not be stacked on the banks sides as it will hinder the flow of water in monsoon season. The same is backfilled in the mined out area.
- There is no toxic element present in the mineral which may contaminate the soil.
- For Liquid waste mobile toilets will be provided which will keep on shifting as per activity shift. Liquid waste shall be disposed-off in septic tanks followed by soak pits other than that this no effluent is generated.

### **5.7.3 Hazardous waste Generation & Management**

Used oil shall be generated from the vehicles and mining machinery. It will be stored properly and sold to registered re-processor.

### **5.8 Mine Closure**

Lease area has been granted for a period of 5 years. As per the production programme envisaged, at the end of lease period, still sufficient mineral would be left available for continuing production activities further, especially due to yearly replenishment of river sand, bajri & boulder in river bed. Hence, no closure is planned. Local villagers will have an option either to be available for employment for next contract/lease. As at present mining is not going to be closed so abandonment cost could not be assessed.

## CHAPTER 6

### ENVIRONMENTAL MONITORING PROGRAM

#### 6.0 General

Success of any environmental management programme depends upon the efficiency of the organizational set up responsible for implementation of the programme. Post project monitoring is an essential part to check the impact of any project activity. Hence monitoring of various environmental parameters will be carried out at regular basis to ascertain the following:

- To assess environmental impacts.
- State of pollution within the mine lease and in its vicinity.
- Planning for predictive or corrective actions in respect of Pollution to keep it within permissible limits.
- Examine the efficiency of pollution control system adopted at the site.

Monitoring will be carried out at side as per the statutory requirements.

Environmental monitoring will be taken up for various environmental components as per conditions stipulated in Environmental Clearance Letter issued by MoEF.& CC, Compliance of same will be submitted to respective authorities on regular basis.

#### 6.1 Activities

**Mining:** Mining of the sand, bajri & boulders from river bed will be done with utmost care. The process will be carried out under strict vigil to ensure safety of the workers and ambient environment.

- **Manual:** River bed mining will be restricted to 1.5m and it shall be done by manual method whereas loading gang of 16-20 persons will be deputed to load sand, bajri & boulders & send for onward despatch.

- **Drilling /Blasting:** There will be no drilling and blasting as the deposit is loosely packed in nature.

## **6.2 Proposed Monitoring Program**

### **6.2.1 Monitoring of Water Quality**

Ground water and surface water samples from study area are recommended to be routinely tested for its quality as per Drinking Water Specification and Surface Water Quality Standards. The water to be collected from sampling stations monthly/quarterly every year. it will be analyzed for any change in water quality due to the mining operation.

### **6.2.2 Air Quality Monitoring**

Ambient air quality is essential for evaluation of the effectiveness of abatement programmes and to develop appropriate control measures. Ambient air quality will be monitored in stations in core zone and in buffer zone. The sites will be identified keeping Prevailing wind directions in mind. The ground level concentrations of Particulate Matter (PM<sub>10</sub>), PM<sub>2.5</sub>, Sulphur Dioxide (SO<sub>2</sub>) and Nitrogen dioxides (NO<sub>2</sub>) established in the ambient air outside the project boundaries and in the adjoining villages will be monitored at regular intervals at sampling stations given in sampling location given in chapter-4 table, stations for 24 hours continuously will be collected twice a week for one month for one season of the year. Any deviation from predicted/expected values will be investigated and necessary corrective action will be taken.

### **6.2.3 Noise Monitoring**

Noise levels in core zone and in buffer zone workspace environment premises will be monitored periodically at no. of stations as per standard. The parameters to be tested are Ld, Ln & Ldn. If any deviation is observed necessary corrective measures will be taken. Monitoring noise level is essential to assess the efficacy of maintenance of schedules undertaken to reduce noise levels and noise protection measures.

#### **6.2.4 Soil Quality Monitoring**

As a part of environmental monitoring soil sampling and analysis will be carried out from no. of stations quarterly study shall be done.

#### **6.2.5 Plantation and greenbelt Development Monitoring**

Monitoring of growth and survival rate of the plants planted for greenbelt development every year shall be done to replace the plants which didn't grow. Following data shall be recorded every year:

- Area under plantation/vegetation
- Period of plantation
- Type of plantation: Trees, grass any other as seeds or saplings.
- Distance between plants
- Type & amount of fertilizer used
- Interval of watering
- Method and period of post plantation care
- Survival Rate
- Density of afforested land both pre & post plant condition

#### **6.2.6 Occupational Health and Safety:**

There will be regular health checkup for the workers and the information shall be furnished to the Environment Monitoring Cell. The checkup shall be done every year for workers more prone to get ill because of their work place, for rest of them the checkup shall be done on six monthly basis-

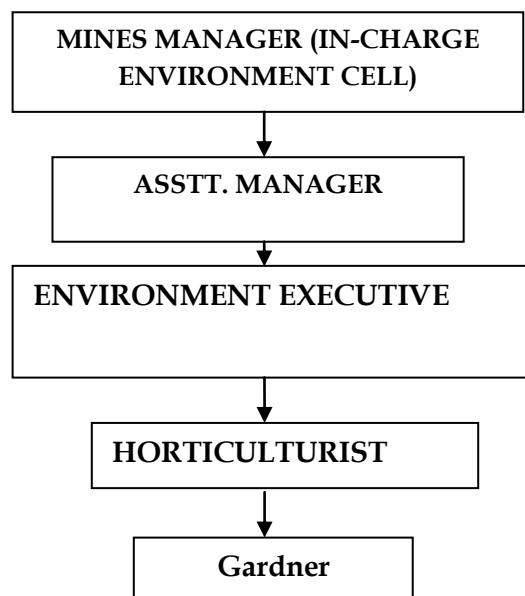
- All personnel in work sites shall have protective gears like helmets, boots etc. so that injuries to personnel are minimized.
- Children and pregnant women shall not be allowed to work under any circumstances.

- No personnel will be allowed to work at site for more than 10 hours per day (8 hour makes one work shift). Regular water sprinkling of water will be ensured so that dust levels are kept to minimum. All activities will be carried out with utmost care. In case any slabs with epigraphically evidence or edicts, sculptural, historical remains or any other materials pertaining to archaeological / historical importance, Department of Archaeology, Govt. Uttarakhand shall be immediately informed.
- Any coins, artefacts or any other chance find will be notified by the workers. The work will be stopped and instruction will be taken from archaeological department.

### 6.2.7 Environmental Monitoring Cell

Monitoring will be done by the supervisory officers of the mine. Any abnormalities shall be brought to the notice of management to take immediate corrective action to prevent any mishap. Following shall be the proposed environmental organization chart for this mine. Mine manager shall be in-charge of the environment cell. The mines owner will also frequently review the work and the managers of mine will overview the arrangements for effective functioning of environmental safeguards.

The environmental data shall be monitored initially by using an outside agency and later an in house monitoring cell shall be developed.



### **Functions of the Monitoring Cell**

1. To carry out environmental monitoring at site for various environmental parameters as required either departmentally or through outside agencies. This will ensure that the environmental status of the core and buffer zone of the mine will be preserved in good status as per rules.
2. To observe the environmental control measures to be implemented.
3. To keep a watch on the flow patterns of drainage and keep vigil on the efficiency of water management system.
4. To study the effects of project activities on the environment.
5. To ensure implementation of plantation programme. Regular monitoring of survival rate of plants should also be carried out to achieve the desired result, for five years.
6. To keep records of monitoring etc. in a systematic way, so as to facilitate easy access, when needed by statutory agencies, etc.
7. Conducting environmental studies and reporting to SPCB.
8. To ensure the availability of the necessary spares for the pollution control equipment all the times so as to keep the pollutants of the environment within the stipulated limits.
9. To identify the source of pollution and to take immediate action to prevent further pollution.
10. Conducting regular health audits to detect any health problems promptly to the workers/ staff. This will reduce occupational health problems.

The recorded data from monitoring of air, water, soil and noise will be submitted half yearly by project proponent to Ministry of Environment and Forests (Regional office) and State Pollution Control Board (SPCB).

### 6.2.8 Environmental Monitoring System & Methodology

For timely evaluation of EMP, regular monitoring of the important environmental parameters will be taken up. The schedule, duration and details of parameters for monitoring are given briefly as under. Based on the results of improvements of adversity in the environmental parameters, monitoring schedules and duration will be restricted, if necessary, after consulting with SPCB and MoEF.

**Table 6.1 Environment Monitoring Schedule Details**

S.No	Description of Parameters	Schedule and duration of Monitoring
1.	Ambient Air Quality (a) In and around mines for SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10</sub>	Samples for 24 hours continuously will be collected every three month except monsoon season at working pit area.
2	Meteorological parameters like temperature, Relative humidity, wind speed, wind direction, rainfall, cloud cover	Continuous monitoring for meteorological parameters
3	Water quality of wells, and in water bodies around the mines	Monthly/Quarterly or as per norms of SPCB & MoEF & CC for various parameters
4	Ambient noise levels inside the mine premises and nearby villages	Once in a month or as per norms of SPCB & MoEF& CC
5	Soil characteristics in nearby villages.	Quarterly or as per norms of SPCB & MoEF & CC for various parameters
6	Occupational health check up	Regular organization of heath checkup camps shall be done.

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7	Inventory of Flora/ Fauna	Once a year on all the green belt sites created and once in 5 years in study area
8	Socio-Economic Aspect	Once in a years through physical survey for detecting any adverse variation and prompt correctives

## CHAPTER 7

### ADDITIONAL STUDIES

#### 7.0 GENERAL

The additional studies covered for the project will involve the following schemes.

1. Draft EIA/EMP report had been submitted to Uttarakhand Environment Protection and Pollution Control Board, Uttarakhand for public hearing, public hearing was held on 07.09.2019 on project site.
2. Risk Assessment (RA) and Disaster Management Plan (DMP) in connection with mining and allied operations of the project has been spelt out in detail to cover likely dangers/risks/explosions/accidents, etc. likely to arise from the project operations, including onsite and offsite emergency plans to meet the disastrous situations.

#### 7.1 ITEMS IDENTIFIED BY THE PROPONENT

Most of the points regarding mitigation and action taken for reducing impacts on surrounding environment during mining operation with proposed production of sand, bajri & boulders *i.e.* 1,98,000 Tonnes/annum. The draft EIA report of the sand, bajri & boulder mining project was been prepared on the guidelines for general and specific TOR has been complied with. However, the comments and response of public hearing has been annexed as **Annexure 07** with this final EIA report to be presented to SEIAA/SEAC Uttarakhand.

#### 7.2 ITEMS IDENTIFIED BY THE REGULATORY AUTHORITY

The project been submitted to State Expert Appraisal Committee (SEAC), Uttarakhand. The project proponent (lessee) will comply with all the conditions stipulated in as per standard TOR.

### **7.3 ITEMS IDENTIFIED BY THE PUBLIC & OTHER STAKEHOLDERS**

The public hearing was done on dated 7.09.2019 near project site. The meeting was chaired by Nagar ayukt, Udhamasinghnagar, Uttarahand. The public hearing proceedings along with queries raised by public and remarks of public hearing panel & project proponent are attached as annexure 19

### **7.4 RISK ANALYSIS & DISASTER MANAGEMENT PLAN**

Safety of mine and the employees is taken care of by the mining rules & regulations, which are well defined with laid down procedure for safety, which when scrupulously followed safety is ensured not only to manpower but also to machines & working environment.

#### **7.4.1 Environmental Risks & Individual Risks Involved During Mining:**

The possible risks in the case of sand, bajri & boulder mining projects are erosion, inundation/floods, accidents due to vehicular movement and accidents during sand, bajri & boulders loading and transporting etc. Mining and allied activities are associated with several potential hazards to both the employees and the public at large. A worker in a mine should be able to work under conditions, which are adequately safe and healthy. At the same time the environmental conditions should be such as not to impair his working efficiency. This is possible only when there is adequate safety in mines.

#### **Objective of Risk Assessment**

- Identifying hazardous activities
- Assessment of risk level and severity in different operations
- Identification of control measures
- Setting monitoring process
- Reduce the impact of mishaps of all kinds
- Reduce the inherent potential for major accidents.
- Slope stability.

## **7.4.2 Assessment of Risks & Mitigative Measures**

Factors of risk involved due to human induced activities in connection with mining operations are as under:

### **1. Drilling and blasting:**

There will be no drilling and blasting involved during mining as the mineral is found loose in nature.

### **2. Floods & Its Control**

Mining will be done during non-monsoon periods; therefore problem of inundation/floods is unlikely to happen.

### **Dewatering**

Depth of mine is limited to 1.5m depth only from the river bed level whereas the ground water is more than 3m deep below surface of river bed. Hence no dewatering is required. During mining, no ground water table will be intersected at all.

### **3. Drowning, if Any**

There is no possibility of drowning in the river; mining operation will be carried out in dry bed only. All mining activities will be stopped during the monsoon season. Deep water zones in the river will be identified. No go-zone will be clearly marked and workers will keep aware of that.

### **4. Failure of Pit Slope & Its Control**

Pit will be created of limited depth only *i.e.* 1.5m. River bank side will be protected by working in 3/4 part of middle of the river. Bank side natural slope will not be disturbed. So it is proposed that banks of the mining area will be sloped to its angle of repose at 45° in a very gentle manner so that there is no pit left which can pose any danger to human being or animals.

## **5. Vehicular Movement and their Mitigation Measures**

- Possibilities of road accidents are possible due to rash driving.
- Possibility of overloading may injure the passer-by public.
- The possibility of accident during vehicular movement in the mine in case pathway is not compacted or movement is at the embankment.
- All transportation within the mining lease working should be carried out directly under the supervision and control of the management.
- 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.
- Road signs will be provided at each and every turning point up to the main road (wherever required).
- 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 10m radius of machine.
- The maximum permissible speed limit shall be ensured.
- Overloading of material will be avoided.
- A statutory provision of the fences, constant education, training etc. will go a long way in reducing the incidents of such accidents.

## **6. Mineral Loading, unloading and Transportation:**

- The mineral will be loaded in trucks by manual method. There is least possibility of injury to the person during loading operation at mine.
- There is a no issue with falling of animals/human into pits since the pit depth is just 1.5m deep.
- The complete mining operation will be carried out under the Management and control of experienced and qualified Mines Manager having Certificate of Competency to manage the mines granted by DGMS.
- All the provisions of Mines Act 1952, MMR 1961 and Mines Rules 1955 and other laws applicable to mine will strictly be complied with.

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- During heavy rainfall the mining activities will be closed.
- All persons in supervisory capacity will be provided with proper communication facilities.
- Competent persons will be provided FIRST AID kits which they will always carry.

## **7.5 NATURAL RESOURCE CONSERVATION:**

Resource conservation is the process of selecting and using processes or technologies that minimize the overall use or consumption of resources while effectively achieving a desired function. The Resource Conservation module describes methods for identifying the relative amounts of resources or materials used or consumed by process.

- Water required during process and operation shall be used judiciously thus there is no wastage of water done.
- Waste water generated such as silt if any, shall be properly treated and it will be disposed off. No mixing of wastewater with river water will take place.
- Water will be allowed with the stream water at any point.
- We should remember that energy saved is energy produced thus unnecessarily engines won't be kept started to avoid wastage of energy.
- Workers and local people will be educated for the protection of natural resources.

## **7.6 REHABILITATION & RESETTLEMENT (R & R):**

Mine lease area comprises of river bed, therefore R&R Plan will not be applicable.

### **7.6.1 Socio-economic Support as Corporate Environment Responsibility**

As mentioned earlier, the scale of operations are big thus produce significant impact in terms of providing employment to a few local residents and uplift-ment of community. However, under corporate environment responsibility, welfare activities will be taken up. The social welfare activities will include assistance in following sectors-

#### **Medical Assistance**

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Assistance will be provided in organizing health camps especially for eye checkups respiratory diseases, etc.

### **Education**

In order to improve the educational activities in the area, following assistance will be provided.

- Repair/Rebuilding of village schools;
- Institution of scholarships and prizes;
- Encouraging pre-primary schools education; and
- Supporting adult education programs.

### **Training of personnel**

In order to improve the skill and self-employment of locals, assistance will be provided in following promotional activities may be taken up.

- Tailoring/embroidery classes for women; and
- Orientation programs for self-employment in collaboration with District Industries Centre and Rural Development Agencies.

### **Agricultural Improvement**

The locals in the area will be benefited by following social programme.

- Organizing training programs with the help of Agricultural Department for farmers in relevant areas such as animal husbandry, dairy development, modern cultivation, scientific storage of grain, water conservation etc, the theme will be selected in consultation with community;

### **Assistance in Utilizing Government Programs**

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Collecting and disseminating information pertaining to various government schemes and providing guidance and assistance to eligible persons for making good use of these schemes e.g. getting loans for setting up small businesses.

#### **Some of other CSR activities may be practiced-**

**Infrastructure development activities like** – road repair, improvement of existing roads, healthcare centre, community centre etc.

#### **7.6.2 Resettlement & Rehabilitation Plan**

- As per the primary site survey & latest census data available, the mine lease area is devoid of any habitation & displacement of population is not applicable.
- With the mining activity the villagers will shift from agriculture based occupation to other secondary & tertiary sector activities such as service provision to the residents. Moreover with the additional source of income, the villagers can improve their livelihood.
- Project affected persons includes agricultural, non-agricultural labourers

#### **7.6.3 Socio-economic benefits arising out of Mining activity:**

No human settlements will be disturbed due to proposed mining activity; consequently, one of the major negative impacts will not be applicable in this case. The benefits of mining activity will be similar to any industrial set-up. There will be opportunities of direct and indirect employments. However, the operation is manual thus will generate large scale direct employment. As mentioned earlier there will be around 164 personnel, most of them will be skilled, unskilled workers. 80% staff will be employed from the local villages. The indirect employment will be far reaching. It can create indirect employment scope for local villagers. The ID proof of the local employees should also be kept as a record. The jobs from which local community can be benefited-

- Canteen services
- Grocery and vegetable shops

- Security services
- Maintenances services
- Once the project becomes operational then ancillary services like repair shops, tea sops, dhabas, machine shops, spare parts shop etc will come up in the nearby areas. The sales of the existing shops will also increase.
- All personnel in work sites shall have protective gears like helmets, boots etc. so that injuries to personnel are minimized. Children and pregnant women shall not be allowed to work under any circumstances.
- No personnel shall be allowed to work at site for more than 10 hours per day (8 hour makes one work shift). Regular water sprinkling of water shall be ensured so that dust levels are kept to minimum.

There shall be no resettlement involved during the project as the area is devoid of population in close proximity. All workers will be subjected to medical examination as per Mines Rule 1995 both at times of appointment and at least once in five years. Medical camps will be organized for this activity.

The community development programme proposed by the proponent for the surrounding population will be carried out along with budget provision proposed for improving the conditions of persons in and around the project area as under:

**Table 7.1: Corporate environment Responsibility**

Sr. No.	Description	Amount (In Lacs)
1	Health check up camps	0.5
2	Assistance to local school, scholarship to students	0.565
3	Sanitations and drinking water facilities	1.0
4	Vocational training to persons for income generation	0.5
<b>Total</b>		<b>2.565</b>

## **CHAPTER 8**

### **PROJECT BENEFITS**

#### **8.0 General**

The proposed project is mining of river sand, bajri & boulders from the riverbed, will have no major impact on surrounding environment. The proposed activity will provide raw material to construction industries there by boosting overall improvement in infrastructure development and economic growth of the state of Uttarakhand.

#### **8.1 Improvement in Physical Infrastructure:**

With the advent of the project there shall be growth in ancillary industries, due to which people not directly related to the project shall get some employment such as tea stalls and eateries, shall develop in the nearby area.

#### **8.2 Improvement in Social Infrastructure:**

The project activity and the management will definitely support the local governing bodies 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. Approach roads will be developed at par with the mining site. There shall be conduction of rehabilitation program for the villagers.

Green belt development / Plantation will be taken up in the surrounding area in vicinity of river banks, along the approach roads, around Govt. building, schools.

#### **Promotion of Social & Economic Status:**

Lessee intends to contribute in economy and social development of the area by performing scientific and systematic development of mines including land rejuvenation and progressive reclamation programme and other necessary measures to protect the quality of environment and human health etc.

### 8.3 Employment Potential:

The management will recruit the semi-skilled & unskilled workers from the nearby villages. It will provide direct employment to about 164 people and indirect employment to many more.

#### 8.3.1 Skilled/Semi skilled/Unskilled work force:

Seeing the extent of mining there shall be requirement of both skilled/semi-skilled & unskilled work force. The details are given in the table below.

**Table 8.1: Details of Employment**

S. No.	Category	Numbers
1.	Mining Competent Person	1
2.	Administrative	1
3.	Supervisor	2
4.	Unskilled	160
	<b>Total</b>	<b>164</b>

#### 8.4 Ancillary Business establishments that may come up on account of the project:

The unit will facilitate development of smaller ancillary industries like Machine shops, Auto Repair Garages, eateries etc. in the area. Besides the supply of Quality River sand, bajri& boulder to the construction companies the project will trigger expansion construction sector and thereby development of ancillary industries in and around the project area.

#### 8.5 Other Tangible Benefits

- The project will provide better educational, health and medical facilities not only to their families but also to nearby villagers.

- The Environment Management Plan (EMP) adopted for the proposed project will protect the environment by implementing effective mitigatory measures by establishing systems and procedures for the purpose.
- Significant positive impact on employment and occupation are envisaged.

## **CHAPTER 9**

### **ENVIRONMENT MANAGEMENT PLAN**

#### **9.0 GENERAL**

The Environment Management Plan must be integrated into the process of mine planning so that ecological balance of the area is maintained and adverse effects are minimized. Environmental Management plan covers all phases of the project considering all impacts with mitigation and monitoring programme.

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 proposed EMP has indicated the details as to how various measures have been proposed to be taken. The baseline setting of different relevant environmental components in the study area and predicted potential impacts on those components due to the proposed project are documented. In this plan, mitigation measures for the identified environmental impacts are documented for operational stage of the proposed project in the form of an EMP. Proper environmental management plan will be proposed for “Sand, bajri& boulder” mining project to mitigate the anticipate impact during the mining operations.

#### **9.1SUBSIDENCE**

Subsidence is the sudden sinking or gradual downward settling of the ground's surface with little or no horizontal motion. The definition of subsidence is not restricted by the rate, magnitude, or area involved in the downward movement. It may be caused by natural processes or by human activities. The human activities like sub-surface mining or extraction of underground fluids, e. g. petroleum, natural gas, or groundwater may cause subsidence. In the proposed mining the mining is open cast and up to 1.5 m from surface thus there is no question of subsidence.

## **9.2 ACID MINE DRAINAGE**

The proposed mine is river bed mine where in sand bajri & boulder will be excavated upto a depth of 1.5m. There is acid mine drainage in the mine.

## **9.3 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 ML 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.
- 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 excavation, loading and unloading points.
- Roads will be properly maintained.

### **Fugitive Dust Control Measurement**

#### **A. During loading operations:-**

- Water sprinkling will be done during loading.
- Regular maintenance of vehicles will be carried out to control dust emission during transportation.
- Overloading will be avoided.

## **B. During Transport Operations:-**

- Water sprinkling will be done during loading and on transportation routes.
- It will be ensured that all transportation vehicles carry a valid PUC certificate.
- Utmost care will be taken to prevent spillage of sand, bajri & boulders from the trucks/dumpers during loading and transportation.
- Trucks/dumpers will be covered by tarpaulin covers.

## **C. Plantation**

Plantation will be carried out at the approach road, river bank, community roads.

### **9.3.1 Control Of SO<sub>2</sub>&NO<sub>x</sub> Levels**

The source of SO<sub>2</sub>&NO<sub>x</sub> 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.

### **9.3.2 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 prevent inhalation of particulate matter thereby reducing the risk of lung diseases and other respiratory disorders among the workers.

## **9.4 WATER MANAGEMENT & WATER POLLUTION CONTROL**

### **9.4.1 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, bajri& boulder.

- Mining schedule will be synchronized with the river flow direction and the gradient of the land.
- The washing of trucks in the river will be avoided.
- Mining will be avoided during the monsoon season. This will help in replenishment of sand, bajri& boulder in the river bed.
- Mining will not intersect the river bed water level or ground water table of the area.
- Mining will be carried out above the water table.
- During operation of the mine water requirements estimated are as below:

**Table 9.1: Water consumption Detail**

S.No.	Water consumption Detail	Water Requirement in KLD
1.	Water for sprinkling	1.5 KLD
2.	Domestic/drinking	5.0 KLD
3.	Green belt development & miscellaneous	0.5 KLD
	<b>Total</b>	<b>7.0 KLD</b>

- **Source of water:** As mining shall take place at one place at a time and, water will be supplied through tanker from the existing bore well/tube wells in the nearby villages where mining is taking place.

#### 9.4.2 Ground Water

There will not be any adverse effect on the ground water quality. The minor mineral does not contain any harmful chemical, which could percolate into the ground and pollute the ground water. Hence, no control measures are required. Septic tank and soak pits have been provided for the disposal of domestic effluent generated from domestic activity. 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.

## **9.5 NOISE CONTROL**

As there will be no heavy earth moving machinery and mining will be done only by manual method thus 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, bajri& boulders mining, hence no possibility of land vibration. The only impact will be due to transportation of mineral by trucks and tractor trolleys etc.As the only impact is due to transportation of sand, bajri& boulder 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/hr 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.

## **9.6 CONTROL OF VIBRATION AND FLY ROCK GENERATION DURING BLASTING**

The proposed mine is open cast manual mine. The mineral is loose and exposed on the surface. There si no requirement of drilling and blasting thus no vibration and fly rock generation will occur during mining.

## **9.7 BIOLOGICAL ENVIRONMENT**

The mining activity will have insignificant effect on the existing flora and fauna. Data have been collected from various Government Departments such as forests, agriculture, animal husbandry and various offices to establish the pre project biological environmental conditions.

### **Greenbelt Development**

Greenbelt development programme will be designed within the natural constraints of the river sand, bajri & bouders 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 following characteristics will be taken into consideration while selecting plant species for green belt development and tree plantation.

- I. They should be local indigenous and drought resistant species.
- II. They should be fast growing and tall trees.
- III. They should be perennial and evergreen.
- IV. They should have thick canopy cover.
- V. The planting should be in appropriate alternate rows around the site to prevent lateral pollution dispersion.
- VI. The trees should maintain regional ecological balance and conform to soil and hydrological conditions. Indigenous species should be preferred.
- VII. Native species will be planted as per CPCB guidelines.

## **Plantation Programme**

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.

The native plant species will be planted to ensure maximum survival of species. A suitable combination of trees that can grow fast and also have good leaf cover shall be adopted to develop the greenbelt. It is proposed to plant 100 no. of native species per year along with trees, herbs, shrubs & grasses.

## **General Guidelines for Green Belt Development**

- i.** Plantation of trees will be done along road side and nearby areas such as in school, villages etc. to arrest auto-exhaust and noise pollution, and in such a way that there is no direct line of sight to the mine when viewed from a point outside the foliage perimeter.
- ii.** Since tree trunks are normally devoid of foliage, it will be appropriate to have shrubbery in form of such trees to give coverage to trunk portion of these trees.
- iii.** Fast growing trees with thick perennial foliage will be grown, as it will take less years for trees to grow to their full height.

In order to facilitate the proper growth of vegetation, limited measures involving preparation of seedbed with suitable amount of fertilizers and treatment with mulches will be taken.

Vegetation covers in and around the mine workings generally helps in:

- Stabilizing erodible slopes to minimize pollution.
- Control of dust.
- Enhancement of aesthetic value.

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- Maximizing evapo-transpiration, which helps minimizing run off.
- Reducing noise.

## **9.8 LAND USE PLANNING AND MINE CLOSURE-**

Land of the area is barren land and belong the river bed area. Excavation of sand, bajri& boulder in the area will not change the land use to great extent since the mineral excavated will be replenished in the next rainy season. There is no mine closure is given for the proposed project.

## **9.9 OCCUPATIONAL HEALTH & SAFETY**

The proposed mining is to be carried out by manual opencast mining. Dust and noise are the general health hazards for the miners. The project proponent will strictly implement all the prescribed safety measures, although the magnitude of mining is very less. High safety is ensured in the working conditions of the miners. Since it is an opencast mine, health problems due to dust may be expected. Protective equipment will be provided to the employees such as dust masks. By using these PPEs, the chances of occupational health diseases will be lowered. The health of the workers will be regularly checked and suitable medical facilities will be created by the lessees. By periodical medical checkup & treatment and job rotation of employees, the impact would be minimized.

## **9.10 SOCIO-ECONOMIC CONDITIONS OF THE REGION**

This project operation will provide livelihood to the poorest section of the society. The overall impact of riverbed mining of sand, bajri& boulder 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 164 persons engaged in extraction of sand, bajri& boulder, loading/un loading of material.

The results of the field survey conducted 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.

### 9.11 ENVIRONMENT MANAGEMENT PLAN

The environmental management plan has been developed with a view to bring down the levels of impacts as discussed in the last chapter within limits. In each of the areas of impact, measures have to be taken to reduce potentially significant adverse impacts and where these are beneficial in nature, such impacts are to be enhanced/augmented so that the overall adverse impacts are reduced to as low level as possible.

**Table 9.2: Budgetary Provision for Environmental Management Programme**

S.No.	Particular	Capital Amount (In Lakhs)	Recurring Amount (in Lakhs)
1	Pollution monitoring- Air, Water, Noise.	1.5	1.60
2	Water Sprinkling	1.0	1.0
3	Wire fencing at plantation sites	0.5	0.5
4	Plantation including maintenance	1.0	0.5
5	Haul road and other roads repair and maintenance	1.0	0.5
6	Expenses on Public Health	0.5	0.5
07	Miscellaneous	-	0.2
<b>Total</b>		<b>5.50</b>	<b>4.8</b>

## CHAPTER 10

### SUMMARY & CONCLUSION

#### **10.1 Introduction**

Sri Jirendrasingh is lessee of the proposed mine who intends to produce Sand, bajri& boulder 1,98,000 MTPA, sanctioned Lease area of this mine is 6.0 ha. subsequently the project falls under Category 'B<sub>1</sub>'. Thus the project will be appraised by State Expert Appraisal Committee of Uttarakhand. Therefore, the lessee will have to take environmental clearance from State expert appraisal committee as per MoEF Notification of EIA, 2006.

The letter of intent (LoI) for sand, bajri& boulders mine has been issued on dated 12 september 2018 vide letter no. 1926/VII-1/18/02(74)/2018 in favour of Sri Jitendra singh in order to minimize the demand supply gap of river sand, bajri boulders in district and state. The proposed lease area lies in the river bed of river Kailash.

The Mining plan and Progressive Mine Closure Plan has been approved with the conditions stipulated by the Directorate of geology and mining Uttakhand.

Lessee got mining plan approved vide letter no. 2488 on dated 08/02/2019.

The proposal for environmental clearance was sent to SEIAA, Uttarakhand with the required Form-1 & Prefeasibility Report for issuance of ToR. The Terms of reference was issued on 26.02.2019. Based on the terms of reference issued, detailed EIA study report has been prepared. Compliance of TOR is attached as **Annexure-1**.

#### **Identification of Project Proponent:**

##### **Project Proponent:**

Mr.Jitendra Singh

S/o Mr.Aan Singh

R/o Village - Khupital, Khurpankha,

EIA report of Sand, bajri & boulders (minor minerals) mine, Village- Ukroli, Tehsil- Sitarganj,  
District Udhamasinghnagar, Uttarakhand developed by Sri jitendra singh

District - Nainital, Uttarakhand

**Address for Correspondence:**

Mr.Jitendra Singh

S/O Mr.Aan Singh

R/O Village - Khupital, Khurpankha,

District - Nainital, Uttarakhand

**Designation:**Owner

**10.2 Project description**

The present mining project is owned by Sri Jitendra singh. The lease area lies in the bed of River Kailash located near village-Ukroli, Tehsil Sitarganj& District-Udhamasinghnagar, Uttarakhand. Total Lease area of the mine is 6.0 ha. (Category 'B') and proposed production is 1,98,000 MT/year. The letter of intent was issued vide letter No. 1926/VII-1/18/02(74)/2018, dated- 12th Sept 2018 in favour of **Mr.Jitendra Singh S/o ShriAan Singh**, R/o – Village-Khupital, Khurpankha, District - Nainital, Uttarakhand granted for lease period of 5 years. The lease document is attached as **annexure II**).

The proposed mining site is approachable by NH-125, site is connected through link road toNH. Link rod to NH-125 is 12 Km away from proposed mine site. Nearest Railway Station Lalkuwan Railway Station:≈16.5 Km in West north west direction (crow fly distance). Nearest Airport (pantnagar) Airport ≈ 16.6 Km in west direction (crow fly distance). Nearest School/College Govt. High School, ≈ 6.5 Km in SW.

**Location Details:**

. The details of the location of the lease and land use are given below in the table:

**Table 10.1:Location Details of Mining Lease**

SL No.	Particulars	Description																		
1	Lease area	6.0 ha. Ha.																		
2	Village	Ukroli																		
3	Tehsil	Sitarganj																		
4	District & State	Udhamasinghnagar, Uttarakhand																		
5	Name of River	Kailash																		
6	Khasara Numbers	Plot no.04 khasra no. 55mi, 65mi, 69mi & 70mi. (Khasra map is attached as <b>plate no. 2</b> )																		
7	Toposheet No	530/12																		
8	Latitude	<table border="1"> <thead> <tr> <th>Pillar</th> <th>Latitude (N)</th> <th>Longitude (E)</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>29°02'20.31"</td> <td>79°41'36.28"</td> </tr> <tr> <td>B</td> <td>29°02'21.93"</td> <td>79°41'41.71"</td> </tr> <tr> <td>C</td> <td>29°02'13.91"</td> <td>79°41'41.33"</td> </tr> <tr> <td>D</td> <td>29°02'07.97"</td> <td>79°41'42.17"</td> </tr> <tr> <td>E</td> <td>29°02'05.09"</td> <td>79°41'37.32"</td> </tr> </tbody> </table>	Pillar	Latitude (N)	Longitude (E)	A	29°02'20.31"	79°41'36.28"	B	29°02'21.93"	79°41'41.71"	C	29°02'13.91"	79°41'41.33"	D	29°02'07.97"	79°41'42.17"	E	29°02'05.09"	79°41'37.32"
Pillar	Latitude (N)	Longitude (E)																		
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D	29°02'07.97"	79°41'42.17"																		
E	29°02'05.09"	79°41'37.32"																		
9	Longitude																			
10	Mineral	Sand Bajri Boulder (Minor Mineral)																		
11	Period of Mining Lease	5 years from date of execution of lease deed The letter of intent is attached as <b>annexure 1</b> )																		
12	Category of Land	Govt. Revenue Land (Non Forest Land)																		

The leasehold area 6.0 ha.has no pits available presently in the river bed as no mining has been done so far till date. The lease area is devoid of any vegetation.

Excavation activities will start after the grant of Environmental clearance. Depending upon the market requirement, Approved mine plan about 1,98,000 Tonnes per year of river sand, bajri & boulder is proposed to be excavated from the mining area.

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Duration of lease will be considered five years from date of execution of lease deed. Ultimate limit of depth will be 1.5 m below existing bed level in river bed as indicated in ultimate plan.

The lease is spread over an area of 6.0 ha. encompassing river bed land. Roads shall be used for transportation of mineral. While mining, 825 ton/day river sand, bajri& boulder will be produced and then transported by tractors having 9 tonne capacity.

As per Working Group Rural Domestic Water & Sanitation Demand there will be provision of Drinking water @ 30LPCD (SOURCE-CPHEEO), Suppression of dust is 1.5 KLD, Thus for 164 workers there will be requirement of 5 KLD Water. Water shall be provided to the workers with the help of hired tankers. Water will be sourced from existing bore well/tube wells in the respective nearby villages where mining will be carried out. Water shall be stored in storage tanks from where it will be used by workers.

There will be employment opportunity for 164 people involved in the mining project.

The mining process will commence soon after getting Environmental Clearance from MoEF as per EIA notification 2006. The estimated project cost will be Rs 1.28crores.

### **10.3 Analysis of Alternatives**

Occurrence of mineral is site specific activity therefore does not provide choice for alternative location. The Lease was granted by, government of Uttarakhand. This site is appropriate for good quality sand excavation. The Lease was granted by the Directorate of Mines & Geology, Uttarakhand. Thus, mining being site specific does not provide choice for alternative location.

### **10.4-Description of Environment**

The mine lease area 6.0ha which falls in Village - Ukroli, tehsil sitarganj district udhamasinghnagar, Uttarakhand. It is located in river bed of Kailash river. The proposed mining site is approachable by link road to NH-125. SH 37 is 17 km away from lease area. Uttra Pradesh and uttarakhand state boundary is 20km away from lease area. Pantnagar railway station is 17 km away from lease area (crow fly distance). Nearest Airport (pantnagar) Airport ≈ 22 Km in

west direction (crow fly distance). Nearest School/College Govt. High School 6.8 Km SW. Geographical location of mine lease area is covered under Survey of India Toposheet No. 53 O/12(H44N/12). Study area map covering a radius of 10 Km around the lease periphery is enclosed as **Plate no.-3**

The applied lease area has slope towards South. Highest point is at 232mRL in the NE corner of the area where as lowest point 229mRL is in the SW corner of the area. The physiographic features are shown in **Plate No. 3**.

The land use distribution in the buffer zone of 10Km radius (from periphery) is given in the table given ahead.

**Table 10.2: Land Use Distribution**

S No.	Category	Area in Sq Km	Area In Ha	%age
1	Agriculture Land	26.5223	2652.23	8.09
2	Fallow Land	29.6321	2963.21	9.04
3	Built-up, Rural	6.98	698.16	2.13
4	forest Land	238.4804	23848.04	72.74
5	River Sand Area	15.6502	1565.02	4.77
6	Scrub Land	7.9209	792.09	2.42
7	Water Bodies, River/Canal	1.0	100.19	0.31
8	Waste land	1.64	164.36	0.5
	<b>Total</b>	<b>327.83</b>	<b>32783.33</b>	<b>100.00</b>

Forest land includes around 23848 ha. area that covers around 72.74% of total area.

Built-up land includes the urban or rural settlements. The major built-up area is about 698.16 hectares which is 2.13 percent of the total 10 km radius study area.

Based on topographical maps and ground truth. The land use is mainly agricultural. The total agricultural area is about 2652.23 hectares which is 8.09 percent of the total study area.

Based on topographical maps and ground truth. Fallow land their area extent have been extracted. The fallow land area is about 2963.21 hectares which is 9.04 percent of the total 10 km radius study area. Based on topographical maps and ground truth. Water bodies their area extent

have been extracted. This area is about 100.195 hectares which is 0.31 percent of the total 10 km radius study area.

PM<sub>2.5</sub> recorded within the study area was in the range of 39.21 µg/m<sup>3</sup> to 60.04µg/m<sup>3</sup> with the average value ranging between 47.01µg/m<sup>3</sup> to 51.08µg/m<sup>3</sup> were compared with the National Ambient Air Quality Standards (NAAQS) and found that all sampling stations recorded in the study area are within the applicable limits i.e., 60µg/m<sup>3</sup> for PM<sub>2.5</sub> for industrial, residential, rural and other areas.

PM<sub>10</sub> recorded within the study area was in the range of 65.06µg/m<sup>3</sup> to 83.34µg/m<sup>3</sup> with the average value ranging between 71.03µg/m<sup>3</sup> to 74.6µg/m<sup>3</sup>.

The 24 hourly average values of PM<sub>10</sub> were compared with the National Ambient Air Quality Standards (NAAQS) and found that all sampling stations recorded in the study area are within the applicable limits i.e., 100 µg/m<sup>3</sup> for PM<sub>10</sub> for industrial, residential, rural and other areas.

SO<sub>2</sub> recorded within the study area was in the range of 10.25 to 25.54µg/m<sup>3</sup> with the average value ranging between 12.5µg/m<sup>3</sup> to 14.54µg/m<sup>3</sup>.

The 24 hourly average values of SO<sub>2</sub> were compared with the National Ambient Air Quality Standards (NAAQS) and it was found that all sampling stations recorded values are below the applicable limits 80 µg/m<sup>3</sup> for industrial, residential, rural and other areas.

NO<sub>2</sub> recorded within the study area was in the range of 12.84µg/m<sup>3</sup> to 39.54µg/m<sup>3</sup> with the average value ranging between 22.26µg/m<sup>3</sup> to 37.11µg/m<sup>3</sup>

The 24 hourly average values of NO<sub>2</sub> were compared with the National Ambient Air Quality Standards (NAAQS) and it was found that all sampling stations recorded values are below the applicable limits 80 µg/m<sup>3</sup> for industrial, residential, rural and other areas.

The values of noise observed in some of the areas are primarily owing to vehicular traffic and other anthropogenic activities. Assessment of hourly night time Leq (Ln) varies from 34.3 to 40.0 dB (A) and the hourly daytime Leq (Ld) varies 54.6 to 58.5 dB (A)

During the study period, the pH was varying for ground waters from 7.02 to 7.88. The pH values for all the samples collected in the study area during study period were found to be within the limits.

In ground water samples collected from the study area, the total dissolved solids are varying from 345 mg/l to 536mg/l. the TDS of the samples were within the permissible limit of 2000 mg/l.

The chloride level in the ground water samples collected in the study area were ranging from 10.68mg/l to a maximum of 46.80mg/l, The chloride samples are within the desirable limits.

In the ground water samples collected from the study area, the hardness is varying from 130mg/l to 196mg/l.

In the ground water samples of study area the fluoride value were in the range of 0.13 to 0.21 mg/l..

The surface water sample was collected from kailash river upstream and downstream and 6 other location.

pH: The pH value of surface water samples was between 6.88- 7.84 and always meets the drinking water desirable standard. Total hardness value of surface water samples was between is 110-168 mg/l Hardness value is within the acceptable limit of 200 mg/l. TDS of surface water samples was between 154 -232 mg/l and meets permissible limit of 500 mg/l. Calcium content in surface water samples was between is 20.32 -32.62 mg/l and found within the acceptable limit of 75 mg/l. Magnesium content in surface water samples was between is 5.9-16.10 mg/l and found within the acceptable limit of 75 mg/l. Fluoride content of surface water samples was between is 0.10 – 0.18 mg/l and meets the acceptable limit of 1 mg/l for potable water. Total alkalinity of surface water samples was between is 76.8 - 128 mg/l and meets within the permissible limit 600

mg/l. Sulphate content in surface water samples was between is 17.6 – 35.6 mg/l and meets the acceptable limit of 200 mg/l for potable water.

The pH of the area was found between 7.18 to 7.56 i.e. slightly alkaline in nature. The texture of soil in all sampled locations were found of three types loam clay and sandy in texture. The water holding capacity was found between 28 to 34.5 % among all samples monitored. The sodium content was reported to be in the range of 39.36 to 55.10 mg/1000g. Available phosphorous was found in range between 11.71 to 15.10mg/Kgand the organic carbon is found to be in range of 0.42 to 0.51 %.

### **Biological environment**

Core zone is devoid of any significant vegetation. It's a river bed area no faunal species were reported in the region, only cattles were found roaming over for grazing purpose.

As per wild life protection act 1972 and subsequent amendment most of the species reported in the study area are schedule III & IV. Only one species Peacock (*pavocristatus*) has been found to be in schedule I.

### **Socio economic environment**

The study area comprise of 10km radius buffer zone. it is found that 75 villages has been found in the study area. 45 villages lie in district udhamasinghnagar and 30 villages lie in district Nainital.

### **Primary survey**

As per the primary field survey the results suggest that following parameters were found satisfactory-

### **Housing facility-**

Housing facility in the villages in buffer zone was found as approximate 40% houses were reported to be pucca house with good condition. And semi-pucca houses were reported about 30% and rest 30% were kachcha houses. It shows a comparatively good picture of the area.

### **Drinking water facility-**

Drinking water in the area is easily available in about 80% houses the borewell supply was there and in rest 20% houses community supply.

### **Electricity**

The electricity availability is better in the region as 98% of houses are having electric connection with sufficient hours of power supply.

### **Education**

Educational status of the people in the villages of buffer zone was found improving. About 75% of adults were found to be educated. The percentage of kids for schooling was found better.

### **Economic status-**

No. of households above poverty line were found more (70%) and rest 30% were found below poverty line.

## **10.5 Anticipated environment impacts**

### **Impact on Water Environment**

Excavation of sand, bajri& boulder within stream bed has a direct impact on the stream's physical characteristics such as geometry, gradient, substrate composition and stability, depth, velocity and sediment transport.

All the parameters including metals concentration were under prescribed limits but project activity could enhance them.

- Alteration of flow pattern/modification of river bed
- Mine seepage and impact on Ground water regime
- Impact on surface water bodies

### **Mitigation Measures:**

- Project shall not affect ground water qualities because the mineral to be excavated is inert and free from toxic chemicals.
- Proper disposal of waste water to prevent it to pour with the stream water.
- No proposal for pumping of water either from river or tapping the groundwater is envisaged.
- Bio toilets will be provided for the workers at site.
- There will not be any adverse impacts on surface hydrology and ground water regime. Mining of river sand is confined up to 1.5m depth from surface of channel or above the ground water table whichever is less. Thus no ground water pollution is expected as the mining operation will not intersect the ground water table.
- No liquid waste will be generated due to mining or any other way so there is no possibility of pollution of water resources due to liquid waste. No contamination of ground water is envisaged.
- During period of mining, no diversion or modification of any part of the river is proposed.
- No mining will be done during monsoon period. However, during non-monsoon period if rain occurs, rainwater will be collected in pit and will be utilized in the green area.

### **Impact on Air Environment**

- Loading/unloading of mineral, and Trucks/dumpers all these shall be the major source of air pollution.
- The model suggests that due to increase in traffic load there will be possibility of increase in gaseous emissions from internal combustion engines giving rise to a reduction in air quality.
  - SO<sub>2</sub> level and NO<sub>x</sub> level were below limit value at each location.
  - PM<sub>10</sub> values could increase due to project activity because there shall be increase in dust due to mining.
  - These villages are prime areas where minor pollution occurs this is why values of Air quality parameters were found more but under prescribed permissible limits.

### **Mitigation Measures**

Following mitigation measures are follows:

- Water sprinkling will be done regularly on the haul roads. This will reduce dust emission.
- To check/reduce the impact of dust, plantation will be done.
- Speed limits will be enforced to reduce airborne fugitive dust from vehicular traffic.
- Spillage from the trucks will be prevented by covering tarpaulin over the trucks.
- Deploying PUC certified vehicles to reduce their emissions.
- Monitoring to ensure compliance with emission limits would be carried out during operation.
- Plantation of trees along the road & on riparian zone (in the restricted area), a long haul road to help to reduce the impact of dust in the nearby villages.
- Dust mask provided to the workers engaged at dust generation points like excavations and loading points.
- Major sources of air pollution are the road transport network of the trucks and loading vehicles. To check emission problem regular maintenance of vehicles will be done and PUC certificate will be obtained for all vehicles and mining machinery.
- Utmost care will be taken to prevent spillage of sand, bajri& boulder from the trucks/tractor trolleys.
- Overloading will be prevented. The trucks/tractor trolleys will be covered by tarpaulin sheet while transportation.

### **Impacts on Noise Environment**

- Transportation (Dumpers, Trucks, Tippers & other vehicles.).
- The ambient noise level during the baseline study at the proposed project site was within permissible limit of the standard of Residential area (~55 dB (A)). During night the noise level at the project site was observed within night time noise standards of 45.0.0 dB (A).

### **Mitigation Measures:**

Project proponent will adopt the following noise abatement measures.

- The vehicles will be maintained in good running condition so that noise level could be reduced to minimum possible level.
- Plantation of trees will be done to dampen the noise and also arrests dust.
- Imposition of speed limit on vehicles near residential areas.
- Truck drivers will be instructed to make minimum use of horns while passing nearby the residential area.
- Noise generated by these equipment's shall be intermittent and does not cause much adverse impact.
- Periodical monitoring of noise will be done.

### **Impacts on Biological Environment**

- The core zone does not comprise of forest area. Though there are forests in the buffer zone. The forests are dominated by herbs and shrubs, and are not ecologically diverse.
- The area does not form part of eco-sensitive areas like National Park, Wildlife Sanctuary, Biosphere Reserves or Tiger Reserves. Likewise the area does not form part of the migratory route of any wildlife species.
- Mining may drive away the wild life from their habitat, and significantly affect wildlife.
- Noise generation due to vehicles may affect avifauna.

### **Mitigation Measures:**

- Measures for green belt development will enhance the vegetation and afforestation in core zone in agricultural land. Emphasis will be given on native plant species & plants of economic importance.
- Haul roads will be sprinkled with water which would reduce the dust emission, thus avoiding damage to the crops.

- No mining will be carried out during the monsoon season to minimize impact on aquatic life which is mainly breeding season for many of the species.
- No discard of food, polythene waste etc will be allowed in the core zone. No night time mining will be done which may catch the attention of wild life.
- Minimized noise pollution will have less adverse effect on avifauna and they will thrive in the area. However, no bird's habitats like nesting, breeding and foraging patterns are noticed in the core zone. Local birds are noticed crossing over the banks in search of food.

**Impact on socio economic environment:**

- Impact on economic status of the people.
- Positive impacts on present status of livelihood in the area
- The conglomeration of sand along river stretch will be removed hence avoid overflowing of water in river.
- Due to the overloading of trucks approach roads will get damaged and this may cause problem to locals.
- During the loading & unloading of mining material the dust particles may suspend in the air. This intern may affects the health of the people.
- Sometimes drivers play loud music which creates sound pollution in the nearby helm.
- Carcinogenic emissions cause lung cancer & other respiratory disorders.

**Mitigation Measures:**

- Over loading of trucks will not be allowed.
- The music will not be allowed to play during the transportation of material.
- Regular water spraying on roads and storage dumps
- The ID proof of the each employee will also be kept as a record.

- **Skill based training** to locals employed people is being imparted which will be further expanded as the employment grows after the expansion of the plant .The training record of the workers should be maintained with certificate.

### 10.6 Environmental Monitoring Program

Post project monitoring will be done and the recorded data from monitoring of air, water, soil and noise will be submitted half yearly by project proponent to Ministry of Environment and Forests (Regional office) and State Pollution Control Board (SPCB).

All the parameters below mentioned shall be checked and any abnormality found shall be reported to the authority. To manage the implementation of environmental monitoring program a dedicated cell will be made to record the change in ambient environment.

- Ambient Air Quality Monitoring
- Noise Monitoring
- Monitoring of Water Quality
- Soil Quality Monitoring
- Plantation and Greenbelt Development Monitoring
- Occupational Health and Safety

**Table 10.3: Environmental Monitoring Schedule**

S.No.	Description of Parameters	Schedule and duration of Monitoring
1.	Ambient Air Quality (a) In and around mines for SO <sub>2</sub> , NO <sub>2</sub> , PM <sub>10</sub> & PM <sub>2.5</sub>	Samples for 24 hours continuously will be collected twice a week for one month for one season of the year or as per norms of SPCB
2	Meteorological parameters like temperature, RH, wind speed, wind direction, rainfall, cloud cover	Continuous monitoring for meteorological parameters
3	Water quality of wells, and in water bodies around the mines	Monthly/Quarterly or as per norms of SPCB & MoEF for various parameters
4	Ambient noise levels inside the mine premises and nearby villages	Once in a month or as per norms of SPCB & MoEF

5	Soil characteristics in nearby villages.	Quarterly or as per norms of SPCB & MoEF for various parameters
6	Occupational health check up	Organization of regular health check up camps shall be done.
7	Inventory of Flora/ Fauna	Once a year on all the green belt sites created and once in a years in study area
8	Socio-Economic Aspect	Once in a years through physical survey for detecting any adverse variation and prompt correctives.

### 10.7 Additional Studies

The Additional Studies conducted are Risk Assessment & Disaster Management / Hazard Management & Occupational Health & Safety.

The community development programme proposed by the proponent for the surrounding population will be carried out along with budget provision proposed for improving the conditions of persons in and around the project area as under:

**Table 10.4: Corporate environment Responsibility**

Sr. No.	Description	Amount (In Lacs)
1	Health check up camps	0.5
2	Assistance to local school, scholarship to students	0.565
3	Sanitations and drinking water facilities	1.0
4	Vocational training to persons for income generation	0.5
<b>Total</b>		<b>2.565</b>

### 10.8 Project Benefits

The project will prove beneficial to the people as the company has already agreed to provide infrastructural facilities to the villagers like Educational facilities, Medical facilities,

Transportation facilities, water supply etc. which will improve the socio-economic environment of the area

## **10.9 Environment Management Plan**

### **Air Management**

Following measures will be taken to control air pollution during mining operations:

- Adequate water spraying on the haul roads.
- Construction of proper haul roads approaching the lease area.
- Development of Green belt/plantation along mining lease, haul roads, mine office to arrest dust.
- Masks will be provided to drillers and persons employed in dusty area.

### **Water Management & Water Pollution Control**

#### **Surface Water**

The major source of surface water pollution due to sand, bajri& boulder 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 vehicles in the river will be avoided.
- Mining will be avoided during the monsoon season. This will help in replenishment of sand, bajri & boulder in the river bed.
- Mining will not interest the river bed water level or ground water table of the area.
- Mining will be carried out above the water table.

#### **Ground Water**

- There will not be any adverse effect on the ground water quality. The minor mineral does not contain any harmful chemical, which could percolate into the ground and pollute the ground water. Hence, no control measures are required. Bio toilets will be provided to workers. 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.

### **Noise Environment**

- 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.

### **Land Environment**

- 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.
- Mining will be carried out during daylight only.
- No foreign material will be allowed to remain/spill in river bed and catchment area, or no pits/pockets will be allowed to be filled with such material.
- Measures will be taken to prevent the working form crossing safety zones.
- Mining on the concave side of the river channel should be avoided to prevent bank erosion. Similarly meandering segment of river will be selected to prevent natural eroding banks and to promote mining on natural building (aggrading) meanders component.

### **Green Belt/Plantation**

Greenbelt development programme 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.

### **Environment Management Plan**


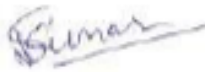
The environmental management plan has been developed with a view to bring down the levels of impacts as discussed in the last chapter within limits. In each of the areas of impact, measures have to be taken to reduce potentially significant adverse impacts and where these are

beneficial in nature, such impacts are to be enhanced/augmented so that the overall adverse impacts are reduced to as low level as possible.

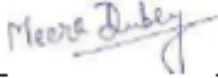
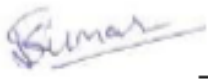
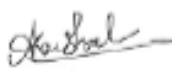

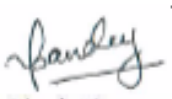
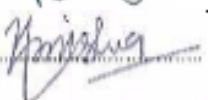

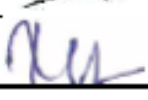

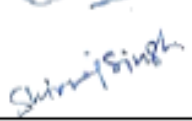
**Table 10.5: Budgetary Provision for Environmental Management Programme**

<b>S.No.</b>	<b>Particular</b>	<b>Capital Amount (In Lakhs)</b>	<b>Recurring Amount (in Lakhs)</b>
1	Pollution monitoring- Air, Water, Noise.	1.5	1.60
2	Water Sprinkling	1.0	1.0
3	Wire fencing at plantation sites	0.5	0.5
4	Plantation including maintenance	1.0	0.5
5	Haul road and other roads repair and maintenance	1.0	0.5
6	Expenses on Public Health	0.5	0.5
7	Miscellaneous	-	0.2
<b>Total</b>		<b>5.50</b>	<b>4.8</b>

**CHAPTER: 11  
DISCLOSURE OF CONSULTANT ENGAGED**

<b>Project Name: "Sand bajri &amp; boulder (minor mineral) Mine"</b>		
<b>Location: River: Kailash River Bed, Village: Ukroli, Tehsil-Sitarganj, District: Udham singh nagar, State: Uttarakhand Area: 6.0 Ha. Schedule- 1 (a)i, Category- B1 Applicant Name: Shri jitendra singh</b>		
Name and address of the Consultant	<b>GLOBUS ENVIRONMENT ENGINEERING SERVICES</b> 326-AB, 3rd Floor, Sahara Shopping Center, Faizabad Road, Lucknow -2260160. Contact: 0522-4071422,+91-9984896973, 9984444121	
Certificate No.	<b>NABET/EIA/1821/LA0034, Valid Till April 03/2021</b>	
Personnel involved in preparation of EIA/EMP report	Mr. Akhilesh Kumar Gupta	
	Mr. Sandeep Kumar(EC)	

**FUNCTIONAL AREA EXPERTS INVOLVED:**

<b>In- House</b>		
F AE-AP, WP	Ms. Meera Dubey	
F AE AP, EB	Mr. Sandeep Kumar	
F AE- SE	Mr. Amen Xavier	
F AE-SW	Ms. Shukti Singh	
<b>Empanelled</b>		
F AE- NV,AQ, SHW,	Mr. Vikas Pandey	
F AE-GEO, HG, LU	Dr. Ajay Mishra	
F AE- RH	Mr. Gautam K. Banerji	
F AE-SC	Mr. Tulsi Ram Rathore	
<b>Team- Members:</b>		
Mr. Matloob Ansari	Environmental Executive	
Mr. Shivraj Singh	Environmental Executive	

EIA report of Sand, bajri & boulders (minor minerals) mine, Village- Ukroli, Tehsil- Sitarganj, District Udhamasinghnagar, Uttarakhand developed by Sri jitendra singh

		Scheme for Accreditation of EIA Consultant Organizations			
S. No.	Consultant Organization	Scope of Accreditation As per NABET Scheme			Project or Activity as per Schedule of MoEFCC Notification dated September 14, 2006 and subsequent Amendments
		Sector Number	Name of Sector	Category	
	Address: C- 25, B/B Nagar, Bhutaneshwar – 751014 E-mail: <a href="mailto:manojnaya333@yahoo.com">manojnaya333@yahoo.com</a> <a href="mailto:globalxperts@rediffmail.com">globalxperts@rediffmail.com</a> Tel.: 0674 – 2436853 05437033487 09617133487	7	Mineral beneficiation including pelletisation	A	2 (b)
		8	Metallurgical industries (ferrous only) - both primary & secondary	A	3 (a)
		9	Cement plants	B	3 (b)
		20	Chemical Fertilizers	A	3 (a)
		22	Distilleries	B	5 (g)
		36	Common effluent treatment plants (CETPs)	B	7 (v)
		37	Common municipal solid waste management facility (CMSWMF)	B	7 (i)
		38	Building and construction projects	B	8 (a)
78	<b>Globus Environment Engineering Services</b> Address: 326 - AB, 3rd Floor, Sahara Shopping Center, Lakhta Crossing, Faizabad Road, Lucknow-226016	1	Mining of minerals - Open cast mining only	B**	1 (a) (i)

List of Accredited Consultant Organizations (Alphabetically) Rev. 71, November 12, 2018

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		Scheme for Accreditation of EIA Consultant Organizations			
S. No.	Consultant Organization	Scope of Accreditation As per NABET Scheme			Project or Activity as per Schedule of MoEFCC Notification dated September 14, 2006 and subsequent Amendments
		Sector Number	Name of Sector	Category	
	E-mail: <a href="mailto:globusenroservice@gmail.com">globusenroservice@gmail.com</a> Tel: 91-728041242 **The organization as a whole was accredited for Cat. A, in view of their having scored less than 50% marks in Office Assessment. Thus, the ACO cannot take up Cat. A projects. Conditions apply	38	Building and construction projects	B**	8 (a)