

**FINAL ENVIRONMENTAL IMPACT ASSESSMENT  
AND  
FINAL ENVIRONMENTAL MANAGEMENT PLAN  
FOR**

**PROPOSED MINING OF SOAPSTONE**

**AT**

**VILLAGE: KARULI, TEHSIL & DISTRICT: BAGESHWAR,  
UTTARAKHAND**

**AREA: 7.784 HA, PROPOSED CAPACITY: 30,000 TPA (MAXIMUM)**

**PROJECT PROPONENT**

**M/S BALRAJ ASSOCIATES  
SHRI. BALWANT SINGH BISHT (PARTNER)  
BHAWAN NO 12, WARD PIYANA, TEHSIL &  
DIST- PITHORAGARH (UTTRAKHAND)**

**PREPARED BY**

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(Accredited by NABET (Quality Council of India)

For EIA studies as 'A' Category Consultant

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Annexure VIII	Details of Public Hearing

# **CHAPTER 1: INTRODUCTION**

## CHAPTER 1: INTRODUCTION

### 1.1 PURPOSE OF THE EIA REPORT

Environmental Impact Assessment (EIA) is one of the proven management tools for integrating environmental concerns in development process and for improved decision making as there is need to harmonize the developmental activities with the environmental concerns into the larger interest of the society. The growing awareness, over the years, on environmental protection and sustainable development, has given further emphasis to the implementation of sound environmental management practices for mitigating adverse impacts from developmental activities. EIA study plays a vital role in sustainable development of a country. Recognizing its importance, the Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India has formulated policies and procedures governing the industrial and other developmental activities to prevent indiscriminate exploitation of natural resources and to promote integration of environmental concern in project development.

Final Environmental Impact Assessment report has been prepared to comply with the proposed Terms of Reference (ToR), under EIA notification of the MoEF&CC dated 14<sup>th</sup> September, 2006 and amended thereof, for seeking environmental clearance for mining of soapstone in the applied mining lease area.

### 1.2 IDENTIFICATION OF PROJECT & PROJECT PROPONENT

The project is being proposed by M/s Balraj Associates (Partner: Shri. Balwant Singh Bisht). The address of the proponent is given below:

M/s Balraj Associates

Bhawan No. 12, Ward Piyana,

Tehsil & District - Pithoragarh (Uttarakhand)

The proponent has applied for environmental clearance for mining lease in the name of Soapstone (Agricultural Land) Mining Project over an area of 7.784 ha at Village- Karuli, Tehsil & District- Bageshwar, Uttarakhand.

### 1.3 BRIEF DESCRIPTION OF PROJECT

#### 1.3.1 NATURE

The proposed mining will be done semi-mechanized way in open cast method in quite a systematic manner by forming 3m high benches

#### 1.3.2 SIZE

The mine lease area is 7.784 Ha private Agricultural land on hill terrain and the project is contemplated to extracted the mineral (Soapstone) by manual open pit/cast method of mining without blasting.

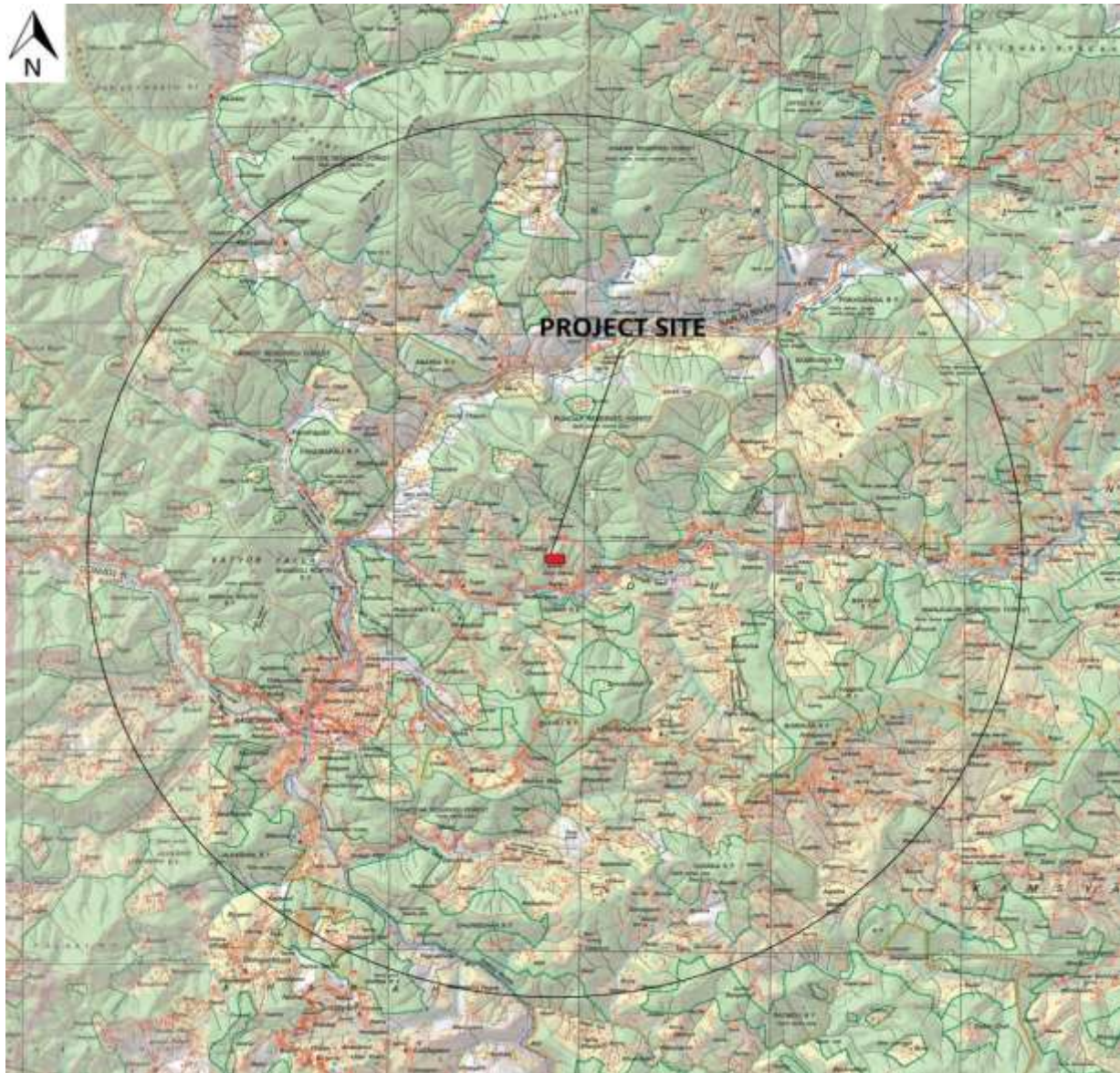
### 1.3.3 LOCATION

The proposed lease of Soapstone Mine is situated at Village-Karuli, Tehsil & District - Bageshwar in the Uttarakhand State. The location and Salient feature of mining Lease area has been shown in **Table 1.1**. The location map of the mine lease area has been shown in **Figure 1.1**.

**Table 1.1: Location and Salient feature of Mining Lease Area**

<b>Sr. No</b>	<b>Particular</b>	<b>Details</b>
<b>A.</b>	<b>Nature of the Project</b>	<b>Soapstone Mining Project.</b>
<b>B.</b>	Size of the Project	
<b>1.</b>	ML Area	7.784 Hectare (Private Agricultural Land).
<b>2.</b>	Proposed Production Capacity	Total Recoverable Quantity of Soapstone:
		30,000 Tonnes/Annum (maximum) (As per approved mining plan)
<b>3.</b>	Lease Period of Mine	Lease was granted for a period of 50 Years.
<b>C.</b>	Method of Mining	
<b>1.</b>	Method	Open-Cast Manual Mining
<b>2.</b>	Blasting / Drilling	Not proposed
<b>D.</b>	Project Location	
<b>1.</b>	Village	Karuli
<b>2.</b>	Tehsil	Bageshwar
<b>3.</b>	District	Bageshwar
<b>4.</b>	State	Uttarakhand
<b>5.</b>	Toposheet No.	53 O/13
<b>6.</b>	Lease Area Coordinates	Latitude : 29°52'2.62" N to 29°52'17.80" N Longitude: 79°49'25.71" E to 79° 49' 39.22" E
<b>E.</b>	Cost Details	
<b>1.</b>	Project Cost	Rs. 10 Lakhs (Excluding land)
<b>F.</b>	Water Demand	
<b>1.</b>	Requirement	7.5 KLD
<b>2.</b>	Source of water	Natural Springs (nalah)
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<b>H.</b>	Environmental Setting	
<b>1.</b>	Nearest Village	Karuli
<b>2.</b>	Nearest Town	Bageshwar, 6.5 Km.
<b>3.</b>	Nearest National / State Highway	Bageshwar – Dofar - Dharamgarh Road, 0.11 Km
<b>4.</b>	Nearest Railway Station	Kathgodam, 80 Km
<b>5.</b>	Nearest Airport	Pantnagar, 101 Km

<b>6.</b>	Ecological Sensitive Areas (National Park, Wild Life Sanctuaries, Biosphere Reserve etc.) within 10 km radius	None
<b>7.</b>	Reserved / Protected Forest within 10 km radius	Gairar Reserve Forest, 600 m
<b>8.</b>	Water bodies within 10 km radius of the mine site.	Punger River, 500 m Saryu River, 9 km
<b>9.</b>	Archaeological Important Place	None
<b>10.</b>	Seismic Zone	V



**Figure 1.1: Location Map of the mine lease area**

#### 1.4 PROJECT'S IMPORTANCE TO THE COUNTRY AND THE REGION

Soapstone finds its use in many of the industries that include detergent & Paper industries etc. The natural available material in the quarry site has been found suitable from techno economic consideration. The mining project shall provide direct employment to about 126 persons. Additional jobs are created by way of transportation.

No subgrade mineral is produced from the mine. The soapstone is being dressed manually and transport to Haldwani. The final material will be utilized paper & cosmetic industries.

#### 1.5 SCOPE OF THE STUDY

The SEAC in its meeting dated 10<sup>th</sup> January, 2019 examined the proposal. After through discussion and deliberation, it has been conveyed by SEAC that EIA/EMP report shall be prepared as per approved ToR and after public consultation through Uttarakhand Environment Protection and Pollution Control Board as the project falls under B1 category. The final EIA/EMP report shall be submitted after incorporating Public Hearing details to SEIAA, Uttarakhand for grant of Environmental Clearance.

#### 1.6 POINT WISE COMPLIANCE

The present EIA/EMP report of the proposed project is prepared as per proposed TOR and in compliance with the ToR No. 66/SEAC dated 01 June 2019 by State Level Expert Appraisal Committee, Dehradun. The copy of the ToR has been attached as **Annexure I**. The point wise compliance of ToR has been shown in **Table 1.2**:

**Table 1.2: Point Wise Compliance for TOR**

Sr No.	ToR Points	Reference of Compliance
1.	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994	The proposed soapstone mine is a new mine. Therefore the year wise production data since 1994 is not applicable.
2.	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given	The copy of LOI is attached as Annexure II.
3.	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee. The above reports should also match with the latest District Survey Report (DSR) notification no- 2827 dated 25 <sup>th</sup> July, 2018.	Complied.  The DSR report of Bageshwar, 2019 has been attached as Annexure VII.
4.	All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an	The study area map has been shown in Figure 1.1 of Chapter 1.

	Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	
5.	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	The land use map of the proposed project has been shown in Figure 3.7 of Chapter 3.
6.	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The details have been have been described in Section 4.3 of Chapter 4.
7.	It should be clearly stated whether the proponent Company has a well laid down Environment	Yes the details have been shown in Figure 6.1 of Chapter 6.
8.	Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	The Institutional Arrangements for Environment Protection and Conservation has been described in 6.2 of Chapter 6.
9.	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	The details have been provided in section 7.2.6 of Chapter 7.
10.	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.	Complied.
11.	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	The land use map of the proposed project has been shown in Figure 3.7 of Chapter 3.
12.	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.	Provided in EIA/EMP Report.  There is no R&R involved in this proposed project.
13.	A Certificate from the Competent Authority in the	No forest land is involved in the

	State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	proposed soapstone mine.  The letter from the forest department that no forest land is involved in the proposed project has been attached as Annexure VI.
14.	Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	No forest land is involved in the proposed soapstone mine
15.	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated. The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	Not Applicable
16.	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	No wildlife Sanctuary/National Park is situated within 10 km radius from the proposed soapstone mine.
17.	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.	No wildlife Sanctuary/National Park is situated within 10 km radius from the proposed soapstone mine.  The letter from Forest Department that no Wildlife Sanctuary is located in 10 km radius from the project site has been attached as Annexure VII.
18.	A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled- I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation	The detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] has been described in section 3.11 of Chapter 3.

	with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	
19.	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable
20.	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	No CRZ area is situated within 10 km radius from the proposed soapstone mine
21.	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	Not Required.
22.	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica,	<p>The baseline data has been collected in pre monsoon season (March-May) 2019. The details have been presented in Chapter 3.</p> <p>The details of Ambient Air Quality have been described in section 3.5 of Chapter 3.</p>

	should be given.	
23.	Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	The Air quality modeling has been described in section 4.4 of Chapter 4.  The details of windrose has been described in section 3.4 of Chapter 3.
24.	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	The details of Water requirement for the Project have been described in section 2.9 of Chapter 2.
25.	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Not required.
26.	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	Not Applicable.
27.	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	The details have been described in section 4.2 of Chapter 4.
28.	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	Not Required.
29.	Details of any stream, seasonal or otherwise, passing through the lease area and modification/diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	No streams, seasonal nallahs or river is passing through the proposed the soapstone mine.
30.	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.	The details have been described in table 4.1 of Chapter 4
31.	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on	The Greenbelt Development Plan have been described in section 9.9 of Chapter 9.

	commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	The Greenbelt and Plantation have been described in section 4.7 of Chapter 4.
32.	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	The impact on Traffic has been mentioned in section 4.13 of chapter 4.
33.	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	The temporary rest shelters and mobile toilets will be provided to the mine workers.
34.	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	The details have been described in section 4.3 of Chapter 4.
35.	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	The details have been described in section 4.10 of Chapter 4.
36.	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	Complied and Provided in EIA/EMP report
37.	Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	The details have been described in section 4.9 of Chapter 4.
38.	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any,	The detailed Environmental Management Plan (EMP) has been described in Chapter 9.

	occupational health impacts besides other impacts specific to the proposed Project.	
39.	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	The details of Public Hearing minutes along with the Photographs have been attached as Annexure VIII.
40.	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No court case is pending in any court against the proposed project.
41.	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	The budget of Environmental Management Plan has been presented in Table 9.3 of Chapter 9. The budget of CSR has been presented in Table 4.13 of Chapter 4. The budget of CER has been presented in Table 9.4 of Chapter 9.
42.	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	The detailed Disaster management Plan has been described in section 7.3 of Chapter 7.
43.	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	The detailed project benefits have been described in Chapter 8.
<b>General Points</b>		
(a)	Executive Summary of the EIA/EMP Report	Complied
(b)	All documents to be properly referenced with index and continuous page numbering.	Complied
(c)	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.	Complied
(d)	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.	Complied
(e)	Where the documents provided are in a language other than English, an English translation should be provided.	Complied
(f)	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Complied
(g)	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.	Complied

(h)	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.	Complied
(i)	As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	Complied
(j)	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Complied
<b>Note:</b>		
1)	The study area shall comprise of radial distance of 10 KM from the project site and the study period is three months. The impact on each of the above parameter as a result of mining shall be assessed through appropriate modeling and prediction methods considering base line data.	Complied
2)	District Survey Report should be submitted as per the latest notification no- 2827 dated- 25-7-2018	Complied and the latest DSR report has been attached as Annexure VII.

## **CHAPTER 2: PROJECT DESCRIPTION**

## CHAPTER 2: PROJECT DESCRIPTION

### 2.1 TYPE OF PROJECT

The project is proposed for the excavation of soapstone from the Hill slope (Agricultural land). It is an opencast mining project where the entire activity will be done in a semi-mechanized way.

### 2.2 NEED FOR THE PROJECT

The project site lies on hill slope which is agricultural land. With the rapidly increasing demand of Soapstone raw materials, The Industry's demand for fine powder is continuously prompting technological advancements to meet this purpose. The pulverizers/hammer mills developed and manufactured in India are capable of producing up to 700 mesh powder. The world market prefers fine powder which can be produced by adopting new processing techniques like micronising and sterilization of the product. Talc, in pulverized form, is mostly used as filler in paper, textile, rubber, insecticides and fertilizer industries. Pure talc after calcining, called 'Lava' is used in the manufacture of low-loss ceramic materials essential for radio, radar television, etc. In roofing products, such as, tar paper, asphalt shingles and roll roofing, talc acts as a fire retardant and increases weather resistance. Body and face powders (talcum powder) are prepared from the finest quality talc after adding deodorant and perfumes.

Talc is used mostly in pulverized form as a filler and extender in various industries. The non-pulverized talc is used in refractory, etc. Total reported consumption of talc/steatite/ soapstone in the organized sector was at 368 thousand tonnes in 2012-13. About 56% consumption in 2012-13, was in Paper Industry, followed by Paint (20%), Pesticide (11%), Ceramic (8%) and Cosmetic (4%) industries. Nominal consumption was shared by Fertilizer, Rubber, Textile, Chemicals and other industries.

The demand in the domestic market is high for Soapstone. The Industry's demand for fine powder is continuously prompting technological advancements to meet this purpose. Mineral is available in abundant quantity in area and can be extracted indigenously.

The proposed mining activity is for indigenous consumption only for Pharmaceutical Industry, Cosmetic Industry, Textile, Ceramic, Paint, Rubber, Plastic, Detergent etc.

### 2.3 LOCATION DETAILS

The proposed lease of Soapstone Mine is situated at Village-Devli, Tehsil — Kanda, District - Bageshwar in the Uttarakhand State. The lease co-ordinates and connectivity details are listed below:

Latitude	29°52'2.62" N to 29°52'17.80" N
Longitude	79°49'25.71" E to 79° 49' 39.22" E

The lease is well connected to metaled road Bageshwar – Dofar - Dharamgarh which is at a distance of approx. 0.11 km from the mine lease area.

The index map of the project site has been shown in **Figure 2.1**.

2.3.1 Lease Hold Area

The lease hold area of 7.784 ha lies on the hill slope. The lease has been intended to allot vide Letter of intent (LoI) no.2668/VII-1/2018/7 Soapstone/18 dated 26/11/2018. The copy of Letter of Intent (LOI) has been attached as **Annexure II**.

2.3.2 Details of the Lease Hold Area

Forest	Area (ha)	Non Forest Land	Area(ha)
Forest (specify)	None	1. Jotdar land	5.349
		2. Land under Category 7 (a)	1.074
		3. State Govt./Civil land	1.062
		4. Land for public use	0.299
<b>Total</b>	<b>Nil</b>	<b>Total</b>	<b>17.824</b>

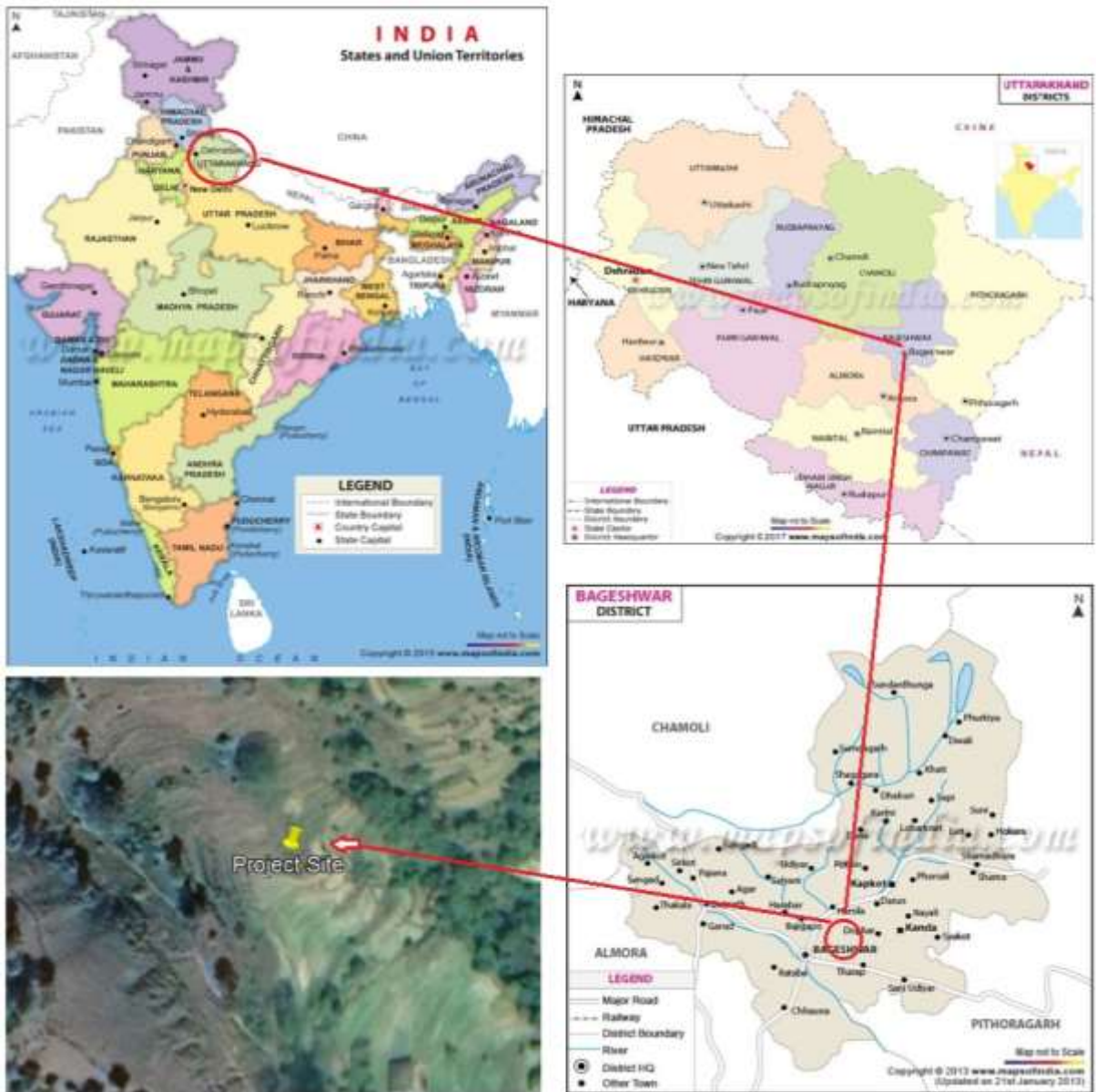


Fig 2.1: Index map of the project site

## 2.4 TOPOGRAPHY & GEOLOGY

### Topography

Bageshwar district comprises two broad physiographic divisions from north to south viz. Central Himalayan Zone (north of the Main Central Thrust) and Lesser Himalayan Zone (south of the Main Central Thrust). The area shows an extremely rugged topography characterised by precipitous hills and deep gorges with sharp variation of high magnitude in surface relief. The general slope is towards south. In the northern parts the elevation of the land surface ranges from about 3000 m to 6861 m above mean sea level whereas in the valleys of southern part, the altitude is as low as 795 m. The soils of Bageshwar district can be broadly classified into two types, viz. Soils of Lesser Himalaya and Soils of Greater or Central Himalaya. Majority of the area is covered by the first type. The soils in this area are exposed in massive mountainous tracts and tangled mass of series of ridges divided from each other by deep, narrow valleys. The soils of Lesser Himalaya are further subdivided into a) Soils of Summits and Ridge tops, b) Soils of Side Slopes, c) Soils of Glacio-Fluvial Valleys, d) Soils of Fluvial Valleys and e) Soils of Cliffs. The soils of Greater Himalaya have been broadly classified under a) Soils of Summits, Ridge Tops and Mountain Glaciers, b) Soils of Side Slopes, c) Soils of Upper Glacio-Fluvial Valleys and d) Soils of Cliffs.

The topography of the proposed project area lies on northeastern, northern & northwestern slope of a hill in a mountainous terrain of rough and rugged topography. The adjacent area is drained by few seasonal nalas. The applied forms a transverse ridge of Devli village ending Northwards and northeastern wards in the valley. The area has sloppy undulating surface and at places flat gentle sloping terraces also. The highest RL is about 1635.1m on the southern side of the applied area, while the lowest RL recorded on the northwestern side of the applied area is about 1496.3m.

### Geology

District Bageshwar is mainly represented by the rocks of Lesser Himalaya and Central Himalaya. The geological set up is very complex due to the repeated tectonic disturbances caused by different orogenic cycles. Valdiya (1980) carried out extensive geological and structural mapping in the area. The salient features of geology are depicted in the geological map of Bageshwar district (Fig. 4). The map is based on Geological Survey of India, 2002.

The rock units exposed in various parts of Bageshwar district comprise current-bedded quartzite with associated volcanics, mica-talc schist, limestone, conglomerate, slate, quartzite, granodiorite, augen gneiss, migmatite and granite gneiss. Many areas in the northern part of the district are yet to be mapped by conventional field methods due to inaccessibility and permanent snow cover. However, a group of regionally metamorphosed rocks known as the Central Crystallines are exposed in this area. The Central Crystallines of the Central Himalayan Zone occur as thrust sheets over the metasedimentary and sedimentary rocks of Lesser Himalayan Zone in varied tectonic settings. Major rock types of Central Crystallines are migmatites, psammitic and mica gneiss, calc gneiss, quartzite, marble, mica schist and amphibolite. Granites of different ages ranging from Paleoproterozoic to Mesozoic-Tertiary intrude the Central Crystallines. Major parts of

Bageshwar district falls under the geotectonic zone known as the Lesser Himalaya. Rock types in the Lesser Himalayan Zone include sedimentaries, metasedimentaries and plutonic igneous rocks. The various rock units have suffered multiple phases of deformation and metamorphism in major parts of the district.

The area forms the part of Cale zone of Tejam and Pithoragarh. According to Prof. K.S. Valdiya (Geology of Lesser Himalaya, 1980) and D. K. Banerjee et. al.(Him. Geol., Vol. 5, 1975) the lithostratigraphic sequence of this area is as follow:

<b>Group/ Formation</b>	<b>Lithology</b>
Berinaq Formation	Quartzite, Meta quartzite, Conglomerate, Phyllite
-----Unconformity -----	
Gangolihat magnesite Structures. Magnesite with talcose phyllite intercalations	Magnasite, dolomitic soapstone with algal
-----Unconformity -----	
Sor Slate	Slate, Phyllite, subgrawake

In this region, rocks of Pithoragarh Formation occur. The development of algal stromatolite in carbonates occurrence or magnesite is a common associate of the carbonates. The Calc-Zone rock units are well known for their structural dispositions (windows, half windows in Lesser Kumaon Himalaya) for stromatolites and minerals (magnesite, dolomite, soapstone and minor metallic occurrences).

**Local Geology:**

The area only shows part of carbonates of Gangolihat Dolomite sequence. The local stratigraphy shows that the mineralized zone lies between upper & lower carbonates as below:

Upper Carbonates: Magnesite sporadic dolomite Middle Talcose phyllite: Talc in pockets

Lower Carbonates: Dolomite & Dolomite Limestone

As per UNFC, the deposit is lenticular of all dimensions including bodies occurring en-echelon fashion.

**Overburden:**

Almost whole block of the applied area is covered with overburden material. This overburden comprises grey to brown to dark brown, fine to medium grained silty-clayey soil. Small fragments of soapstone and magnesite are also present in this soil. Thickness of this overburden varies from 0.4 to 1.1 m.

**Soapstone bearing with Magnesite:**

Intermixing of soapstone [Mg<sub>3</sub>Si<sub>4</sub>O<sub>10</sub>(OH)<sub>2</sub>] with magnesite occur below the soil cover. Mostly this soapstone or talc is highly prone to easy weathering and erosion due to its softness and thus its outcrops are rare. In shallow depth soapstone is massive to highly foliated and shows brightness/whiteness characteristic which generally varies from medium to high. At places talc pockets are crushed and crumbled due to association with shear zones present in the area. In the applied area soapstone is fine grained, off-white to white, foliated and sometimes powdery due to crushing. In specimens or fragments it shows flexibility in edges due to thinness and trimming. Overburden comprises magnesite boulders

intermixed with soapstone. This intermixed magnesite boulders in soapstone are about 60%.

**Source: Approved Mining plan**

## **2.5 CLIMATE**

The climate in Bageshwar district is temperate to sub-humid. The northern part of the district experiences sub-zero temperature almost throughout the year whereas the central and southern parts are comparatively warm and humid. Severe winter is the chief climatic feature in the district. In general, the district experiences a tropical to subtropical and sub-humid climate except for the northern part where a cold temperate climate prevails.

### **2.5.1 Temperature, Relative Humidity and Wind**

January is the coldest month with mean maximum temperature of 10°C, the mean minimum temperature being about 2°C. Temperature drops down to -6°C during January and February in the northern part of the district. June is the warmest month with the mean maximum and the mean minimum temperatures of 25°C and 15°C respectively. The maximum temperature recorded in the district was 43°C (May 2003) whereas the minimum temperature recorded was 4°C (January 2003).

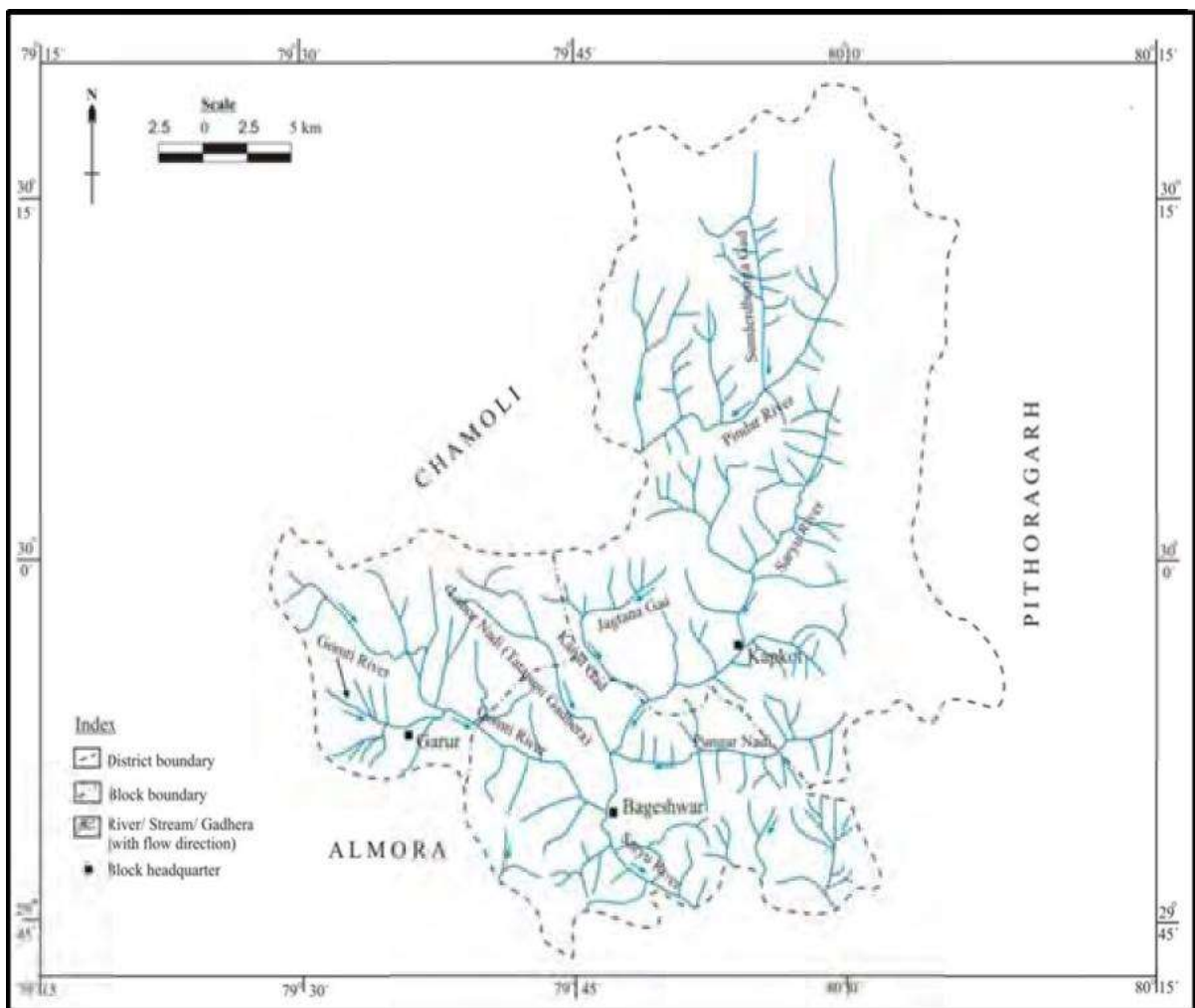
The Relative Humidity increases rapidly with the onset of monsoon and reaches at about 80% during July to September. The driest part of the year is the pre-monsoon period, when the humidity is as low as 30% in the afternoons. Skies are heavily clouded during the monsoon months and for short spells when the district is affected by Western Disturbances. Two broad wind patterns are observed in the district viz. north easterly to easterly (May to September) and south easterly to westerly (October to March).

### **2.5.2 Rainfall**

Most of the rainfall, about 75% of the annual value, occurs during monsoon months of June to September. July is the rainiest month followed by August. In September, depressions from Bay of Bengal occasionally reach Uttarakhand and affect the weather of Bageshwar district also. This phenomenon may cause heavy rains. With the withdrawal of monsoon in September, the intensity of rainfall rapidly decreases. The decrease continues till November, which is a practically rainless month. Winter precipitation is associated with the passage of the Western Disturbances and is in the form of snowfall over higher elevations. The monthly and annual normal rainfall data of Kausani Rain Gauge Station for the period 1997-2002 shows that the annual rainfall ranges from 1051 to 1705 mm and the Annual Average Rainfall is 1331.4 mm. The monthly rainfall data from the rain gauge station also reveals that the maximum rainfall (460.4 mm) was received in July 2001 whereas the minimum rainfall (355.8 mm) was observed in June 2000.

**2.6 SURFACE DRAINAGE PATTERN**

Drainage of the area is mainly controlled by Saryu, Gomti and Pindar Rivers and their tributaries (locally called Nadi, Gad or Gadhera) viz. Pungar Nadi, Khir Ganga Nadi, Bhadrapati Nadi, Revti Ganga, Kanal Gad, Lahor Nadi, Jagtana Gad, Kulur Gad, Sukunda Gad etc. Sub-trellis, sub-rectangular and sub-dendritic are the most common drainage patterns in the area. The Central and North-Central parts of the district are drained by Saryu River. Gomti River drains the western and south eastern parts whereas Pindar River drains the northern part. These rivers are primarily fed by snowmelt with relatively smaller contribution from ground water. However, during the lean period, the rivers are fed by ground water occurring as base flow. The surface drainage pattern map is shown in **Figure 2.2**.



**Figure 2.2: Surface Drainage Map**

## **2.7 PROPOSED METHOD OF MINING**

The mining will be done semi-mechanized way in open cast method in quite a systematic manner by forming 9m high benches. However, there may be minor variation in the width and-height which the lessee will keep on mending.

The top soil and interburden to be scrapped with the help of JCB machine, dozer, shovels, pickaxe, spade & crowbar and will be stacked separately in dump yard located near the working pit.

The extracted mineral is properly sorted out at the mine site. Mining work is going on at 38 benches. Crow bars are sometimes used to dislodge the mineral.

The excavation for soapstone will be made through JCB Machine, dozer, shovels, pickaxe, spade & crowbar.

The benches will be developed from bottom to top at present in nap land only.

It is proposed to make 6.0m height benches which will be sliced in two stages each of 3m & 1.5m height.

The slope of the faces will be kept 60°-65° and the ultimate slope of the pit will remain 45°.

Developmental work will be done by construction of road/track to different working benches, removal of top soil and interburden.

The soil will be filled into the bags, loaded on mules and unload into stockyard.

The interburden generated during mining will be separately stacked and places shown within the applied area which will be backfilled.

Sorting of high grade soapstone will be done on the benches by the labourers and it will be graded.

The local people will be used for removal of mineral to the nearest road point from where the minerals will be transported by trucks to Haldwani.

The mineral will be loaded over the trucks by the manual labour. The pit will be connected by track/foot path to the main road.

The slope of track may vary from 1:8 to 1:20.

Each mining face will be connected by track/road having width 3.0m.

Exploitation of soapstone is small scale of mining and does not require any drilling & blasting.

The average rate of production of soapstone is estimated in between 28000 & 30000 tonnes per year.

Proper precautionary measures shall be taken to prevent soil erosion.

The recovery of the soapstone will be 40% of the total excavation.

Office, store, first aid centre, drinking water shed, rest shelter etc. will be constructed temporarily within the applied area.

The mining is confined in the applied area and mining benches of the pit will be backfilled to retain its original topography therefore the efforts for afforestation would be done inside the applied area in between lease boundary and UPL, about 0.338 ha area will be covered by 1700 saplings in first five year and by the end of the lease period 17,000 saplings will be planted.

The top soil and interburden are stacked separately in dump yard within the applied area and will be used for reclamation of the pit after exploitation of the mineral.

Mining operations shall be carried out scientifically by following the provisions of Mining and Minerals (Development & Regulation) Act, 2015, Uttarakhand, Metalliferrous Mines Regulations (MMR) 1961, UKMMCR 2001 and time to time directions given by Geology & Mining Unit & State Government will not be over looked at any stage.

7.5 m un-mined barrier will be maintained all along the lease boundary and vegetation growth generated on such boundary to isolate mining from rest of the area. Exploitation of the soapstone will not be done in land for public use.

## **2.8 RESERVE (AVAILABLE QUANTUM) AND PRODUCTION (EXTRACTABLE QUANTUM)**

### **Economic Axis (EI):**

- (i) Due to mining surrounding area & past exploration within area, it has been revealed that the mineral is good grade & having no problem in selling in the market. Mineral shall be transported manually as well as mules up to road side & loaded in to truck. NOC from individual land owners have been obtained. On this basis economic viability of the deposit has been established & mineral is economically viable. Hence economic axis under UNFC for the deposit is E=1.
- (ii) Specific end use grade of reserve established. The reserves of soapstone with applied area are cosmetic, paper & detergent grade.
- (iii) Specific knowledge of own forest & other land use data is available. The applied area is totally agricultural land & after mining it shall be backfilled, leveled it & put use for agriculture.

Feasibility axis: As this is small opencast semi-mechanized mine. The feasibility study carried out for this area and is considered to be pre-feasibility status. Hence pre-feasibility axis under UNFC for the deposit is F=I.

Geology: Due to past exploration within area, local geology, mineralogy & geometry of soapstone deposit has been established. The identification of ore body carried out & only soapstone was formed to be occurred within applied area.

### **Geological Axis:**

(G-I) Actual exploration in vicinity of applied area has been established by way of mining pits. Therefore geological axis has been considered under G 1.

- (i) Geological Survey: Mapping in the scale of 1:1000 will triangulation point & bench marks carried out & shown in surface geological plan. Extensive pitting in surrounding area has been done & nature of deposition of soapstone has been established.
  - ii) Linking of map with topo grid carried & latitude & longitude of corner pillar token,
  - iii) Assessment of lithology carried out based on the exposures in the pit of soapstone, structure & surface mineralization studied & mapped.
2. Geo chemical survey: Detailed sampling of pit.
  3. Geophysical survey: Geophysical survey was carried was carried out on the basis of exposure & outcrops. Based on the exploration & exposure in the pit, the mineralization zone delineated,
  4. Technological: Extensive pitting at the time of prospecting period was carried out within the applied area. The depth of pit varies 3m to 6m. The deposit is regular with low dip. Surface & subsurface lithology & co-relation of mineralization zones carried out by pitting & sampling carried out from pit faces.

**Parameters for Estimation:**

1. The cross section area of each section line has been calculated for each category of reserves. The cross sectional area is multiplied by the strike influence to get the volume. The volume is multiplied by the bulk density to get the tonnage in each section line.
2. Bulk density of soapstone has been assumed 2.6 in view of our past experience in and around the area.
3. Bulk density of interburden (Magnesite) has been assumed 2.5 in view of our past experience in the area.
4. Recovery of interburden (Magnesite) has been taken as 70% of the total excavation as per the past experience with in the area & on the basis of prospecting carried out within applied area.
5. Due to past mining surrounding of applied area, it has been revealed that incidence of soapstone in different pits varies 20% to 40%, therefore on an average incidence of soapstone has been considered 30% of total excavation.

**Proved (111) Mineral Reserves:**

All the quantities of Soapstone occurring 9m vertically below the surface has been considered under "111" category.

**Probable (122) Mineral Reserves:**

All the quantities of Soapstone occurring 3m vertically below 'from proved depth has been considered under "122" category.

**Feasibility Mineral Resource: (211)**

Reserves blocked in barrier ultimate pit limit under proved mineral reserves has been considered as 211.

**Pre feasibility Mineral Resources (222):** Reserves blocked in barrier ultimate pit limit under probable mineral reserves has been considered as 222.

**Inferred mineral Resource (333)**

All the quantities of soapstone occurring beyond 50m from proved zone & upto applied boundary & 3m depth from surface has been considered under inferred mineral resource (333).

The details calculation of reserve & resources is shown in **Table 2.1**.

**Table 2.1: Details calculation of reserve & resources**

Category according to UNFC code	Recoverable Reserves (Tonnes)	Grade
111	691585.48	Pesticide/insecticide and Soap
122	461056.99	Pesticide/insecticide and Soap
<b>Total</b>	<b>1152642.47</b>	
333	230528.49	

### Measured reserved

Section Line	Sectional area (m <sup>2</sup> )	Strike influence (m)	Volume (m) <sup>3</sup>	Recoverable reserves (tonnes)
LB to A-A'	394.95	26	16087.31	15282.95
A-A' to B-B'	2222.64	47	108642.62	103210.51
B-B'to C-C'	4024.94	33	138135.77	131228.98
C-C 'to D-D'	3697.74	31	119215.14	113254.38
D-D' to E-E	2832.58	29	85427.60	81156.22
E-E' to F-F'	2823.71	36	105719.52	100433.54
F-F' to G-G'	2773.94	38	109625.91	104144.62
G-G' to END	3099.65	14	45130.83	42874.29
<b>Total</b>	<b>22070.03</b>		<b>727984.72</b>	<b>691585.48</b>

### Indicated reserved

Section Line	Sectional area (m <sup>2</sup> )	Strike influence (m)	Volume (m) <sup>3</sup>	Recoverable reserves (tonnes)
LB to A-A'	396.63	26	10724.88	10188.63
A-A' to B-B'	1481.76	47	72428.43	68807.01
B-B'to C-C'	2683.29	33	92090.51	87485.99
C-C 'to D-D'	2465.16	31	79476.76	75502.92
D-D' to E-E	1888.32	29	56951.73	54104.14
E-E' to F-F'	1882.47	36	70479.68	66955.69
F-F' to G-G'	1849.29	38	73083.94	69429.74
G-G' to END	2066.43	14	30087.22	28582.86
<b>Total</b>	<b>14713.35</b>		<b>485323.14</b>	<b>461056.99</b>

### Inferred reserved

Section Line	Sectional area (m <sup>2</sup> )	Strike influence (m)	Volume (m) <sup>3</sup>	Recoverable reserves (tonnes)
LB to A-A'	198.32	26	5362.44	5094.32
A-A' to B-B'	740.88	47	36214.21	34403.50
B-B'to C-C'	1341.65	33	46045.26	43742.99
C-C 'to D-D'	1232.58	31	39738.38	37751.46
D-D' to E-E	944.16	29	28475.87	27052.07
E-E' to F-F'	941.24	36	35239.84	33477.85
F-F' to G-G'	924.65	38	36541.97	34714.87
G-G' to END	1033.22	14	15043.61	14291.43
<b>Total</b>	<b>7356.68</b>		<b>242661.57</b>	<b>230528.49</b>

### Production

The year wise production schedule, quantities of waste to be generated from different benches in each pit is shown in **Table 2.2**.

**Table 2.2: Details of the production (Year wise)**

**I Year: Pit 1:**

RL Bench Level (m)		Height (m)	Recoverable Soapstone (Tonne)	Saleable Soapstone (Tonne)	Balance Soapstone (Tonne)	Total Rejects (cum)	Interburden (cum)	Soil (cum)
From	To							
1221	1218	3	421.47	421.00	0.47	503	256	247
1218	1215	3	490.35	490.00	0.35	323	323	0
1215	1212	3	392.28	392.00	0.28	259	259	0
1218	1215	3	632.54	632.00	0.54	692	417	275
1215	1212	3	706.09	706.00	0.09	466	466	0
1212	1209	3	564.87	564.00	0.87	372	372	0
1215	1212	3	1532.23	1532.00	0.23	1791	1010	780
1212	1209	3	1793.83	1793.00	0.83	1183	1183	0
1209	1206	3	1435.06	1435.00	0.06	946	946	0
1212	1209	3	2090.47	2090.00	0.47	2214	1378	835
1209	1206	3	2280.51	2280.00	0.51	1504	1504	0
1206	1203	3	1824.41	1824.00	0.41	1203	1203	0
1209	1206	3	1507.11	1507.00	0.11	2098	994	1104
1206	1203	3	2009.48	2009.00	0.48	1325	1325	0
1203	1200	3	1607.58	1607.00	0.58	1060	1060	0
1206	1203	3	2363.57	2363.00	0.57	2424	1558	866
1203	1200	3	2521.14	2521.00	0.14	1662	1662	0
1200	1197	3	2016.92	2016.00	0.92	1330	1330	0
1203	1200	3	1963.44	1818.00	145.44	2198	1198	1000
<b>Total</b>			<b>28153.34</b>	<b>28000.00</b>	<b>153.34</b>	<b>23551</b>	<b>18444</b>	<b>1507</b>

**II Year: Pit 1:**

RL Bench Level (m)		Height (m)	Recoverable Soapstone (Tonne)	Saleable Soapstone (Tonne)	Balance Soapstone (Tonne)	Total Rejects (cum)	Interburden (cum)	Soil (cum)
From	To							
1203	1200	3	145.44	145.00	0.44	96	96	0
1200	1197	3	2298.66	2298.00	0.66	1516	1516	0
1197	1194	3	1838.93	1838.00	0.93	1212	1212	0
1200	1197	3	1857.68	1857.00	0.68	2100	1225	875
1197	1194	3	2123.07	2123.00	0.07	1400	1400	0
1194	1191	3	1698.45	1698.00	0.45	1120	1120	0
1197	1194	3	1596.05	1596.00	0.05	1746	1052	693
1194	1191	3	1781.64	1781.00	0.64	1175	1175	0
1191	1188	3	1425.31	1425.00	0.31	940	940	0
1194	1191	3	2297.53	2297.00	0.53	2283	1515	768
1191	1188	3	2397.42	2397.00	0.42	1581	1581	0
1188	1185	3	1917.94	1917.00	0.94	1265	1265	0
1191	1188	3	1675.12	1675.00	0.12	1718	1104	614
1188	1185	3	1786.80	1786.00	0.80	1178	1178	0
1185	1182	3	1429.44	1429.00	0.44	942	942	0
1188	1185	3	1517.58	1517.00	0.58	1966	1001	965
1185	1182	3	1916.94	1221.00	695.94	1264	1264	0
<b>Total</b>			<b>29704.00</b>	<b>29000.00</b>	<b>704.00</b>	<b>23501</b>	<b>19585</b>	<b>3916</b>

**III Year: Pit-2**

RL Bench Level (m)		Height (m)	Recoverable Soapstone (Tonne)	Saleable Soapstone (Tonne)	Balance Soapstone (Tonne)	Total Reject (cum)	Interburden (cum)	Soil (cum)
From	To							
<b>Pit-2</b>								
1161	1158	3	712.23	712.00	0.23	682	411	271
1158	1155	3	795.05	795.00	0.05	459	459	0
1155	1152	3	636.04	636.00	0.04	367	367	0
1158	1155	3	1386.46	1386.00	0.46	1572	800	772
1155	1152	3	1751.32	1751.00	0.32	1010	1010	0
1152	1149	3	1401.05	1401.00	0.05	808	808	0
1155	1152	3	1495.92	1495.00	0.92	1530	863	667
1152	1149	3	1751.32	1751.00	0.32	1010	1010	0
1149	1146	3	1401.05	1401.00	0.05	808	808	0
1152	1149	3	1430.01	1430.00	0.01	1243	825	418
1149	1146	3	1492.18	1492.00	0.18	861	861	0
1146	1143	3	1193.75	1193.00	0.75	689	689	0
1149	1146	3	1196.10	1196.00	0.10	1108	690	418
1146	1143	3	1304.83	1304.00	0.83	753	753	0
1143	1140	3	1043.87	1043.00	0.87	602	602	0
1146	1143	3	1806.81	1806.00	0.81	1674	1042	632
1143	1140	3	1971.07	1971.00	0.07	1137	1137	0
1140	1137	3	1576.85	1576.00	0.85	910	910	0
1143	1140	3	2068.79	2068.00	0.79	1857	1194	663
1140	1137	3	2206.71	2206.00	0.71	1273	1273	0
1137	1134	3	1765.37	1387.00	378.37	800	800	0
<b>Total</b>			<b>30386.80</b>	<b>30000.00</b>	<b>386.80</b>	<b>21153</b>	<b>17312</b>	<b>3841</b>

**IV Year: (Pit-2)**

RL Bench Level (m)		Height (m)	Recoverable Soapstone (Tonne)	Saleable Soapstone (Tonne)	Balance Soapstone (Tonne)	Total Reject (cum)	Interburden (cum)	Soil (cum)
From	To							
<b>Pit-2</b>								
1137	1134	3	378.37	378.00	0.37	218	218	0
1140	1137	3	1138.17	1138.00	0.17	1126	657	469
1137	1134	3	1300.77	1300.00	0.77	750	750	0
1134	1131	3	1040.61	1040.00	0.61	600	600	0
1137	1134	3	601.88	601.00	0.88	523	347	176
1134	1131	3	628.04	628.00	0.04	362	362	0
1131	1128	3	502.43	502.00	0.43	290	290	0
1134	1131	3	361.41	361.00	0.41	357	209	149
1131	1128	3	413.04	413.00	0.04	238	238	0
1128	1125	3	330.43	330.00	0.43	191	191	0
1131	1128	3	198.85	198.00	0.85	210	115	96
1128	1125	3	238.62	238.00	0.62	138	138	0
1125	1122	3	190.89	190.00	0.89	110	110	0
1128	1125	3	83.88	83.00	0.88	78	48	29
1125	1122	3	91.50	91.00	0.50	53	53	0
1122	1119	3	73.20	73.00	0.20	42	42	0
1125	1122	3	458.29	458.00	0.29	439	264	174

<b>Mining of Soapstone from Lease Area (7.784 Ha.) at Village- Karuli, Tehsil &amp; District - Bageshwar, Uttarakhand.</b>	<b>Final EIA/EMP</b>
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1122	1119	3	511.58	511.00	0.58	295	295	0
1119	1116	3	409.26	409.00	0.26	236	236	0
1122	1119	3	1421.72	1421.00	0.72	1406	820	586
1119	1116	3	1624.82	1624.00	0.82	937	937	0
1116	1113	3	1299.86	1299.00	0.86	750	750	0
1119	1116	3	1934.11	1934.00	0.11	2046	1116	930
1116	1113	3	2320.93	2320.00	0.93	1339	1339	0
1113	1110	3	1856.74	1856.00	0.74	1071	1071	0
1116	1113	3	2586.18	2586.00	0.18	2558	1492	1066
1113	1110	3	2955.64	2955.00	0.64	1705	1705	0
1110	1107	3	2364.51	2364.00	0.51	1364	1364	0
1113	1110	3	2008.21	699.00	1309.21	1047	403	644
<b>Total</b>			<b>29323.95</b>	<b>28000.00</b>	<b>1323.95</b>	<b>20480</b>	<b>16162</b>	<b>4318</b>

**V Year: (Pit -2 & Pit-3)**

RL Bench Level (m)		Height (m)	Recoverable Soapstone (Tonne)	Saleable Soapstone (Tonne)	Balance Soapstone (Tonne)	Total Reject (cum)	Interburden (cum)	Soil (cum)
From	To							
<b>Pit-2</b>								
1113	1110	3	1309.21	1309.00	0.21	756	756	0
1110	1107	3	2142.09	2142.00	0.09	1236	1236	0
1107	1104	3	1713.67	1713.00	0.67	989	989	0
1110	1107	3	899.11	899.00	0.11	919	519	401
1107	1104	3	1052.61	1052.00	0.61	607	607	0
1104	1101	3	842.09	842.00	0.09	486	486	0
1107	1104	3	456.66	456.00	0.66	437	263	174
1104	1101	3	509.76	509.00	0.76	294	294	0
1101	1098	3	407.81	407.00	0.81	235	235	0
1104	1101	3	238.67	238.00	0.67	208	138	70
1101	1098	3	249.05	249.00	0.05	144	144	0
1098	1095	3	199.24	199.00	0.24	115	115	0
<b>Pit-3</b>								
1125	1122	3	502.10	502.00	0.10	437	290	147
1122	1119	3	523.94	523.00	0.94	302	302	0
1119	1116	3	419.15	419.00	0.15	242	242	0
1122	1119	3	1067.52	1067.00	0.52	1056	616	440
1119	1116	3	1220.02	1220.00	0.02	704	704	0
1116	1113	3	976.02	976.00	0.02	563	563	0
1119	1116	3	714.65	714.00	0.65	756	412	344
1116	1113	3	857.58	857.00	0.58	495	495	0
1113	1110	3	686.06	686.00	0.06	396	396	0
1116	1113	3	832.05	832.00	0.05	771	480	291
1113	1110	3	907.70	907.00	0.70	524	524	0
1110	1107	3	726.16	726.00	0.16	419	419	0
1113	1110	3	1663.32	1663.00	0.32	1493	960	533
1110	1107	3	1774.21	1774.00	0.21	1024	1024	0
1107	1104	3	1419.37	1419.00	0.37	819	819	0
1110	1107	3	1563.72	1563.00	0.72	1599	902	697
1107	1104	3	1830.69	1830.00	0.69	1056	1056	0
1104	1101	3	1464.55	1307.00	11.20	19079	15984	3095
<b>Total</b>			<b>29168.75</b>	<b>29000.00</b>	<b>22.40</b>	<b>38158</b>	<b>31968</b>	<b>6191</b>

### Man Power Requirement:

Owing to the topography of the area, which is a rough terrain, Soap Stone mining activity is needed as the primary source of income for the locals. The mine will provide employment to about 126 workers. It will provide employment to the people residing in vicinity and also indirectly by the development of supporting infrastructure and allied activities. The manpower requirement for the proposed project is shown in **Table 2.3** along with the breakup, who will be utilized for excavation & loading of minerals into trucks.

**Table 2.3: Details of Manpower requirement**

S. No.	Category	Numbers
1.	Mine Manager	1
2.	Supervisor	2
3.	Time Keeper	1
4.	Office Assistant/Dispatch Supervisor	2
5.	Daily wages workers	120
<b>TOTAL</b>		<b>126</b>

\*Additional workers include workers for dust suppression purpose, providing water for drinking & domestic purpose, for maintenance of roads, etc.

### Solid Waste Generation & its Disposal

The top soil will be removed with the help of JCB machine, dozer, shovels, pickaxe, spade & crowbar and stacked separately. The soil intermixed with fragments and interburden rejects are low grade magnesite. Part of these rejects will be utilized in construction and maintenance of retaining walls, parapet walls, check dams and other construction works. About 25369 cum of rejects will be used for this task, and in dump yard remaining rejects about 101475 cum will be backfilled.

The quantity of top soil, interburden and Mineral rejects to be generated in each year is shown in **Table 2.4**.

**Table 2.4: Details of Top soil, interburden and Mineral rejects generated**

Year	Top Soil (cum)	Interburden (cum)	Mineral Rejects (cum)
<b>I</b>	5107	18444	23551
<b>II</b>	3916	19585	23501
<b>III</b>	3841	17312	21153
<b>IV</b>	4318	16162	20480
<b>V</b>	6191	31968	38159
<b>Total</b>	<b>23373</b>	<b>103471</b>	<b>126844</b>

### Storage and preservation of top soil:

The top soil material to be generated from each pit will be temporarily stacked towards slope side of working pits. Dumping shall be carried out in single terrace. All the quantities shall be used in backfilling before the commencement monsoon period. Therefore no proposal has been envisaged for separate stacking of top soil. Before the commencement of monsoon all the pits shall be backfilled.

**Restriction on mining:**

- As per the Uttarakhand mining policy no mining operation shall be carried out within 100 m of railway line & bridge.
- The mining will not intercept the ground water table.
- The contractors will abide by Uttarakhand Minor Mineral Concession Rules, 2001 and guidelines contained in the River/Stream Bed Mining Policy and Land forms studies were taken into consideration.
- The contractors will abide at the time of mining with the term and condition as laid down under Mines Act, 1952 and Mines & Minerals (Regulation and Development) Act, 1957, Forest (Conservation) Act, 1980 and the stipulations of the EIA/EMP.
- The contractor will abide by provision of Mines Act, 1952, Interstate Migrant Work Man Act, the contractor with the satisfaction of competent authority will provide drinking water, rest shelter, first aid box, welfare facilities as Central and State Govt. labor laws.

**2.9 SITE FACILITIES AND UTILITIES**

**Water Supply**

Water requirement for the proposed project will be provided for the workers for drinking & domestic purpose. Water will also be provided for dust suppression. Fresh water will be only used for drinking purpose. The break up for water requirement is shown in **Figure 2.3**.



**Figure 2.3: Details of water requirement**

**Temporary Rest Shelter:**

A temporary rest shelter will be provided for the workers near to the site for rest.

- Provisions will also be made for following in the rest shelter
- First aid box along with anti-venoms to counteract poison produced by certain species of small insects, if any.
- Sanitation facility i.e. septic tank or community toilet facility will be provided for the workers.

## 2.10 STATUTORY REQUIREMENTS

It is accepted that effective resource management cannot be done in isolation. The proponent therefore vigorously pursues approaches towards coordination and integration where possible, so as to lead to coordinated regulatory systems.

Various acts dealing with matters relating to the conservation and protection of the environment and which a holder of a mining authorization must also take cognizance of include inter alia, the following:

- Uttarakhand Mineral Policy, 2011
- Uttarakhand Minor Mineral Concession Rules, 2001
- The Mines Act, 1952
- The Mines and Mineral (Development and Regulation) Act, 1957
- Mines Rules, 1955
- Mineral Concession Rules, 1960
- Mineral Conservation and Development Rules, 1988
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- The Environment (Protection) Act, 1986
- The Forest (Conservation) Act, 1980

## 2.11 OTHER MINE LEASE PRESENT WITHIN THE STUDY AREA

The other soapstone mine sites which are present within 500 m from the proposed mine and in the study area (10 km) has been presented in **Table 2.5**. The mine lease sites present in the core zone (100 m) and the study area marked in Google earth and SOI toposheet has been shown in **figure 2.4** and **2.5** respectively

**Table 2.5: Details of other soapstone mines present in the study area (10 km radius) from the proposed soapstone mine**

Sr. No.	Mine No. Marked on SOI Topo Sheet & Google Earth Map	Details Of Mine	Area (ha)
1.	M2	Shri Vikram Singh Shahi S/O Shri Deewan Singh	3.273
2.	M4	Shri Krishna Singh Parihar S/O Dev Singh	0.967
3.	M7	Shri Sachin Tiwari S/O Shri Naveen Chandra	0.672
4.	M11	Shri Gang Prasad Pandey S/O Shri Naveen Chandra	0.753
5.	M18	Shri Harak Singh Kanwal S/O Shri Dev Singh	13.335
6.	M23	Smt. Nandita Tiwari W/O Shri J.C.	49.78

		Tiwari	
7.	M24	M/S Jagnath Minerals	7.689
8.	M30	M/S N.S. Corporation	25.798
9.	M33	Sher Singh Dhapola S/O Shri Bachi Singh	1.749
10.	M34	Shri Tek Chandra Kapoor S/O Shri Hukum Chandra	1.749
11.	M36	M/S Shriram Bharat Mines	5.674
12.	M37	M/S M.R. Minerals	1.295
13.	M40	Shri Girish Chandra Petshali S/O Shri Jugal Kishor Petshali	1.925
14.	M44	M/S Uttarakhand Talk Pvt. Ltd.	4.449
15.	M50	Shri Harish Chandra Lohni S/O Nandaballabh Lohni	4.640
16.	M52	Shri Subodh Lal Sah S/O Shri Girdhari Lal Sah	4.049
17.	M63	Shri Ramesh Singh Majila S/O Shri Nain Singh Majila	4.056
18.	M65	Shri Kuldeep Singh Bisth S/O Shri Deewan Singh	3.70
19.	M71	Shrimati Geeta Boriyal	4.698
20.	M72	M/s Devbhoomi mines	17.824
21.	M75	Shri Govind Singh Rotela	4.620
22.	M76	Shri Ramesh Singh	9.810



**Figure 2.4: Other Mine sites present in the core and study area from the proposed project marked in Google earth**

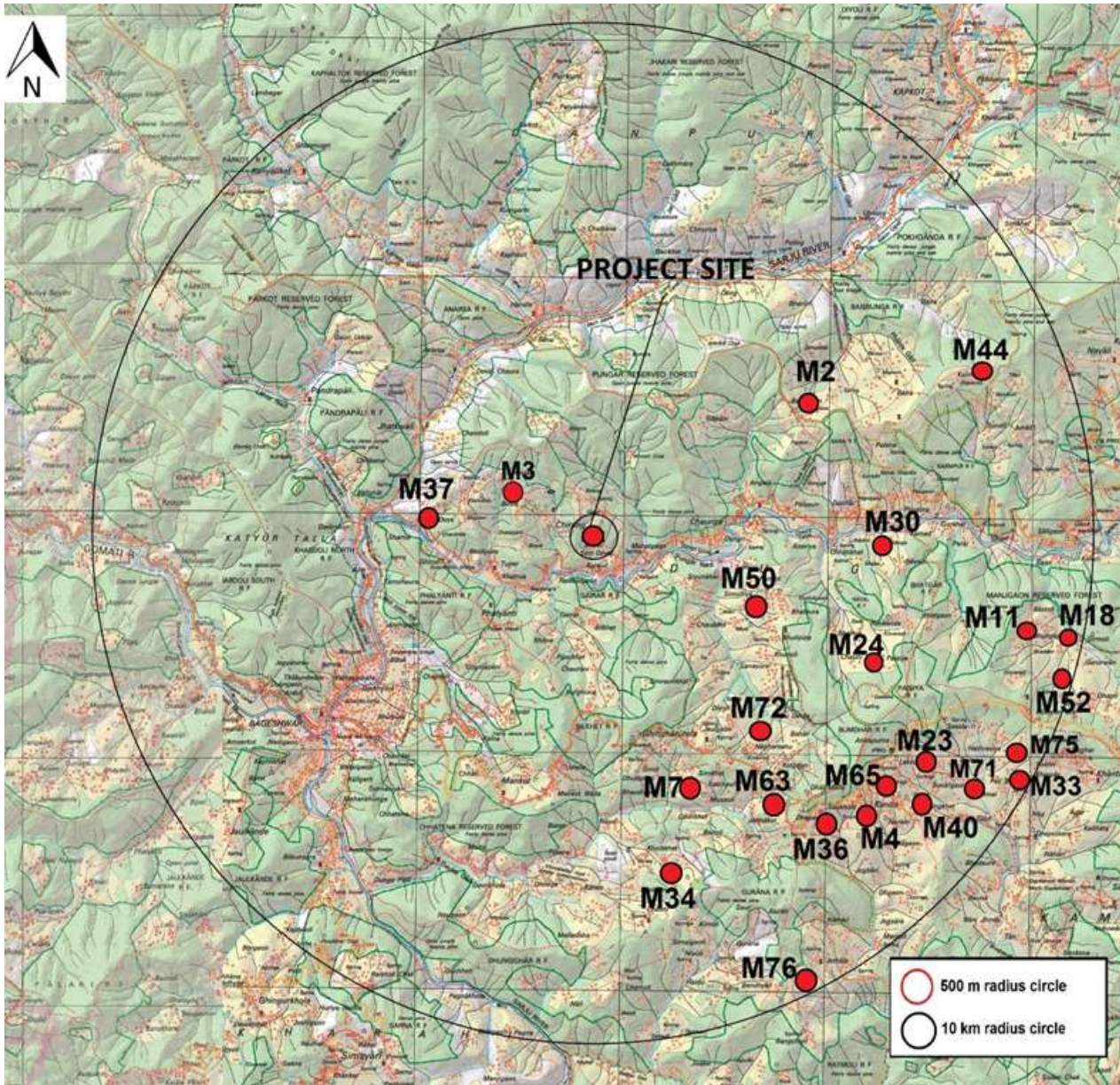


Figure 2.5: Other Mine site present in the core and study area from the proposed project marked in SOI Toposheet

# **CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

## CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT

### 3.1 PREAMBLE

Baseline environmental studies were conducted to monitor micro-meteorology, Ambient Air Quality, Ground and Surface water quality, Noise Levels, present land use pattern, soil quality, biological environment, socio-economic status, health status etc. within a study area of 10 Km. radius around the project site. To establish the existing physical, natural, socio-economic and cultural environment condition of the study area, data has been collected through primary sources (consultation with the key persons) in addition to information gathered from various secondary sources. All project relevant secondary data has been collected on regional environmental and social features from various reports pertaining to Government Agencies / Institutions and through literature reviews. Relevant data has been compiled from the census data of 2011, for obtaining details regarding the demographic and socio-economic features in the study area.

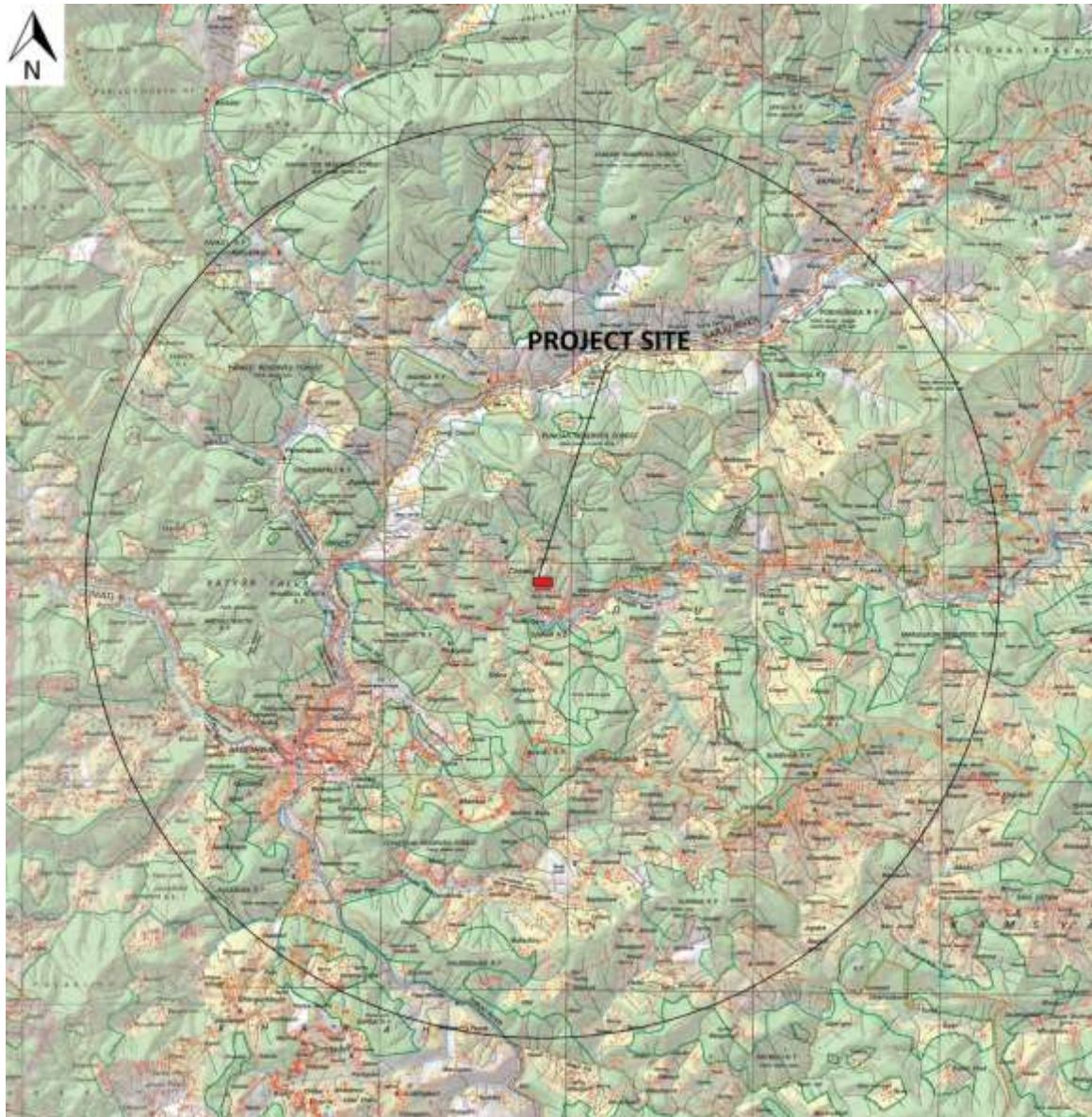
The main aim of the impact assessment study depends mainly on two factors. One of the estimation of impact from proposed project on the environment and second one is the assessment of the environmental condition. Both are key factors to arrive at the post project scenario. The estimated impact due to the mine lease area can be superimposed over the existing conditions to arrive at the post project scenario. The scope of the baseline studies includes detailed characterization of following environmental components, which are most likely to be influenced by the setting up of a mine lease area.

- Metrological conditions
- Ambient Air Quality
- Noise levels
- Water Quality (Surface and Ground water)
- Soil Quality
- Socio economic status

### 3.2 STUDY AREA AND PERIOD

The base-line data has been collected at the project site and 10 km buffer zone for prominent environmental attributes like Ambient Air Quality, Ambient Noise Level, Water quality and Soil profile. Primary and Secondary data has also been collected for other environmental attributes for the preparation of EIA/EMP report. The baseline study for the project was conducted during March 2019 to May 2019 (pre monsoon). The baseline data monitoring procedures conforms to the requirement of EIA Notification, 2006 (as amended on 14.09.2006). The monitoring and analysis was done through Noida Testing Laboratory which is NABL and MoEF&CC accredited.

Study area map comprising direct impact area is shown in **Figure 3.1**



**Figure 3.1: Study Area Map (10 km radius)**

### **3.3 METHODOLOGY / APPROACH**

#### **3.3.1 Methodology of EIA**

Environmental Impact Assessment study has been conducted within an area of 10 km radius around the ML area. The various steps involved in the study for this project are divided into three following phases.

- Identification of significant environmental parameters and assessing the baseline status within the study area and assessment of pollutants envisaged due to proposed activities and the polluting activities in the study area on various environmental parameters.
- Evaluation of impacts after superimposing the predicted pollution load over the baseline condition.

- Prepare Environmental Management Plan for mitigation of impacts on environment arising out of the proposed activity.

### 3.3.2 Approach

Environmental monitoring in order to establish the baseline environmental status of the study area for Ambient air, Water, Soil, Land use, ecology, etc.

- Collection of site specific meteorological data at the mine site.
- Carrying out a detailed biological study for the Core and Buffer Zone.
- Literature review that includes identification of relevant data and articles from various publications, various government agencies and other sources for socio-economy, meteorology, land use, ecology, etc.
- Identify various existing pollution loads due to mining and domestic activities in the buffer zone.
- Evaluate the predicted impacts on the various environmental attributes in the study area by using scientifically developed and widely accepted Environmental Impact Assessment (EIA) Methodologies.
- Preparation of an Environmental Management Plan (EMP) outlining the measures for improving the environmental quality.

Accordingly, field studies were carried out during the study period (March 2019 to May 2019) to establish the existing baseline conditions.

## 3.4 METEOROLOGICAL CONDITIONS

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

A meteorological station was set up at the proposed mine premises. Meteorological data was generated during the pre-monsoon monitoring period.

The following parameters were recorded at hourly intervals continuously during monitoring period, except rainfall which was recorded on daily basis.

- Wind speed
- Wind Direction
- Air Temperature
- Rainfall

### 3.4.1 Climate of the project district

The average temperature for the year in Bageshwar is 20.4 °C (68.8 °F). The warmest month, on average, is June with an average temperature of 27.3 °C (81.2 °F). The highest temperature ever recorded was 38 °C, recorded on 5 June 2017. The coolest month on average is January,

with an average temperature of 11 °C (51.8 °F). The average amount of precipitation for the year in Bageshwar is 48.1" (1221.7 mm). The month with the most precipitation on average is July with 13.0" (330.2 mm) of precipitation. The month with the least precipitation on average is November with an average of 0.2" (5.1 mm). There is an average of 63.6 days of precipitation, with the most precipitation occurring in August with 15.3 days and the least precipitation occurring in November with 0.8 days.

### 3.4.2 Wind speed/Direction

Generally, light to moderate winds prevail throughout the year with speed ranging from 1 to 19 kmph. Winds were light and moderate particularly during the morning hours, while during the afternoon hours the winds were stronger. The wind rose diagram developed during the study period is shown in **Figure 3.2** reveals that pre-dominant wind direction occurs mostly blowing from west direction in project site and the average wind speed is 6.91 kmph.

**Table 3.1(a)** shows the Meteorological Data Parameters at the project site whereas **Table 3.1 (b)** shows the Meteorological Data Parameters of Mukteshwar district (Nearest IMD from the proposed project) for the months of March to May 2019.

**Table-3.1 (a): Meteorological Data Parameters at Project site for the months of March to May 2019**

Date	Temperature, deg C			Humidity, %			Pressure, hPa			Wind Speed, km/Hr	Predominant Wind Direction	Rainfall mm
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg		
March	7.2	31.6	21.2	48	56	52	1012.6	1015.4	1013.2	6.9	W	
April	12.2	34.2	23.8	42	47	45	1010.2	1014.9	1012.4	7.1	W	
May	17.2	37.7	29.2	44	52	47	1009.5	1012.7	1011.2	6.8	W	

Source: Weather station

**Table-3.1 (b): Meteorological Data Parameters at Mukteshwar district (Nearest IMD from the proposed project) for the months of March to May 2019**

Date	Temperature, deg C			Humidity, %			Pressure, hPa			Wind Speed, km/Hr	Predominant Wind Direction	Rainfall mm
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg		
March	1.4	22.5	11.95	51	62	56.5	773.5	776	774.75	6.7	W	52.9
April	4.3	26.7	15.5	43	47	45	773.7	775.2	774.45	6.8	W	46
May	6.9	28.6	17.75	58	60	59	772.5	774.3	773.4	6.9	W	69.4

Source: IMD

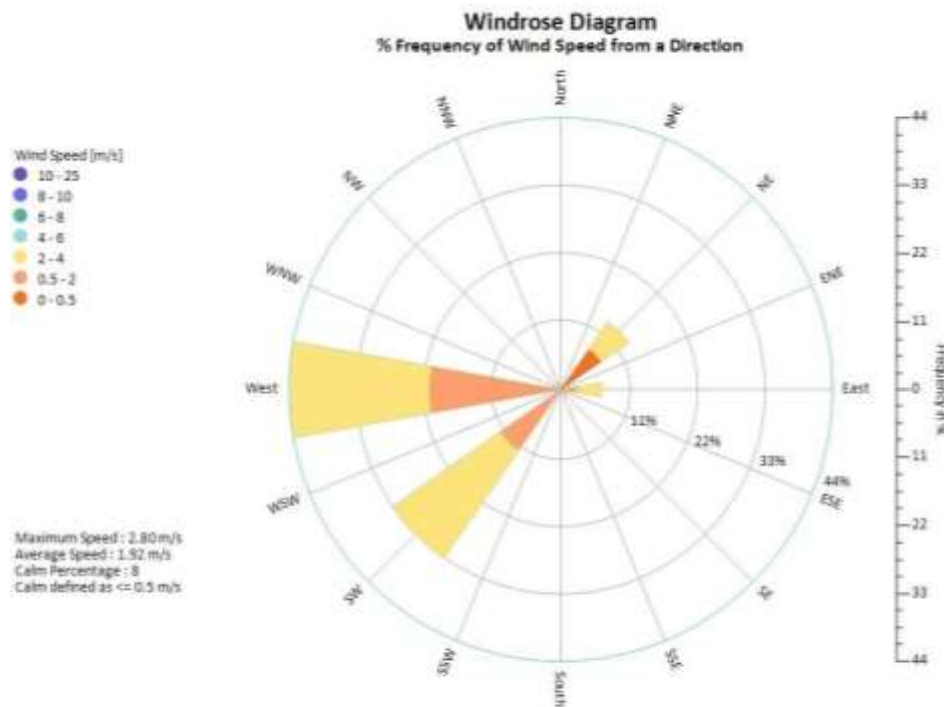


Figure 3.2: Wind-rose of the project site (March to May 2019)

### 3.5 AIR ENVIRONMENT

#### 3.5.1 Ambient Air Quality

The Ambient Air Quality was monitored in the impact area as per MoEF&CC guidelines and as per approved ToR by SEAC, Uttarakhand. 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.

#### 3.5.2 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 surveillance programme has been based on the following consideration.

- Meteorological parameters covering upwind, downwind and cross wind direction
- 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 5 locations, one in core zone and the other four in the study area of 10 km 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 **Figure 3.3** and shown in **Table-3.2**.

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 pollutant namely Particulate Matter-10 (PM<sub>10</sub>), Particulate Matter-2.5 (PM<sub>2.5</sub>), Sulphur-dioxide (SO<sub>2</sub>) and Nitrogen dioxide (NO<sub>2</sub>) has been measured through a planned field monitoring. The baseline values of the air pollutants of concern are presented in **Tables 3.3 (a) to Tables 3.3 (d)** below statistical parameters like minimum, maximum, average and 98th percentiles have been computed from the observed field data for all sampling stations. These are compared with the standards prescribed by National Ambient Air Quality Standards 2009.

**Table 3.2: Location of Ambient Air Quality Monitoring Stations**

S. No.	Location Name	Direction	Distance from the project site (in km)
AAQ1	Project Site	-	0
AAQ2	Kalna	SW	3.83
AAQ3	Dungri	NE	2.21
AAQ4	Chhuriya Panaura	NE	8.78
AAQ5	Goginapani	SW	2.38

**Table-3.3 (a): Ambient Air Quality in the Study Area PM<sub>10</sub>**

Location		PM10 (µg/m <sup>3</sup> )			
Code	Name of the Station	Min	Max	Average	98 <sup>th</sup> percentiles
AAQ-1	Project Site	43.6	60.2	57.4	59.0
AAQ-2	Kalna	42.5	59.6	55.5	58.2
AAQ-3	Dungri	41.7	60.6	56.3	59.8
AAQ-4	Chhuriya Panaura	44.2	61.2	58.7	60.0
AAQ-5	Goginapani	48.3	62.8	60.0	61.4
<b>NAAQ Standards</b>	<b>100 (24 hr)</b>				

**Table-3.3 (b): Ambient Air Quality in the Study Area PM<sub>2.5</sub>**

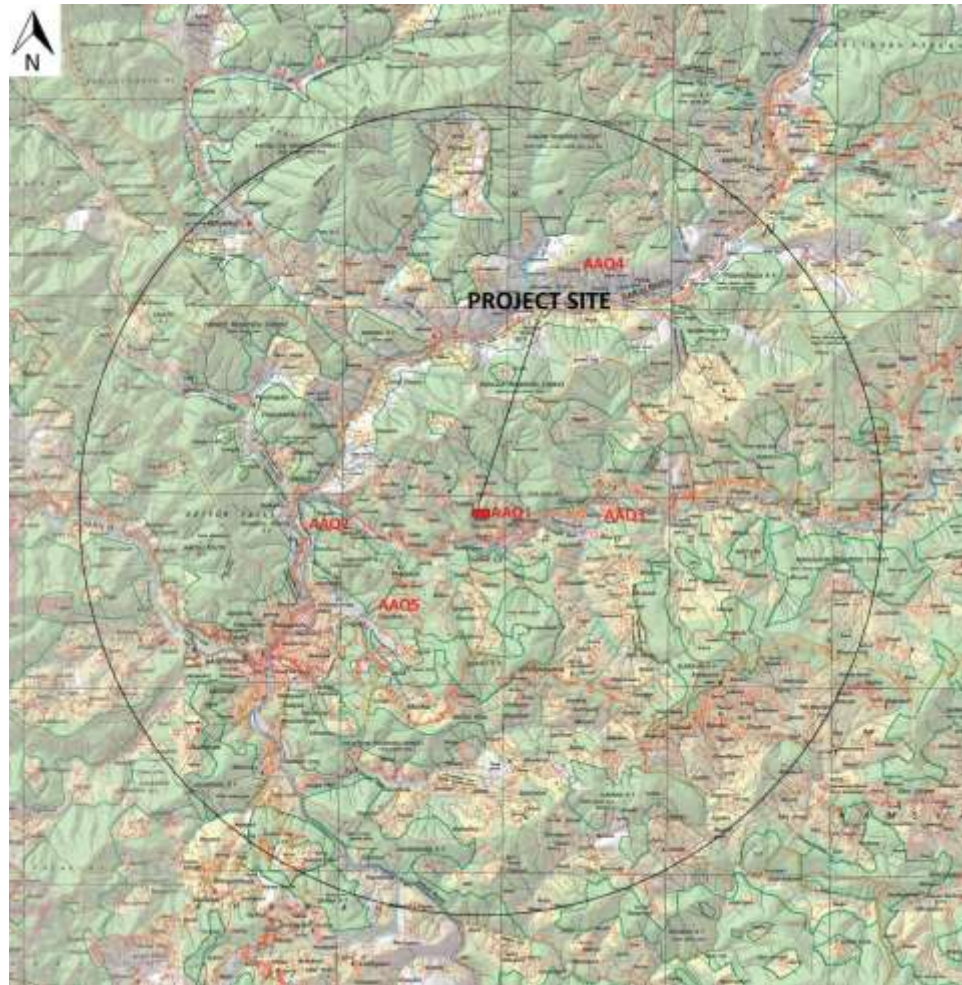
Location		PM2.5 (µg/m <sup>3</sup> )			
Code	Name of the Station	Min	Max	Average	98 <sup>th</sup> percentiles
AAQ-1	Project Site	16.2	24.4	22.3	23.5
AAQ-2	Kalna	19.0	27.1	23.9	26.8
AAQ-3	Dungri	18.6	26.9	21.6	26.0
AAQ-4	Chhuriya Panaura	16.7	23.7	19.1	23.2
AAQ-5	Goginapani	20.3	28.2	25.5	27.7
<b>NAAQ Standards</b>	<b>60 (24 hr)</b>				

**Table-3.3 (c): Ambient Air Quality in the Study Area SO<sub>2</sub>**

Location		SO2 (µg/m <sup>3</sup> )			
Code	Name of the Station	Min	Max	Average	98 <sup>th</sup> percentiles
AAQ-1	Project Site	5.4	6.2	5.2	5.8
AAQ-2	Kalna	5.7	7.8	6.0	7.2
AAQ-3	Dungri	5.5	6.5	5.5	6.2
AAQ-4	Chhuriya Panaura	5.6	7.0	6.3	6.5
AAQ-5	Goginapani	5.8	8.4	7.5	8.0
<b>NAAQ Standards</b>	<b>80 (24 hr)</b>				

**Table-3.3 (d): Ambient Air Quality in the Study Area NO<sub>2</sub>**

Location Code	Name of the Station	NO <sub>2</sub> (µg/m <sup>3</sup> )			
		Min	Max	Average	98 <sup>th</sup> percentiles
AAQ-1	Project Site	7.8	15.2	12.9	14.4
AAQ-2	Kalna	7.6	13.0	12.8	12.0
AAQ-3	Dungri	8.2	16.2	14.3	15.6
AAQ-4	Chhuriya Panaura	8.4	14.6	13.7	13.8
AAQ-5	Goginapani	8.7	17.3	16.6	16.7
<b>NAAQ Standards</b>	<b>80 (24 hr)</b>				



**Figure 3.3 Ambient Air Quality Monitoring Locations**  
**Some of the photographs of Air Monitoring**



### 3.5.3 Baseline Scenario

#### a) Suspended Particulate Matter (PM10)

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 mines. The following sources of suspended particulate matter in the study area are identified:

- Emission due to vehicular movement
- Dust generation from mining operations

The minimum and maximum level of PM<sub>10</sub> recorded within the study area was in the range of 41.7.1 µg/m<sup>3</sup> to 62.8 µg/m<sup>3</sup> with the 98<sup>th</sup> percentile ranging between 58.2 µg/m<sup>3</sup> to 61.4 µg/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> in Industrial, Residential, Rural and other areas.

#### b) Particulate Matter (PM2.5)

Fine 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 mines. The following sources of suspended particulate matter in the study area are identified:

- Emission due to vehicular movement
- Dust generation from mining operations

The minimum and maximum level of PM<sub>2.5</sub> recorded within the study area was in the range of 16.2 µg/m<sup>3</sup> to 28.2 µg/m<sup>3</sup> with the 98<sup>th</sup> percentile ranging between 23.2 µg/m<sup>3</sup> to 27.7 µg/m<sup>3</sup>.

The 24 hourly average values of PM<sub>2.5</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., 60 µg/m<sup>3</sup> for PM<sub>2.5</sub> in Industrial, Residential, Rural and other areas.

#### c) Sulphur Dioxide (SO2)

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. The following sources of Sulphur dioxide in the study area are identified:

- Emissions from domestic/consumption of fuel (coal, diesel, etc)

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.

The minimum and maximum concentration of SO<sub>2</sub> recorded within the study area was 5.4 to 8.4 µg/m<sup>3</sup> with the 98<sup>th</sup> percentile ranging between 5.8 µg/m<sup>3</sup> to 8.0 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) Nitrogen Dioxide (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 field burning of coal.
- 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. The minimum and maximum level of NO<sub>2</sub> recorded within the study area was in the range of was 7.6 µg/m<sup>3</sup> to 17.3 µg/m<sup>3</sup> with the 98<sup>th</sup> percentile ranging between 12.0 µg/m<sup>3</sup> to 16.7 µg/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.

### **3.6 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.

#### **3.6.1 Source of Noise**

The main sources of noise in the study area are domestic activities, industrial activities and vehicular traffic. The main occupation of the villagers in the study area is agriculture and business.

#### **3.6.2 Noise Level in the Study Area**

The baseline noise levels have been monitored at 5 locations, one in core zone and four within the study zone twice a week during pre monsoon period, 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 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 3.4** and represented in **Table 3.4**. The results are presented in **Table 3.5 (a)** **Table 3.5 (b)** and **Table 3.5 (c)**.

**Table 3.4: Noise Level Monitoring Stations in the Study Area**

S. No.	Location Name	Direction	Distance from the project site (in km)
NQ1	Project Site	-	0
NQ2	Kalna	SW	3.83
NQ3	Dungri	NE	2.21
NQ4	Chhuriya Panaura	NE	8.78
NQ5	Goginapani	SW	2.38

**Table 3.5 (a): Leq Noise Level in the Study Area (during day and Night) (March 2019)**

Location Code	Noise levels dB(A), Day (Leq)	Noise levels dB(A) Night, (Leq)	Noise Limits in dB(A), Leq Day Time	Noise Limits in dB(A), Leq Night Time	Area
NQ1	47.6	37.6	75	70	Mine Site (Industrial)
NQ2	50.6	38.7	65	55	Commercial
NQ3	49.7	37.8	55	45	Residential
NQ4	51.3	46.2	55	45	Residential
NQ5	48.5	39.6	50	40	Silence Zone (Near School)

**Table 3.5 (b): Leq Noise Level in the Study Area (during day and Night) (April 2019)**

Location Code	Noise levels dB(A), Day (Leq)	Noise levels dB(A) Night, (Leq)	Noise Limits in dB(A), Leq Day Time	Noise Limits in dB(A), Leq Night Time	Area
NQ1	46.8	36.2	75	70	Mine Site (Industrial)
NQ2	48.3	37.5	65	55	Commercial
NQ3	41.7	39.2	55	45	Residential
NQ4	50.4	40.5	55	45	Residential
NQ5	47.4	38.8	50	40	Silence Zone (Near School)

**Table 3.5 (c): Leq Noise Level in the Study Area (during day and Night) (May 2019)**

Location Code	Noise levels dB(A), Day (Leq)	Noise levels dB(A) Night, (Leq)	Noise Limits in dB(A), Leq Day Time	Noise Limits in dB(A), Leq Night Time	Area
NQ1	42.8	39.5	75	70	Mine Site (Industrial)
NQ2	50.3	36.6	65	55	Commercial
NQ3	48.2	35.4	55	45	Residential
NQ4	51.2	42.7	55	45	Residential
NQ5	46.5	37.2	50	40	Silence Zone (Near School)

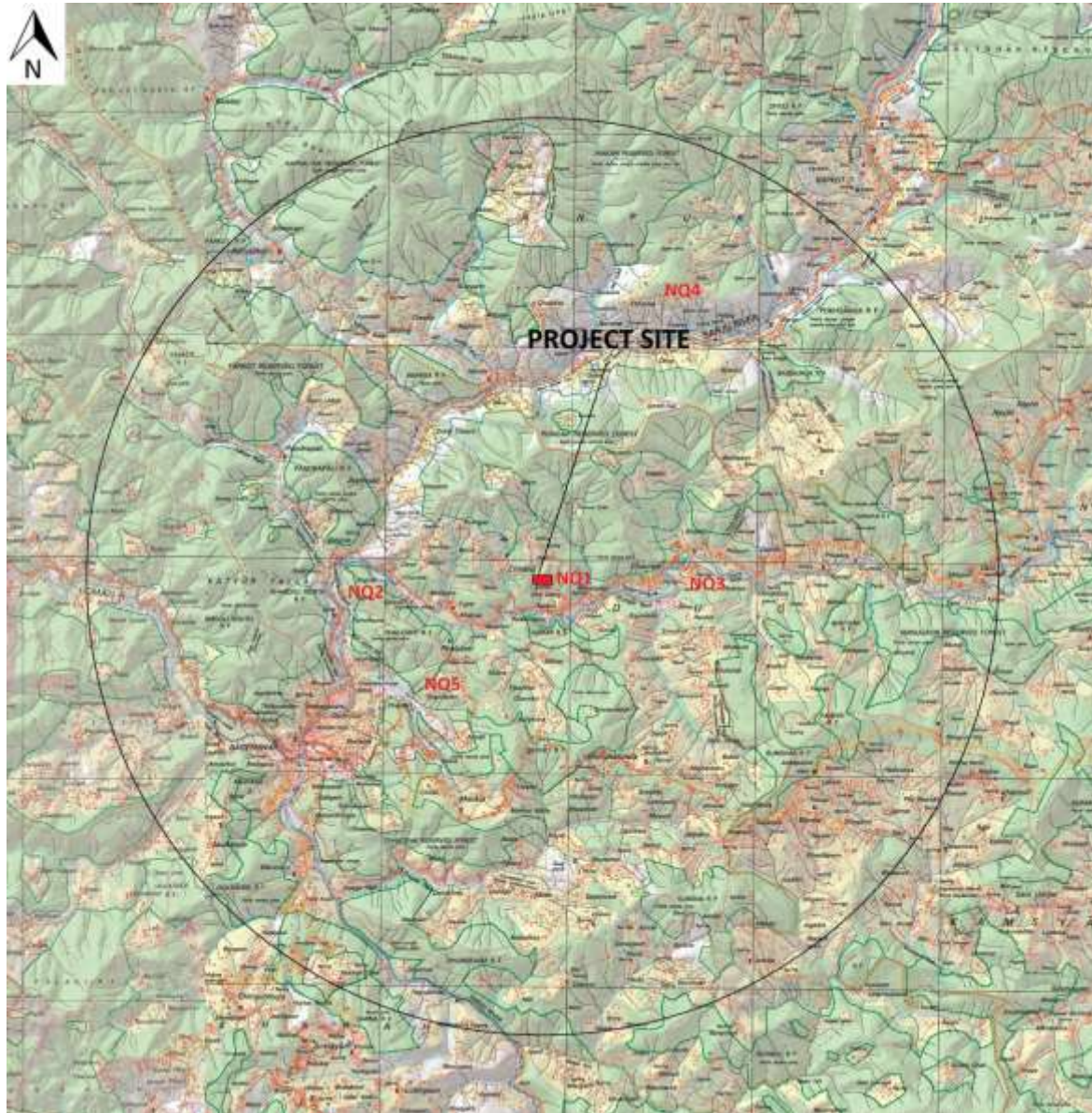


Figure 3.4: Ambient Noise Level Monitoring Locations

### 3.6.3 Ambient Noise Standards

Ministry of Environment, Forest and Climate Change (MoEF&CC) 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-3.6**

**Table 3.6: Ambient Quality Standards in respect of Noise**

Area Code	Category of Area	Noise dB (A) Leg	
		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

### 3.6.4 Baseline Scenario

The values of noise observed in some of the areas are primarily owing to vehicular traffic and other anthropogenic activities. Assessment of average logarithm night time Leq (Ln) varies from 35.4 to 46.2 dB (A) and the average logarithm daytime Leq (Ld) varies from 41.7 to 51.3 dB (A) within the study area.

The status of noise quality within the 10 km zone of the study area is, therefore, within the MoEF&CC standards.

#### Some of the photographs of Noise Monitoring



## 3.7 WATER ENVIRONMENT

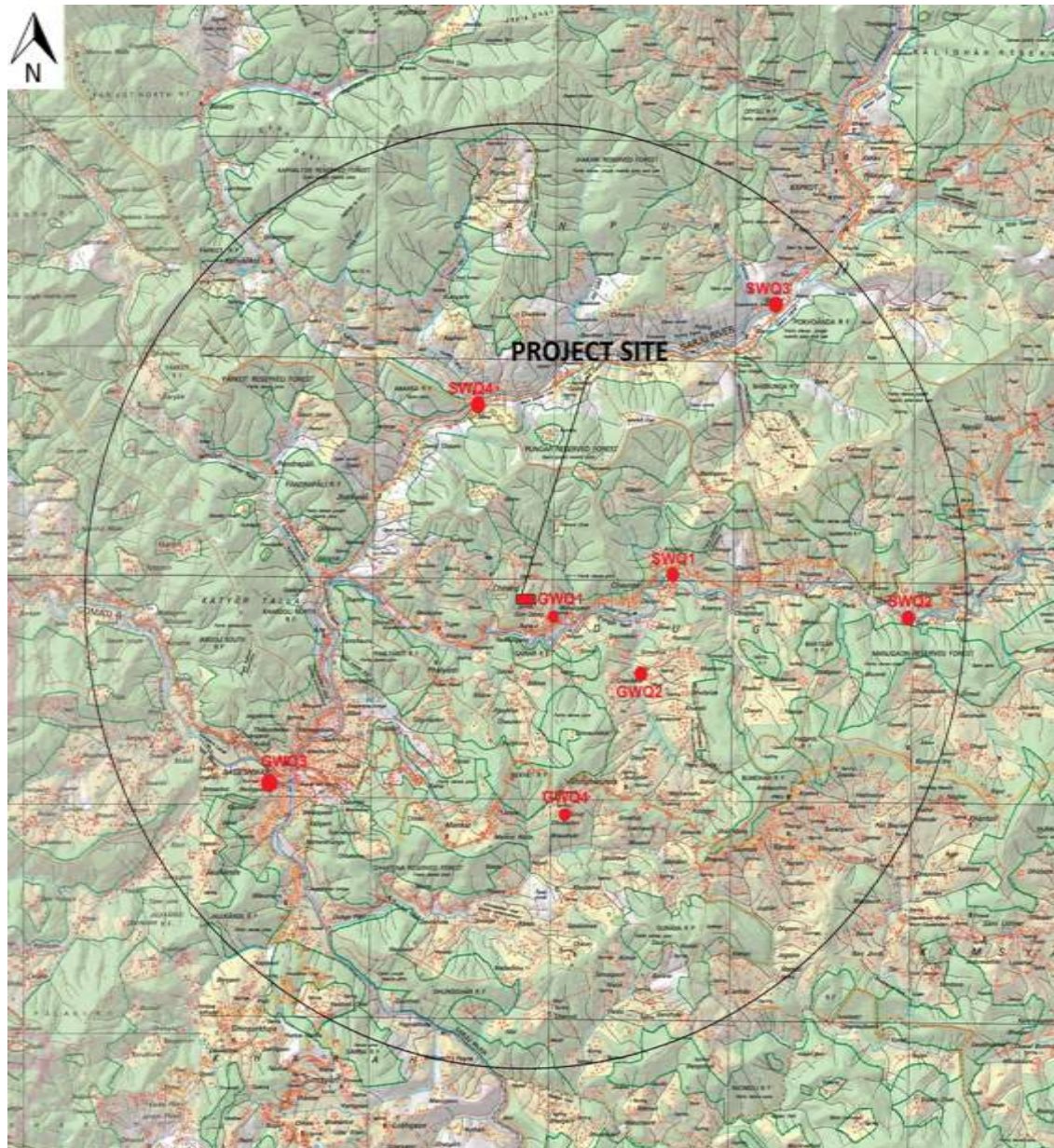
### 3.7.1 Water Quality

Water quality assessment is one of the essential components of EIA study. Such assessment helps in evaluating the existing health of water body and suggesting appropriate mitigation measures to minimize the potential impact from development projects. Water quality of ground water has been studied in order to assess proposed water-uses in dust suppression, drinking and green belt watering purpose.

The water quality within the study area was monitored during the study period. The water samples were collected once in month. The water sampling locations marked within the study are presented in **Table 3.7** and the result of the monitoring and analysis are presented in the **Table 3.8 (a)** to **Table 3.8 (c)**. **Figure 3.5** shows the Water Quality Monitoring Locations marked within the Study Area.

**Table 3.7: Location of Water Sampling Sites**

S. No.	Location Name	Direction	Distance from the project site (in km)
GWQ1	Near Project Site (karuli Village) (Spring water)	-	0
GWQ2	Chaubhata (Spring water)	SE	2.50
GWQ3	Bageshwar (Spring water)	SW	6.5
GWQ4	Siroli (Spring water)	S	4.50
SWQ1	Pungar river (Upstream)	E	3.00
SWQ2	Pungar river (Downstream)	SE	2.20
SWQ3	Sarju river (Upstream)	NE	8.50
SWQ4	Sarju river- Khargera (Downstream)	NE	8.28



**Figure 3.5: Location Map of Water Sampling Sites**

Table 3.8 (a): Water Quality during the month of March 2019

S.No	Parameter	Limit (as per IS:10500:2012)		Unit	GW1	GW2	GW3	GW4	SW 1	SW2	SW3	SW4
		Desirable Limit	Permissible Limit									
1	Colour	5	15	Hazen	<5	<5	<5	<5	<5	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	1	5	NTU	<1	<1	<1	<1	<1	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	-	7.46	7.38	7.64	7.45	7.82	7.55	7.68	7.26
6	Total Hardness (as CaCO <sub>3</sub> )	200	600	mg/l	182	174	178	190	166	172	170	177
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.25	0.24	0.23	0.30	0.28	0.26	0.25	0.24
8	Chlorides (as Cl)	250	1000	mg/l	18	16	17	20	15	19	16	20
9	Fluoride (as F)	1	1.5	mg/l	0.5	0.4	0.6	0.3	0.6	0.5	0.4	0.3
10	TDS	500	2000	mg/l	242	255	258	270	265	264	242	260
11	Calcium(as Ca <sup>2+</sup> )	75	200	mg/l	40	42	44	46	42	40	35	47
12	Magnesium (as	30	100	mg/l	19	16	14	15	20	16	17	18
13	Copper (as Cu)	0.05	1.5	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese(as Mn)	0.1	0.3	mg/l	0.04	0.03	0.05	0.02	0.05	0.04	0.03	0.02
15	Sulphate (as SO <sub>4</sub> )	200	400	mg/l	14	17	18	15	16	13	12	15
16	Nitrate(as NO <sub>3</sub> )	45	No Relaxation	mg/l	2.0	1.0	3.0	5.0	3.0	2.0	4.0	3.0
17	Phenolic Compounds (as	0.001	0.002	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg)	0.001	No Relaxation	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
19	Nickel (as Ni)	0.01	No Relaxation	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
20	Selenium ( as Se )	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As)	0.01	0.05	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	Lead (as Pb)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
23	Zinc (as Zn)	5	15	mg/l	0.03	0.04	0.03	0.02	0.03	0.05	0.04	0.06

24	Chromium (as Cr6+)	0.05	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Alkalinity (as	200	600	mg/l	172	168	154	171	182	166	175	158
26	Aluminum (as Al)	0.03	0.2	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
27	Boron (as B)	0.5	1	mg/l	0.4	0.1	0.3	0.2	0.4	0.3	0.2	0.1
28	Sodium Na	-	-	mg/l	10	12	11	9	9.2	9.8	8.2	8.8
29	Potassium K	-	-	mg/l	3.9	3.8	2.9	3.0	3.6	3.0	2.8	2.7
30	COD	-	-	mg/l	BDL	BDL	BDL	BDL	9.3	10.2	10.4	11.4
31	BOD	-	-	mg/l	BDL	BDL	BDL	BDL	3.5	4.0	5.5	6.0
32	Dissolved Oxygen	-	-	mg/l	4.0	4.2	4.5	5.2	5.0	5.4	6.4	6.5
<b>Bacteriological Parameter</b>												
1	Fecal Coliform	Shall not be detectable		MPN/100ml	Absent	Absent	Absent	Absent	56	60	68	65
2	Total Coliform	Shall not be detectable		MPN/100ml	Absent	Absent	Absent	Absent	110	122	108	107

**Table 3.8 (b): Water Quality during the month of April 2019**

S.No	Parameter	Limit (as per IS:10500:2012)		Unit	GW1	GW2	GW3	GW4	SW 1	SW2	SW3	SW4
		Desirable Limit	Permissible Limit									
1	Colour	5	15	Hazen	<5	<5	<5	<5	<5	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity	1	5	NTU	<1	<1	<1	<1	<1	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	-	7.58	7.52	7.62	7.48	7.54	7.77	7.68	7.56
6	Total Hardness (as CaCO3)	200	600	mg/l	185	172	180	190	166	174	162	158
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.24	0.26	0.23	0.27	0.26	0.24	0.22	0.28
8	Chlorides (as Cl)	250	1000	mg/l	15	17	16	24	22	20	19	17
9	Fluoride (as F )	1	1.5	mg/l	0.5	0.4	0.6	0.3	0.3	0.7	0.6	0.5
10	TDS	500	2000	mg/l	258	266	252	272	266	255	264	278
11	Calcium(as Ca2+)	75	200	mg/l	43	42	44	48	45	41	47	44

<b>Mining of Soapstone from Lease Area (7.784 Ha.) at Village- Karuli, Tehsil &amp; District - Bageshwar, Uttarakhand.</b>	<b>Final EIA/EMP</b>
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12	Magnesium (as	30	100	mg/l	15	17	14	13	12	19	14	16
13	Copper (as Cu)	0.05	1.5	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese(as Mn)	0.1	0.3	mg/l	0.02	0.03	0.04	0.01	0.02	0.01	0.04	0.03
15	Sulphate (as SO4)	200	400	mg/l	12	14	13	18	17	16	12	11
16	Nitrate(as NO3)	45	No Relaxation	mg/l	2	1	4	3	4	2	3	1
17	Phenolic Compounds (as C6H5OH)	0.001	0.002	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg)	0.001	No Relaxation	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
19	Nickel (as Ni)	0.01	No Relaxation	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
20	Selenium ( as Se )	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As)	0.01	0.05	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	Lead (as Pb)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
23	Zinc (as Zn)	5	15	mg/l	0.04	0.02	0.05	0.03	0.05	0.06	0.04	0.03
24	Mineral oil	0.5	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Alkalinity (as CaCO3)	200	600	mg/l	172	166	158	170	152	168	175	148
25	Aluminum (as Al)	0.03	0.2	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
27	Boron (as B)	0.5	1	mg/l	0.2	0.1	0.3	0.4	0.4	0.3	0.2	0.1
28	Sodium Na	-	-	mg/l	12	14	11	12	11	10	8.5	8.8
29	Potassium K	-	-	mg/l	3.6	3.5	2.8	3.2	3.5	3.7	2.5	2.6
30	COD	-	-	mg/l	BDL	BDL	BDL	BDL	12.5	11.4	10.6	11.5
31	BOD	-	-	mg/l	BDL	BDL	BDL	BDL	5.6	6.4	5.8	6.2
32	Dissolved Oxygen	-	-	mg/l	4.5	4.0	4.8	5.2	5.0	5.6	6.0	6.2
<b>Bacteriological Parameter</b>												
1	Fecal Coliform	Shall not be detectable		MPN/100ml	Absent	Absent	Absent	Absent	58	62	69	68
2	Total Coliform	Shall not be detectable		MPN/100ml	Absent	Absent	Absent	Absent	115	125	110	118

Table 3.8 (c): Water Quality during the month of May 2019

S.No	Parameter	Limit (as per IS:10500:2012)		Unit	GW1	GW2	GW3	GW4	SW 1	SW2	SW3	SW4
		Desirable Limit	Permissible Limit									
1	Colour	5	15	Hazen	<5	<5	<5	<5	<5	<5	<5	<5
2	Odour	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeabl
3	Taste	Agreeable	Agreeable	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeabl
4	Turbidity	1	5	NTU	<1	<1	<1	<1	<1	<1	<1	<1
5	pH	6.5-8.5	No Relaxation	-	7.72	7.62	7.58	7.50	7.64	7.78	7.58	7.68
6	Total Hardness (as CaCO <sub>3</sub> )	200	600	mg/l	158	172	166	182	152	174	148	155
7	Iron (as Fe)	0.3	No Relaxation	mg/l	0.22	0.23	0.26	0.27	0.26	0.21	0,24	0,25
8	Chlorides (as Cl)	250	1000	mg/l	14	15	17	18	19	20	13	18
9	Fluoride (as F)	1	1.5	mg/l	0.4	0.5	0.3	0.6	0.4	0.7	0.5	0.3
10	TDS	500	2000	mg/l	265	242	263	276	259	269	275	279
11	Calcium(as Ca <sup>2+</sup> )	75	200	mg/l	44	42	48	46	45	43	41	40
12	Magnesium (as	30	100	mg/l	14	13	17	19	17	15	16	18
13	Copper (as Cu)	0.05	1.5	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
14	Manganese(as Mn)	0.1	0.3	mg/l	0.04	0.02	0.03	0.01	0.03	0.01	0.04	0.02
15	Sulphate (as SO <sub>4</sub> )	200	400	mg/l	12	16	18	17	13	14	15	17
16	Nitrate(as NO <sub>3</sub> )	45	No Relaxation	mg/l	2.1	2,6	1.8	2.4	1.7	2.4	1.2	2.9
17	Phenolic Compounds (as C <sub>6</sub> H <sub>5</sub> OH)	0.001	0.002	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
18	Mercury (as Hg)	0.001	No Relaxation	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
19	Nickel (as Ni)	0.01	No Relaxation	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
20	Selenium ( as Se )	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
21	Arsenic (as As)	0.01	0.05	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	Lead (as Pb)	0.01	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
23	Zinc (as Zn)	5	15	mg/l	0.04	0.03	0.02	0.01	0.04	0.02	0.03	0.01
24	Chromium (as Cr <sup>6+</sup> )	0.05	No Relaxation	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25	Alkalinity (as CaCO <sub>3</sub> )	200	600	mg/l	177	167	153	175	168	158	142	166

26	Aluminum (as Al)	0.03	0.2	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
27	Boron (as B)	0.5	1	mg/l	0.3	0.1	0.4	0.2	0.4	0.2	0.3	0.1
28	Sodium Na	-	-	mg/l	12	14	13	10	11	10	9.2	8.4
29	Potassium K	-	-	mg/l	3.2	3.8	4.0	3.6	3.2	2.2	2.4	2.3
30	COD	-	-	mg/l	BDL	BDL	BDL	BDL	12.5	12.4	11.5	13.8
31	BOD	-	-	mg/l	BDL	BDL	BDL	BDL	6.0	6.2	5.4	5.7
32	Dissolved Oxygen	-	-	mg/l	4.6	4.5	5.2	5.5	6.5	6.4	6.0	6.2
<b>Bacteriological Parameter</b>												
1	Fecal Coliform	Shall not be detectable		MPN/100ml	Absent	Absent	Absent	Absent	56	58	65	62
2	Total Coliform	Shall not be detectable		MPN/100ml	Absent	Absent	Absent	Absent	110	120	112	115

### 3.7.2 Sampling Frequency and Sampling Techniques

Parameters for analysis of water quality were selected based on the utility of the particular source of water as per MoEF&CC guidance. Hence quality of ground water was compared with IS: 10500: 1991 (Reaffirmed 1993 With Amendment No -3 July 2010) for drinking purposes. Surface water quality was monitored for parameters as per Methods of Monitoring & Analysis published by CPCB and it was rated according to the CPCB Water Quality Criteria against A, B, C, D & E class of water. Water samples were collected as Grab water sample from sampling location. The samples were analyzed as per standard procedure / method given in IS: 3025 (Revised Part) and standard method for examination of water and wastewater Ed.21st, published jointly APHA, AWWA and WPCF.

The surface water quality is compared with CPCB water quality criteria mentioned in **Table 3.9** below:

**Table 3.9: Water Quality Criteria as per Central Pollution Control Board**

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organized)	B	Total Coliforms Organism MPN/100ml shall be 500 or less; pH between 6.5 and 8.5; Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source afterconventional treatment disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less; pH between 6 to 9; Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5 Electrical Conductivity at 25°C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

**Some of the photographs of Water Sampling**



**Karuli Location**



**Pungar river**

**3.7.3 Result & Conclusion:**

- 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 or water supply system. During the study period, the pH was varying for ground water from 7.38 to 7.72 and the surface water are 7.26 to 7.82. 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 2000 mg/l, beyond this palatability decreases and may cause gastro intestinal irritation. In ground water samples collected from the study area, the total dissolved solids in ground water are varying from 242 mg/l to 276 mg/l whereas in surface water varying from 242 mg/l to 279 mg/l. The TDS of the samples were above the desirable limit but within the permissible limit of 2000 mg/l.
- The desirable limit for chlorides is 250 mg/l 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 14 mg/l to a maximum of 24 mg/l, in surface water samples 13 mg/l to 22 mg/l. The chloride samples are within the desirable limits.
- The desirable limit as per IS-10500 Standards for hardness is 200 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 158 mg/l to 190 mg/l, in surface water samples 148 mg/l to 177 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, as per IS-10500. Most of the heavy metals in all samples are below detectable limits.

Comparing the values of pH, DO, BOD and total coliforms with 'Use based classification of surface waters' published by Central Pollution Control Board; it can be seen that all the analyzed surface waters can be compared with class 'B' and can be used as Outdoor bathing (Organized).

### 3.8 SOIL CHARACTERISTICS

The composite soil samples were collected from site and the study area and were analyzed for characterization. The locations of the monitoring sites are depicted in **Figure 3.6** and given in **Table 3.10** Showing Soil Sample Collection Points marked within the Study Area.

#### 3.8.1 Methodology

The soil samples were collected in the month of **May 2019**. Soil samples were collected from 8 locations. The samples were filled in polythene bags, labeled in the field with number and site name and sent to laboratory for analysis. The test results are given in **Table-3.11**.

Particulars	Details
Frequency	One grab sample from each station once during the Study Period
Methodology	Composite grab samples of the topsoil were collected from 3m depth, and mixed to provide a representative sample for analysis. They were stored in airtight Polythene Bags and analyzed at the laboratory

**Table 3.10: Soil Sample Collection Points**

S. No.	Location Name	Direction	Distance from the project site (in km)
SQ1	Project Site	-	0
SQ2	Kalna1	SW	3.83
SQ3	Dungri	NE	2.21
SQ4	Chhuriya Panaura	NE	3.78
SQ5	Goginapani	SW	2.38
SQ6	Aneriya	SE	4.67
SQ7	Gainar	NE	9.41
SQ8	Kalna 2	SW	3.80

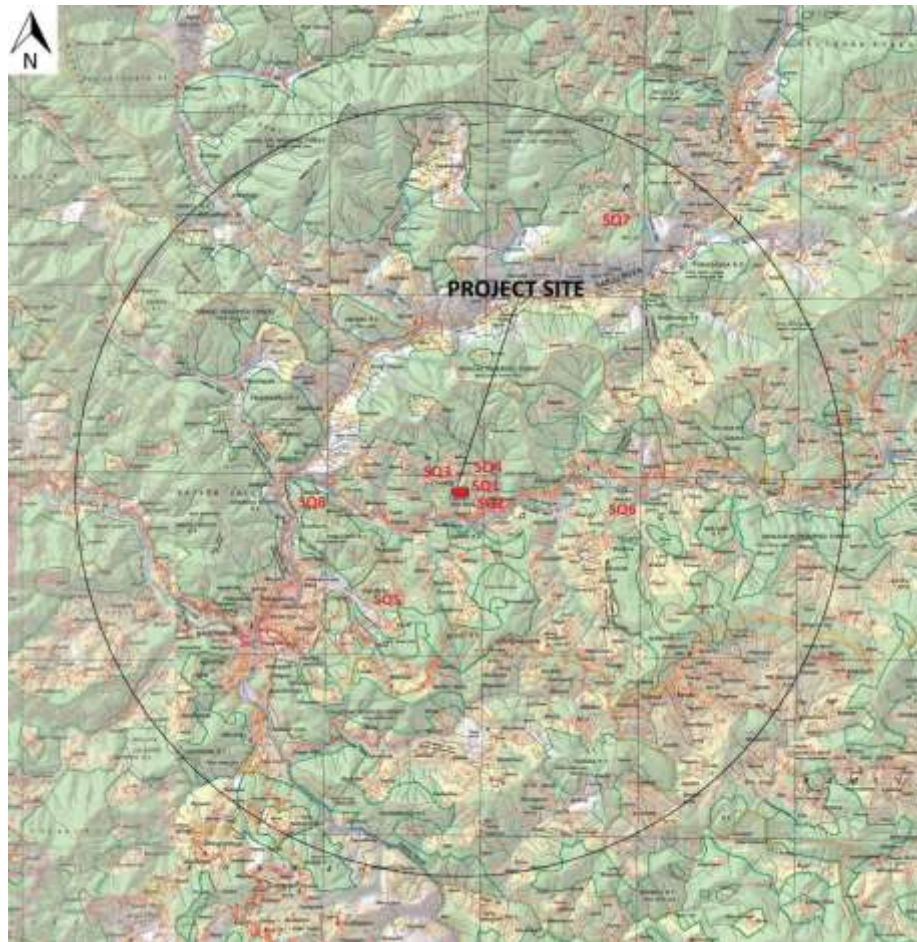


Figure 3.6: Location Map of Soil Sampling Sites

Some of the photographs of Soil Sampling



Near Project Site



Gairar Location

Table 3.11: Physiochemical Properties of Soil (May 2019)

S.No.	Parameter	Unit	SQ-1	SQ-2	SQ-3	SQ-4	SQ-5	SQ-6	SQ-7	SQ-8
1.	pH (1:2)	-	7.67	7.42	7.58	7.54	7.64	7.62	7.52	7.69
2.	Electrical Conductivity (1:2)	µmhos/cm	268	377	410	295	385	420	355	440
3.	Texture	-	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam
4.	Sand	%	20.2	22.6	19.5	21.2	23.6	18.6	17.8	21.5
5.	Silt	%	58.2	59.2	61.7	59.3	55.9	60	59.9	58.9
6.	Clay	%	21.6	18.2	18.8	19.5	20.5	21.4	22.3	19.6
7.	Cation exchange capacity	meq/100gm	14.5	17.8	15.2	16.8	18.2	13.0	16.2	18.7
8.	Exchangeable Potassium	mg/kg	119	128.4	121.2	116	132.2	118.2	120.8	123.2
9.	Exchangeable Sodium	mg/kg	95.2	115.8	106.8	90.5	119.4	99.6	113.4	110.8
10.	Exchangeable Calcium	mg/kg	2316	2355.0	2212.0	2344	2415.0	2265.0	2310.0	2252.0
11.	Exchangeable Magnesium	mg/kg	384	466.0	467.0	374	478.0	468.0	448.0	470.0
12.	Sodium Absorption Ratio	-	0.44	0.52	0.58	0.45	0.46	0.49	0.57	0.42
13.	Water Holding Capacity	%	22.6	25.5	26.4	28.6	27.8	21.2	29.6	24.2
14.	Porosity	%	36.2	32.5	30.2	33.6	31.4	34.5	36.5	35.6

### 3.8.2 Results of Analysis of the Soil

Physical characteristics of soil were characterized through specific parameters viz bulk density, porosity, water holding capacity, pH, electrical conductivity and texture. Soil pH plays an important role in the availability of nutrients. Soil microbial activity as well as solubility of metal ions is also dependent on pH. In the study area, variations in the pH of the soil were found to be slightly basic (7.42 to 7.69). Electrical conductivity (EC) is a measure of the soluble salts and ionic activity in the soil. In the collected soil samples the conductivity ranged from 268 – 440  $\mu\text{mhos/cm}$ .

The soils with low bulk density have favorable physical condition where as those with high bulk density exhibit poor physical conditions for agriculture crops.

### 3.9 LAND USE/LAND COVER MAPPING

#### ➤ Coordinates of the mine lease area

Map with all corner coordinates of the mine lease area are super imposed on toposheet is shown in **Figure-3.7**.

To assess the land use pattern surrounding the 10 km radius of the site, a detailed study was carried out. The land use pattern study reveals that the 10 km environs is predominantly forest and agriculture area. The land use details are given in **Table-3.12**.

**Table 3.12: Land use of the study area**

Sr. No.	Particulars	Area (ha)	Percentage
1	Settlements	1350	4.30
2	Water bodies	1084	3.45
3	Barren land	1220	3.89
4	Crop land	3162	10.07
5	forest area	24584	78.29
	<b>Total</b>	<b>31400</b>	<b>100.00</b>

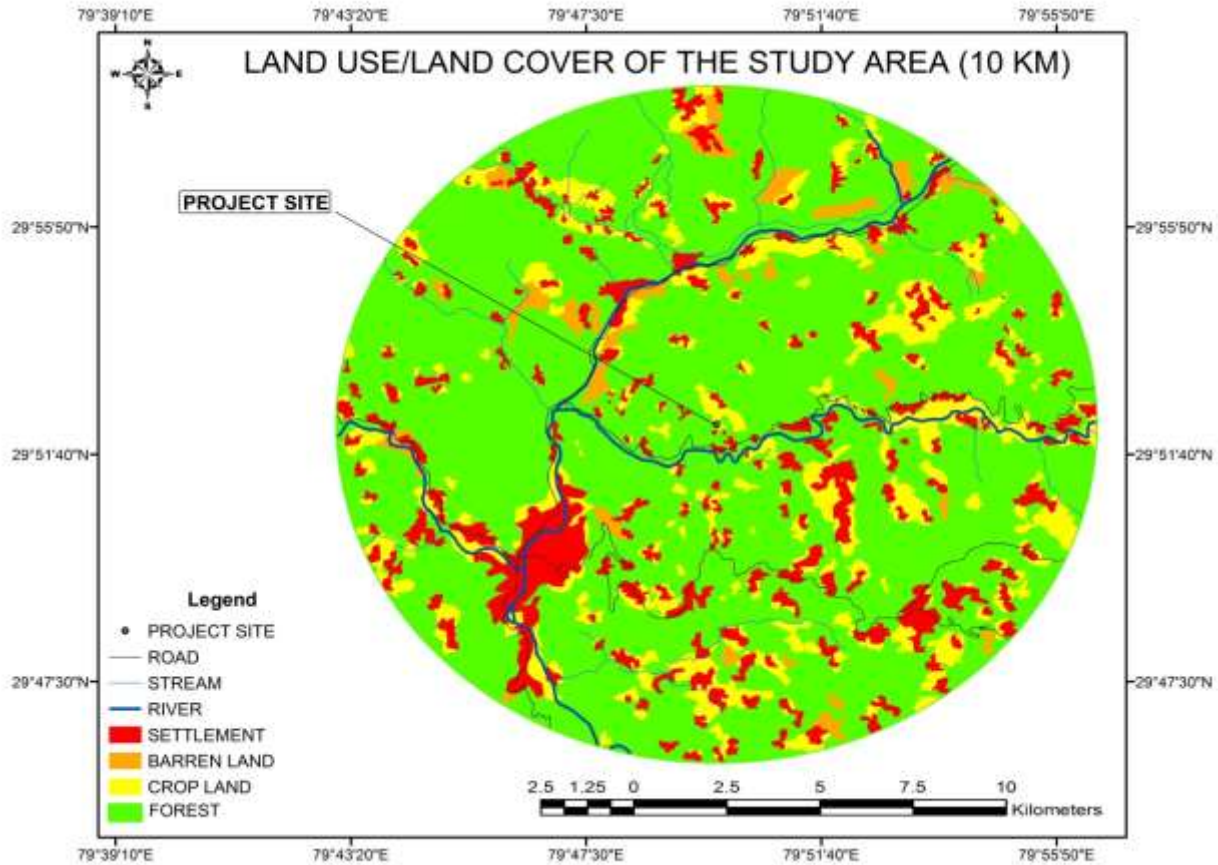


Figure 3.7 Land use delineation of 10 km radius area

### 3.10 TRAFFIC STUDY

Traffic study is carried out by understanding the existing carrying capacity of the road in the vicinity of site and flow towards State highway in the area. Then depending on the capacity of the mine, the number of trucks that will be added to the present scenario will be compared to the carrying capacity as recommended by Indian Road Congress (IRC). The existing volume of traffic and, the Level of Service are given in **Table-3.13 (i)** and shown in traffic density map as **Figure 3.8**.

Table 3.13 (i): Existing Traffic Scenario & LOS

Road	V (PCU/day)	C (PCU/day)	Existing V/C Ratio	LOS
Bageshwar – Dofar Dharamgarh Road	600	1100	0.54	B

V= Volume in PCU's/day

&

C= Capacity in PCU's/ day

#### During Mine operation

Total Capacity of mine : 30,000 TPA

No. of working days : 240 days

Total Capacity of mine/day : 30,000 /240 = 125 tonnes/day

Truck Capacity : 9 tonnes  
 No. of trucks deployed per day :  $125/9 = 14$  trucks per day  
 No. of trucks deployed/day to & fro :  $14*2=28$  trucks  
 Increase in PCU/day : 62

The addition to traffic by the proposed project during its operation is given table below:

**Table 3.13 (ii): Additional Traffic Scenario & LOS due to proposed project**

Road	V	C	Modified V/C Ratio	LOS
Bageshwar – Dofar Dharamgarh Road	662	1100	0.60	B

From the above analysis it can be seen that the V/C ratio is likely to be changed to 0.60 on Bageshwar – Dofar Dharamgarh Road with LOS remains “B” which is “Very Good” as per the classification. So the additional load on the carrying capacity of the concerned roads is not likely to have much significant adverse effect.



**Figure 3.8: Transportation Route Map**

### 3.11 BIOLOGICAL ENVIRONMENT

Biological diversity comprises the variability of species, genus and ecosystems and is very crucial for maintaining the basic processes on which the life depends. Broadly it can be divided in to two types i.e. the floral diversity and faunal diversity. Conservation of the biodiversity is essential for the sustainable development as it not only provides the food, fodder and medicine but also contribute in improvement of essential environmental attributes like air, water, soil, etc.

Before starting any Environmental Impact Assessment study, it is necessary to identify the baseline of relevant environmental parameters which are likely to be affected as a result of operation of the proposed project. A similar approach has been adopted for conducting the study on Biological Environment for this Project. Both terrestrial and aquatic ecosystems have been studied to understand the biological environment.

#### 3.11.1 Methodology for the study

Detailed survey was conducted to evaluate floral and faunal composition of the study area. Primary data on floral and faunal composition was recorded during site visit and secondary data was collected from the Forest department and published relevant literature. Inventory of flora and fauna has been prepared on the basis of collected data.

**Field study period:** The ecological survey has been conducted for one season. All data were collected in pre monsoon season. The map showing the details of reserve forest within 10 km radius has been shown in **Figure 3.9**. The details are given as below:

**Table 3.14: Mode of data collection & parameters considered during the survey**

Aspect	Data	Mode of data collection	Parameters monitored
Terrestrial Ecology	Primary data collection	By conducting field survey	Floral and Faunal diversity
	Secondary data collection	From authentic sources like Range office and Forest Department of Uttarakhand and available published literatures	Floral and Faunal diversity and study of vegetation, forest type, importance etc.
Aquatic Ecology	Primary data collection	By conducting field survey	Floral and Faunal diversity
	Secondary data collection	From authentic sources like Range office and Forest Department of Uttarakhand and available published literatures	Floral and Faunal diversity and study of vegetation, forest type, importance etc.

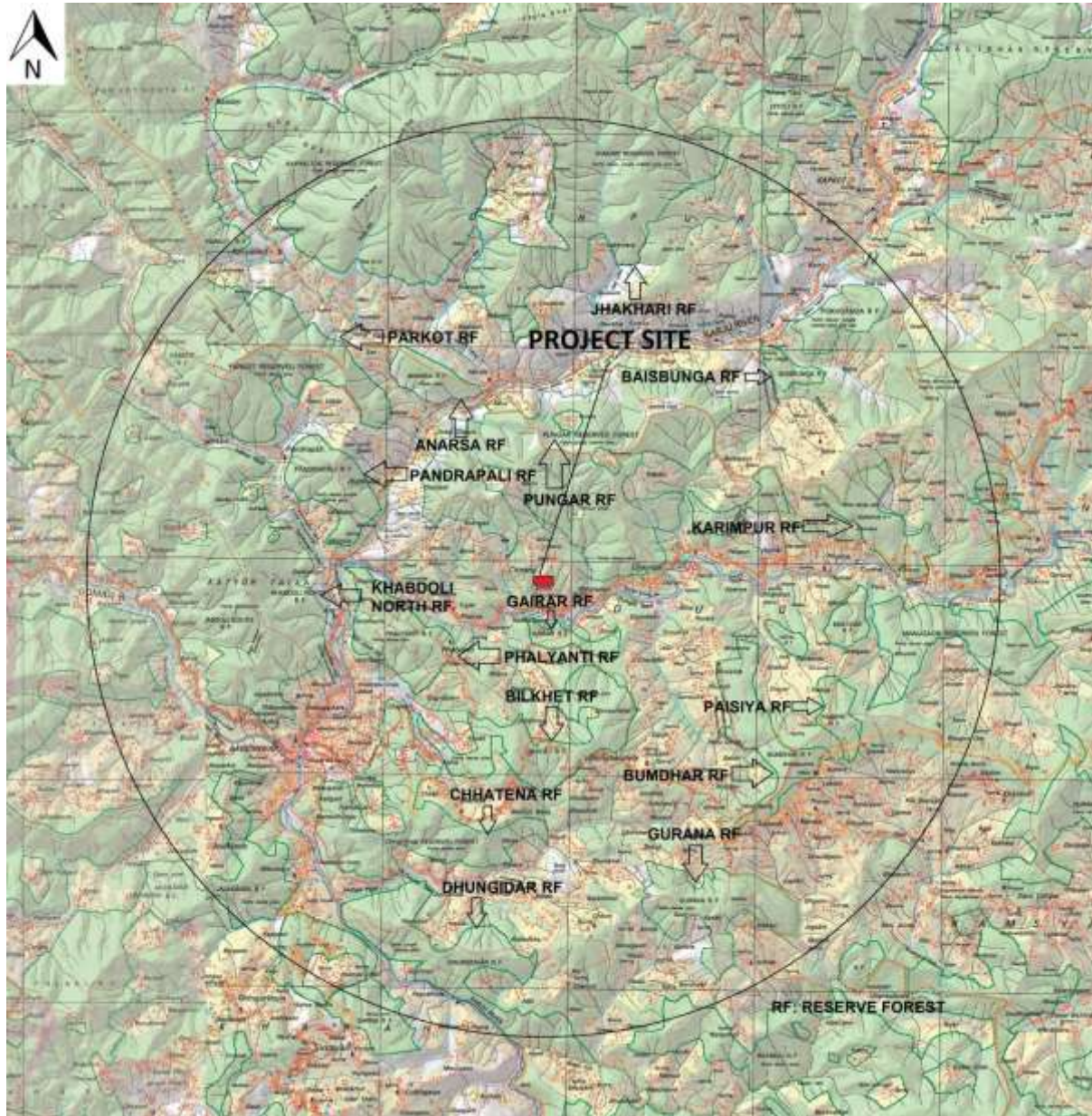


Figure 3.9: Details of reserve forest within 10 km radius

### 3.11.2 Physical Environment of the study area:

Bageshwar is one of the mountainous districts of Uttarakhand State. Prior to its formation as a separate district, Bageshwar constituted a part of Almora district. The district was included in Uttarakhand State after the state was carved out of Uttar Pradesh on 9<sup>th</sup> November 2000. The district lies between latitudes 29°40' and 30°20' N and longitudes 79°25' and 80°10' E (Survey of India Degree Sheet Nos. 53N and 53O). The district is bounded by Almora district in the south, Chamoli district in the north and northwest and Pithoragarh district in the east. The geographical area of the district is 1687.8 km<sup>2</sup> (Census, 2001).

#### 3.11.2.1 Drainage:

Drainage of the area is mainly controlled by Saryu, Gomti and Pindar Rivers and their tributaries (locally called Nadi, Gad or Gadhera) viz. Pungar Nadi, Khir Ganga Nadi, Bhadrapati Nadi, Revti

Ganga, Kanal Gad, Lahor Nadi, Jagtana Gad, Kulur Gad, Sukunda Gad etc. Sub-trellis, sub-rectangular and sub-dendritic are the most common drainage patterns in the area. The Central and North-Central parts of the district are drained by Saryu River. Gomti River drains the western and south eastern parts whereas Pindar River drains the northern part. These rivers are primarily fed by snowmelt with relatively smaller contribution from ground water. However, during the lean period, the rivers are fed by ground water occurring as base flow.

### **3.11.2.2 Climate:**

January is the coldest month with mean maximum temperature of 10°C, the mean minimum temperature being about 2°C. Temperature drops down to – 6°C during January and February in the northern part of the district. June is the warmest month with the mean maximum and the mean minimum temperatures of 25°C and 15°C respectively. The Relative Humidity increases rapidly with the onset of monsoon and reaches at about 80% during July to September. The driest part of the year is the pre-monsoon period, when the humidity is as low as 30% in the afternoons. Skies are heavily clouded during the monsoon months and for short spells when the district is affected by Western Disturbances. Two broad wind patterns are observed in the district viz. north easterly to easterly (May to September) and south easterly to westerly (October to March).

### **3.11.2.3 Agriculture:**

Agriculture is the main occupation of the people. However, intensive cultivation is not possible as major part of the district is mountainous. Agricultural activities are common on gentle hill slopes and in relatively plain, broad river valleys of Gomti and Saryu Rivers. Rice, wheat, mandua, barley, maize and sawan are the principal crops grown in the district. Garur valley has the maximum cultivated area. Due to high production of rice, the area is known as "Rice Bowl of Kumaun".

### **3.11.3 Forests cover and Forest Type:**

The forest of the district includes the vast range found in the Himalayas, varying from the sub-tropical species which grow in the outer ranges of low hills to the rich Alpine vegetation in the north. Uttarakhand covers an area of 53, 483 sq km which is 1.63 % of the geographical area of the country as mentioned in the India State of Forest Report 2017 and 45.80% of the state's geographical area. In terms of forest canopy density classes, the state has 4762 km<sup>2</sup> area under very dense forest, 14167 km<sup>2</sup> area under moderately dense forest and 5567 km<sup>2</sup> area under open forest. Out of 2246 km<sup>2</sup> total area of Bageshwar district, 194 km<sup>2</sup> area is under very dense forest, 883 km<sup>2</sup> fall under moderately dense forest and 304 km<sup>2</sup> area is open forest (61.49% area of district encompasses forest cover).

As per Champion and Seth (1968), the project site included following types of forests.

- Very dense forest
- Moderate dense forest
- Open forest
- Scrub

Pre – Monsoon	:	March-May 2019
Survey sites	:	Around the project site in 10 km radius
Core zone	:	At the project site (100m)
Buffer zone	:	Around the project site in 10 km radius.

### 3.11.4 Taxonomic Diversity: Floristic of Terrestrial Ecosystem

The magnificent Himalaya is well recognized for its bio-physical diversity and socio-cultural Heritage, unique physical and ethnic diversity, traditional systems and an ample quantity of Indigenous knowledge. It forms one of the Global Biodiversity Hotspots-the Himalayan Biodiversity Hotspot.

**Table 3.15: Tree species recorded in the study area during pre- monsoon period-2019**

S. No.	Botanical Name	Family	Local Name / English	Availability
1.	<i>Phoenix humilis</i>	Arecaceae	Khajoor	Occasional
2.	<i>Acacia catechu</i>	Mimosaceae	Khair	Occasional
3.	<i>Prunus armenica</i>	Rosaceae	Chulu	Common
4.	<i>Adina cordifolia</i>	Rubiaceae	Haldu	Common
5.	<i>Terminalia chebula</i>	Combretaceae	Harad	Common
6.	<i>Bombax ceiba</i>	Bombacaceae	Semal	Common
7.	<i>Ficus religiosa</i>	Moraceae	Pipal	Common
8.	<i>Syzygium cumuni</i>	Myrtaceae	Jamun	Common
9.	<i>Populus ciliata</i>	Salicaceae	Pahadi Pipal	Common
10.	<i>Pyrus pyr ifolia</i>	Rosaceae	Nashpati	Common
11.	<i>Erythrina suberosa</i>	Fabaceae	Dhak	Common
12.	<i>Cedrus deodara</i>	Pinaceae	Devdar	Common
13.	<i>Ficus nemoralis</i>	Moraceae	Dudhla	Common
14.	<i>Shorea robusta</i>	Dipterocarpaceae	Saal	Common
15.	<i>Dalbergia Sissoo</i>	Fabaceae	Shisham	Common
16.	<i>Litsea chinensis</i>	Lauraceae	Lauraceae	Common
17.	<i>Pyrus pashia</i>	Rosaceae	Mehal	Common
18.	<i>Ficus glomerata</i>	Moraceae	Gular	Common
19.	<i>Lagerstroemia indica</i>	Lythraceae	Gulbahar	Common
20.	<i>Quercus semecarpifolia</i>	Fabaceae	Khairu	Rare
21.	<i>Quercus leucotrichophora</i>	Fabaceae	Banj	Common
22.	<i>Sapindus mukurossi</i>	Sapinadaceae	Reetha	Common
23.	<i>Cassia fistula</i>	Caesalpiaceae	Amaltash	Common
24.	<i>Mangifera indica</i>	Anacardiaceae	Aam	Common
25.	<i>Emblca officinalis</i>	Euphorbiaceae	Amla	Common
26.	<i>Castanopsis tribuloides</i>	Fagaceae	Katauni	Common
27.	<i>Machilus duthiei</i>	Lauraceae	Kaula	Rare
28.	<i>Salix wallichiana</i>	Salicaceae	Bains	Occasional
29.	<i>Dendrocalamaus strictus</i>	Poaceae	Bans	Common
30.	<i>Aegle marmelos</i>	Rutaceae	Bel	Common
31.	<i>Betula utilis</i>	Betulaceae	Bhuj	Occasional
32.	<i>Grewia optiva</i>	Tiliaceae	Bhimal	Common
33.	<i>Salix babylonica</i>	Salicaceae	Salicaceae	Common

Source: Field survey & Bageshwar forest department.

**Table 3.16: Tree, shrub & herb species recorded in the study area during pre- monsoon period-2019**

S. No	Botanical Name	Family	Local Name / English	Local Availability
1.	<i>Lespedeza eriocarpa</i>	Fabaceae	Khunju	Common
2.	<i>Schefflera venulosa</i>	Araliaceae	Khadsemal	Common

3.	<i>Viburnum erubescens</i>	Caprifoliaceae	Gani	Common
4.	<i>Viburnum mullaha</i>	Caprifoliaceae	Ricchoi	Occasional
5.	<i>Viburnum nervosum</i>	Caprifoliaceae	Gadbiya	Occasional
6.	<i>Carissa opaca</i>	Apocynaceae	Karaunda	Occasional
7.	<i>Rubus niveus</i>	Rosaceae	Kala Hinsalu	Occasional
8.	<i>Dioscorea deltoidea</i>	Dioscoreaceae	Taroi	Occasional
9.	<i>Murraya exotica</i>	Rutaceae	Kamini	Common
10.	<i>Berberis asiatica</i>	Berberidaceae	Kilmoda	Common
11.	<i>Lantana camara</i>	Verbenaceae	Kuri	Common
12.	<i>Nyctanthes arbor-tristis</i>	Oleaceae	Harsingar	Common
13.	<i>Artemisia vulgaris</i>	Asteraceae	Kurinja	Common
14.	<i>Plectranthes rugosus</i>	Lamiaceae	Kurkha	Common
15.	<i>Smilax aspera</i>	Liliaceae	Kukurdada	Common
16.	<i>Skimmia anquetilia</i>	Rutaceae	Kedarpati	Occasional
17.	<i>Rubus biflorus</i>	Rosaceae	Achhai	Common
18.	<i>Asparagaus racemosus</i>	Liliaceae	Satavar	Common
19.	<i>Viburnum cotinifolium</i>	Caprifoliaceae	Ghinna	Common
20.	<i>Randia tetrasperma</i>	Rutaceae	Ghighari	Common
21.	<i>Rhus continus</i>	Anacardiaceae	Tung	Common
22.	<i>Cassia tora</i>	Caesalpiniaceae	Chakunda	Common
23.	<i>Pleurospermum densiflorum</i>	Apiaceae	Gugal	Rare
24.	<i>Mimosa pudica</i>	Mimosaceae	Chuimui	Common
25.	<i>Strobilanthes wallichii</i>	Acanthaceae	Jaanu	Common
26.	<i>Rubus duthieamus</i>	Rosaceae	Jogi	Common
27.	<i>Phoenix acaulis</i>	Arecaceae	Thakal	Rare
28.	<i>Taraxacum officinale</i>	Asteraceae	Dudhiya	Common
29.	<i>Datura stramonium</i>	Solanaceae	Dhatura	Common
30.	<i>Mentha sylvestris</i>	Lamiaceae	Pudina	Common
31.	<i>Adhatoda vasica</i>	Acanthaceae	Basinga	Common
32.	<i>Centella asiatica</i>	Apiaceae	Brahmi	Common
33.	<i>Salix elegans</i>	Salicaceae	Kadvi	Common
34.	<i>Zizyphus mauritiana</i>	Rhamnaceae	Ber	Common
35.	<i>Cannabis sativa</i>	Cannabinaceae	Bhang	Common
36.	<i>Ficus scandes</i>	Moraceae	Chachri	Common
37.	<i>Lawsonia inermis</i>	Lythraceae	Mehndi	Common
38.	<i>Euphorbia royleana</i>	Euphorbiaceae	Suru	Common

Source: Field survey & Bageshwar forest department.

**Table 3.17: Climber species recorded in the study area during pre- monsoon period-2019**

S. No	Botanical Name	Family	Local Name / English	Local Availability
1.	<i>Rubus paniculatus</i>	Rosaceae	Kathula	Common
2.	<i>Milletia auriculata</i>	Fabaceae	Gauj	Occasional
3.	<i>Clematis montana</i>	Ranunculaceae	Kenia	Common
4.	<i>Tinospora cordifolia</i>	Menispermaceae	Giloy	Rare
5.	<i>Cryptolepis buchanani</i>	Asclepiadaceae	Dudhibel	Common
6.	<i>Holboellia angustifolia</i>	Berberidaceae	Jangali sharifa	Occasional

Source: Field survey & Bageshwar forest department

**Table 3.18: Parasite species (angiosperm) recorded in the study area during pre-monsoon period-2019**

S. No.	Botanical Name	Family	Local / English Name	Local Availability
1.	<i>Cuscuta reflexa</i>	Cuscutaceae	Amarbel	Common
2.	<i>Taxillus vestitus</i>	Loranthaceae	Pand	Common
3.	<i>Viscum nepalense</i>	Loranthaceae	Budu	Common
4.	<i>Dendrophthoe falcata</i>	Loranthaceae	Banda	Common

Source: Field survey & Bageshwar forest department.

**Table 3.19: Bamboo species recorded in the study area during pre-monsoon period-2019**

S. No.	Botanical Name	Family	Local / English Name	Local availability
1.	<i>Arundinaria alcate</i>	Poaceae	Gol Ringal	Common
2.	<i>Dendrocalamus hamiltonii</i>	Poaceae	Kako Bans	Common
3.	<i>Dendrocalamus somdevii</i>	Poaceae	Bans	Common
4.	<i>Dendrocalamus strictus</i>	Poaceae	Bans	Common

Source: Field survey & Bageshwar forest department.

**Table 3.20: Grass species recorded in the study area during pre-monsoon period-2019**

S. No.	Botanical Name	Family	Local/ English Name	Local availability
1.	<i>Saccharum munja</i>	Poaceae	Munj	Common
2.	<i>Eragrostis curvula</i>	Poaceae	Love grass	Common
3.	<i>Setaria sphacelata</i>	Poaceae	Setaria grass	Common
4.	<i>Dactylis glomerata</i>	Poaceae	Auchard grass	Common
5.	<i>Saccharum spontaneum</i>	Poaceae	Kans	Common
6.	<i>Crypsopogon gryllus</i>	Poaceae	Kush	Common
7.	<i>Cynodon dactylon</i>	Poaceae	Dub	Common
8.	<i>Sorghum halepense</i>	Poaceae	Bajra	Common
9.	<i>Cymbopogon martinii</i>	Poaceae	Babla	Common
10.	<i>Themeda anathera</i>	Poaceae	Piriya	Common

Source: Field survey & Bageshwar forest department.

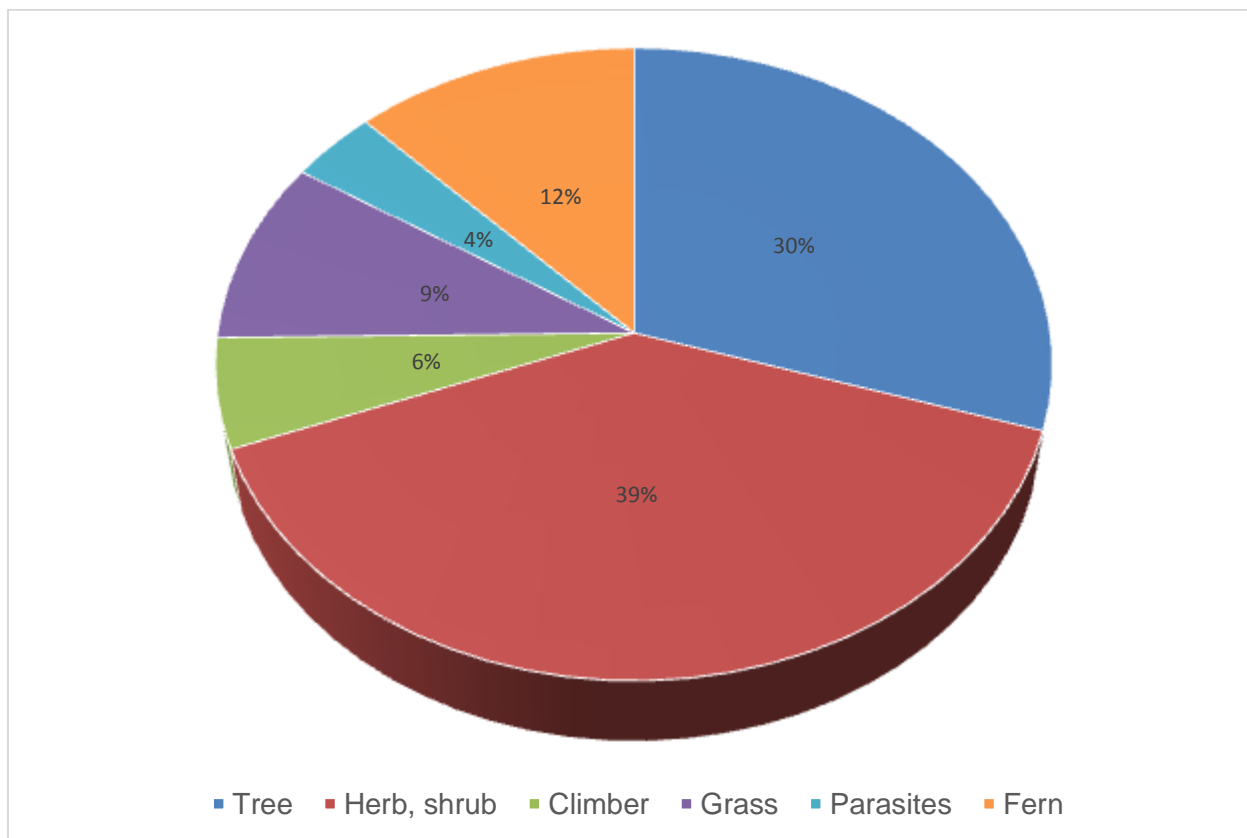
**Table 3.21: Non-flowering plant species in the study area during Pre monsoon season, 2019**

S. No.	Botanical Name	Family	Local / English name	Local availability
<b>Fern</b>				
1.	<i>Angiopteris evecta</i>	Angiopteridaceae		Common
2.	<i>Osmunda hilsenbergii</i>	Osmundaceae		Rare
3.	<i>Drynaria propinqua</i>	Polypodiaceae		Common
4.	<i>Microsorium membranaceum</i>	Polypodiaceae		Common
5.	<i>Phymatopteris oxyloba</i>	Polypodiaceae		Common
6.	<i>Lygodium japonicum</i>	Lygodiaceae		Common
7.	<i>Pteris biaurita</i>	Pteridaceae		Common
8.	<i>Pteris vittata</i>	Pteridaceae		Common
9.	<i>Adiantum philippense</i>	Adiantaceae		Common
10.	<i>Vittaria flexuosa</i>	Pteridaceae		Common

11.	<i>Sphenomeris chinesis</i>	Lindsaceae		Common
12.	<i>Christella parasitica</i>	Thelypteridaceae		Common
13.	<i>Tectaria coadunata</i>	Tectariaceae		Common
<b>Bryophyte</b>				
14.	<i>Anthoceros sp.</i>	Anthoceroceae		Common
15.	<i>Funaria hygrometrica</i>	Funariaceae		Occasional
16.	<i>Riccia sp.</i>	Ricciaceae		Common
<b>Algae</b>				
17.	<i>Spirogyra sp.</i>	Zygnemataceae		Occasional
18.	<i>Chara sp.</i>	Characeae		Occasional
19.	<i>Nostoc sp.</i>	Nostocaceae		Common

**Source: Field survey & Bageshwar forest department.**

During Pre monsoon season, a total of 113 species were recorded inhabiting land. The floral angiosperm diversity (94 species) was dominated by tree species (32); the other species recorded are shrub, herb (42), climber (06), parasitic angiosperm (04) and grass (10) species. The graph showing the Taxonomic diversity of terrestrial flora in the project area during pre-monsoon, 2019 has been shown in **Figure 3.10**.



**Figure 3.10: Taxonomic diversity of terrestrial flora in the project area during pre-monsoon, 2019**

### 3.11.5 Economically Important Species

The terrestrial peculiarities make the Himalayan region a very diverse system subtending a wide range of flora types. The biodiversity of this region is severely vulnerable by natural and anthropogenic disturbances. During the field survey, numbers of plant species which are medicinally and economically importance in the area were recorded. These plants are used by local people for various purpose and also used as food and other devotions. A total of 19 Species of sparingly significant plants were recorded in the project area.

**Table 3.22: Economically & medicinally important plant species recorded in the project area**

S. No.	Botanical Name	Family	Local / English Name	Life form
1.	<i>Asparagus adscendens</i>	Liliaceae	Shatavar	Herb
2.	<i>Quercus leucotrichophora</i>	Fagaceae	Banj	Tree
3.	<i>Juglans regia</i>	Juglandaceae	Akhrot	Tree
4.	<i>Ficus religiosa</i>	Moraceae	Pipal	Tree
5.	<i>Ficus palmata</i>	Moraceae	Bedu	Tree
6.	<i>Ricinus communis</i>	Euphorbiaceae	Arandi	Shrub
7.	<i>Jatropha curcas</i>	Euphorbiaceae	Safed Arand	Shrub
8.	<i>Litsea umbrosa</i>	Lauraceae	Chirar	Tree
9.	<i>Symplocos crataegoides</i>	Symplocaceae	Lodh	Tree
10.	<i>Rhododendron arboreum</i>	Ericaceae	Burans	Tree
11.	<i>Prunus cerasoides</i>	Rosaceae	Padam	Tree
12.	<i>Bauhinia variegata</i>	Caesalpinaceae	Kanchnar	Tree
13.	<i>Bombax ceiba</i>	Bombacaceae	Semal	Tree
14.	<i>Cedrus deodara</i>	Pinaceae	Deodar	Tree
15.	<i>Hedychium spicatum</i>	Zingiberaceae	Haldi	Herb
16.	<i>Malaxis acuminata</i>	Orchidaceae	Jivak	Herb
17.	<i>Myrica esculenta</i>	Myricaceae	Kaphal	Tree

Source: Field survey & Bageshwar forest department.

### 3.11.6 Fauna Diversity: Terrestrial Ecosystem

The list of fauna according are based on primary survey and multiples sources of data together with the operating plans of Bageshwar forest divisions, printed articles in scientific journals, publications of multiple sources of data like the Zoological Survey of India. During field surveys resulted in to updated information of the 48 species belonging to both vertebrate as well as invertebrate animal diversity. The faunal species recorded in the project area include; butterfly 06 species, avifauna 24 species and vertebrates 18 species. The percentage contribution of different species is dominated by birds and mammal. Two Schedule – 1 species have also been recorded in the study area and their conservation plan has been attached as **Annexure V**.

The graph showing the Taxonomic diversity of terrestrial fauna in the project area during pre-monsoon, 2019 has been shown in **Figure 3.11**.

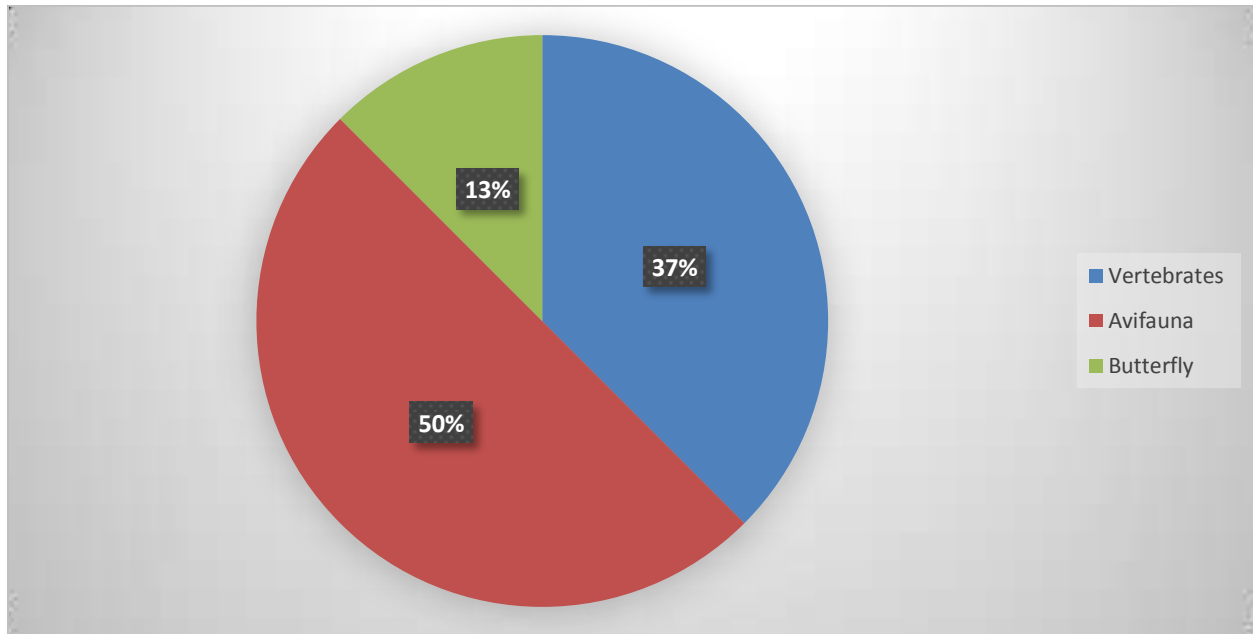


Figure 3.11. Taxonomic diversity of terrestrial fauna in the project area during pre-monsoon, 2019

Table 3.23: Vertebrate's species recorded in the study area during pre-monsoon, 2019

S. No.	Scientific Name	Local/ English Name	Local Availability	WPA, 1972	IUCN category
1.	<i>Presbytis entellus</i>	Common Langur	Common	II	NA
2.	<i>Macaca mulata</i>	Rhesus Macaque	Common	II	NA
3.	<i>Susscrofa cristatus</i>	Indian wild Boar	Frequently	III	NA
4.	<i>Felis chaus</i>	Jungle cat	Frequently	II	LC
5.	<i>Herpestes edwardsi</i>	Common mongoose	Common	II	LC
6.	<i>Vulpes bengalensis</i>	Indian fox	Common	II	LC
7.	<i>Vulpes vulpes</i>	Red fox	Common	II	NA
8.	<i>Hyaena hyaena</i>	Striped hyena	Occasional	III	NT
9.	<i>Lutra lutra</i>	Common otter	Rare	II	NT
10.	<i>Rousettus leschenaultia</i>	Fulvous fruit bat	Common	-	NA
11.	<i>Petaurista petaurista</i>	Red flying squirrel	Common	II	LC
12.	<i>Lepus nigricollis nigricollis</i>	Indian hare	Common	IV	NA
13.	<i>Axis axis</i>	Spotted deer	Frequently	III	NA
14.	<i>Cervus unicolor</i>	Sambhar	Common	III	VU
15.	<i>Muntiacus muntjak</i>	Barking deer	Common	III	NA
16.	<i>Panthera pardus</i>	Leopard	Rare	I	NT
17.	<i>Ursus thibetanus</i>	Asiatic Black Bear	Rare	I	VU

Source: Field survey & Bageshwar forest department.

Note: NA- Not assessed yet for IUCN category, LC- Least Concern, NT- Near threatened, VU- Vulnerable.

**Table: 3.24: Avifauna (Bird) species recorded in the project area during pre- monsoon season, 2019**

S. No.	Scientific Name	Local / English name	Local availability
1.	<i>Motacilla alba</i>	White wagtail	Frequent
2.	<i>Certhia himalayana</i>	Bar-tailed creeper	Common
3.	<i>Garrulax albogularis</i>	White throated laghing trush	Common
4.	<i>Neophron percnopterus</i>	Egyptian vulture	Common
5.	<i>Gyps himalayensis</i>	Himalayan griffon	Frequently
6.	<i>Falco tinnunculus</i>	Common kestrel	Common
7.	<i>Francolinus francolinus</i>	Black francolinus	Common
8.	<i>Gallus gallus</i>	Red jungle fowl	Frequently
9.	<i>Vanellus indicus</i>	Red wattled lapwing	Rare
10.	<i>Columbia livia</i>	Rock pigeon	Frequently
11.	<i>Psittacula cyanocephala</i>	Plum headed parakeet	Common
12.	<i>Psittacula himalayana</i>	Stay- headed parakeet	Frequently
13.	<i>Eudynamys scolopacea</i>	Asian Koel	Common
14.	<i>Heirococcyx sparverioides</i>	Large Hawk Cuckoo	Common
15.	<i>Heirococcyx varius</i>	Common Hawk Cuck	Common
16.	<i>Glaucidium radiatum</i>	Jungle Owlet	Common
17.	<i>Glaucidium brodiei</i>	Collared Owlet	Common
18.	<i>Coracias benghalensis</i>	Indian roller	Common
19.	<i>Dendrocopos auriceps</i>	Brown-fronted woodpecker	Common
20.	<i>Acridotheres fuscus</i>	Jungle myna	Common
21.	<i>Acridotheres tristis</i>	Common myna	Common
22.	<i>Corvus splendens</i>	House crow	Common
23.	<i>Corvus macrochrychos</i>	Large-billed crow	Common
24.	<i>Sitta castanea</i>	Chestnut-bellied Nut hatch	Common

Sources: Field survey & Bageshwar forest department.

**Table 3.25: Butterfly species recorded in the project area during pre-monsoon, 2019**

S. No.	Scientific Name	Local availability	IUCN Status
1.	<i>Pieris brassicae</i>	Common	NA
2.	<i>Pieris caniaidia</i>	Frequently	NA
3.	<i>Gonepteryx rhamni</i>	Common	NA
4.	<i>Colias fieldi</i>	Common	NA
5.	<i>Colias erate</i>	Common	NA
6.	<i>Lampides sp.</i>	Common	NA

Source: Field survey & Bageshwar forest department.

### 3.12 SOCIO-ECONOMIC ENVIRONMENT

Socio-Economic status of the population is an indicator for the development of the region. Any development project of any magnitude will have a bearing on the living conditions and on the economic base of population in particular and the region as a whole. Similarly, the proposed activities will have its share of socio-economic influence in the study area. The section delineates the overall appraisal of society relevant attributes. The baseline data collection of project on socioeconomic aspects in the study area has been done through the analysis of secondary data (Census 2011) available for the study area of 10 km radius around the project site. The information in the context was gathered on the following socio-economic parameters viz.

- Demographic profile
- Education levels
- Occupational Profile
- Cropping Pattern
- Other Socio-Economic Parameters.

### **3.12.1 Socio-Economic Impact Assessment**

Socio-Economic Impact Assessment (SEIA) refers to the systematic analysis of various social and economic characteristics of the human beings living in the geographical / study area around the proposed project location. SEIA is carried out separately but concurrently with Environment Impact Assessment (EIA) study. The SEIA focuses on the likely effects of the project on social and economic well-being of the community. The impact(s) may be direct or indirect, positive or negative. In this Chapter of the EIA Report an attempt has been made to assess the composite Socio-Economic Impact of the project.

#### **3.12.1.1 Steps taken to prepare the SEIA Report**

Various steps taken to prepare the SEIA report were as follows

- Literature review
- Identification of habitations in the study area with the help of google earth and toposheet
- Visit to project site
- Collection of secondary data
- Planning and designing of the field survey for collection of primary data
- Formulation of Data collection tools (Schedule/Questionnaire)
- Field testing of Schedule/Questionnaire through a pilot survey
- Briefing of field staff
- Scrutiny of filled-in-schedules
- Data processing and tabulation
- Data analysis and preparation of report.

#### **3.12.1.2 Approach**

Research approach plays an important role to decide suitable methodology. It helps to develop research design and increase the effectiveness of research study. In the present study inductive approach has been adopted, which is a bottom top approach. Under this approach first data is collected both from primary and secondary sources. After scrutiny, tables are generated in pre-designed formats. Subsequently, EIA/EMP report is prepared after detail analysis of data. The final report is prepared after incorporating the comments and suggestions of the client.

### **3.12.1.3 Objectives of SEIA**

The prime objective of the current study is to assess the likely impact of the project on socio-economic characteristics of people living in the study area. Further, it is to be gauged whether the impact would be direct or indirect and whether the said impact would be positive or negative. Lastly, it is to be comprehended if the impact is negative and how the same could be mitigated.

### **3.12.1.4 Scope**

The Scope of the study is as follows:

- a) Collection of baseline data of the study area.
- b) Collation of data, analyses and generation of tables.
- c) Comprehension of socio-economic status of the people living in the study area.
- d) Identification and inventory of probable impacts of the project on social and economic aspects in the study area.
- e) Assessment of the probable impacts of the project on the people living in the study area.
- f) Facilitation of sustainability of positive impact by recommending community development initiatives in the study area.
- g) Suggestion of mitigation measures in case of adverse impact.

### **3.12.2 Methodology**

For composite Socio-Economic Impact Assessment of projects, the consultant carries out systematic analysis of the various socio-economic characteristics, both in terms of quality and quantity. Accordingly, both qualitative and quantitative data was collected from secondary sources. The secondary data was collected from the published data / information of the Census Authority. Records of the state and district administration were also referred. For collection of primary data, a sample survey was conducted in the study area which spans a radius of 10 km from the periphery of the boundary of the project site. In each selected habitation, a specified number of representative households were selected for collection of information through face to face interviews with head of the household or any responsible member of the family.

#### **3.12.2.1 Census Survey**

To assess the likely impacts of the project, Census data (viz. Population Census Abstract and Amenities- 2011) of all the habitations identified were taken into consideration to prepare the data base. It is treated as a census survey because all habitations located in the area were considered for the collection of information. Sample Survey was conducted for substantiating of socio-economic data got through the Census. Further, in selected habitation a household survey was conducted by drawing representative sample of households. Since, collection of information from all the households in a habitation is time consuming and expensive, the sample survey approach was adopted for collection of information from the selection of villages and households in the village(s) / town(s).

### 3.12.3 Bageshwar District (Project District)

Bageshwar is a town and a municipal board in Bageshwar district in the state of Uttarakhand, India. It is located at a distance of 470 km from the National Capital New Delhi and 332 km from the State Capital Dehradun. Bageshwar is known for its scenic beauty, Glaciers, Rivers and Temples. It is also the administrative headquarters of Bageshwar district. Situated on the confluence of Sarju and Gomati rivers, Bageshwar is surrounded by the mountains of Bhileshwar and Nileshwar to its east and west and by the Suraj Kund in the north and Agni Kund in the south. Bageshwar was a major trade mart between Tibet and Kumaun, and was frequented by the Bhotia traders, who bartered Tibetan wares, wool, salt and Borax in exchange for Carpets and other local produces in Bageshwar.

### 3.12.4 Population Profile

The description of the project district is presented in **Table 3.26**. According to the 2011 census of India, Bageshwar has a population of 2,59,898.

**Table 3.26: Demographic details of Project District and Tehsil**

S.No.	District/Tehsil	Households	Population					
			Total	Male	%	Female	%	Sex ratio
1.	Bageshwar	57,941	2,59,898	1,24,326	47.84	1,35,572	52.16	1090

Source: Census of India, 2011

### 3.12.5 Caste Wise Distribution of Population

**Table 3.27** provides detailed information about the SC, ST population in Bageshwar district as well as on the Project area. The total SC population in Bageshwar district is 72,061 which is 27.72% of the total population, while ST population is 1,982, which is 0.76% of the total population.

**Table 3.27: Caste wise distribution of population**

Sl. No.	District/Project Area	Schedule Caste (SC)		Schedule Tribes (ST)	
		Total	% of SC	Total	% of ST
1	Bageshwar	72,061	27.72	1,982	0.76

Source: Census of India, 2011

### 3.12.6 Literacy Rate

**District Bageshwar:** The literate population in Bageshwar district is 1,79,483, out of which male & female are 97,546 and 81,937 respectively. The male literates represent 54.35% while female represent 45.65% of the total population.

The details of literacy rate and literate people in Bageshwar tehsil and district are provided in **Table 3.28**.

**Table 3.28: Literacy Rate of Project District and Project Area**

S. No	District/Project Area	Number of Literate			Literacy Rate %	
		Total	Male	Female	Male	Female
1	Bageshwar	1,79,483	97,546	81,937	54.35	45.65

Source: Census of India, 2011

### 3.12.7 Ethnographic Profile of Project State and Project District

The various Scheduled Castes and the Scheduled Tribes in Project district area are Agariya, Dom, Dhobi, Dhangar and Bhotiya, Jaunsari, Tharu etc.

The list containing the names of the Scheduled Castes and the Scheduled Tribes applicable for the Census of India 2011 in the Project State are given below **Table 3.29 (a & b)**:

**Table 3.29 (a): List of Schedule Caste in the Project District**

S.NO	Name of SC	S.NO	Name of SC
1.	Agariya	34.	Patari
2.	Badhik	35.	Saharya
3.	Badi	36.	Dhangar
4.	Baheliya	37.	Dhanuk
5.	Baiga	38.	Dharkar
6.	Baiswar	39.	Dhobi
7.	Bajaniya	40.	Dom
8.	Bajgi	41.	Domar
9.	Balahar	42.	Dusadh
10.	Balai	43.	Gharami
11.	Balmiki	44.	Ghasiya
12.	Bangali	45.	Gond
13.	Banmanus	46.	Gual
14.	Bansphor	47.	Habura
15.	Barwar	48.	Hari
16.	Basor	49.	Hela
17.	Bawariya	50.	Kalabaz
18.	Beldar	51.	Kanjar
19.	Beriya	52.	Kapariya
20.	Bhantu	53.	Karwal
21.	Bhuiya	54.	Khairaha
22.	Bhuyiar	55.	Kharwar (excluding banbasi)
23.	Boria	56.	Khatik
24.	Chamar, Dhusia, Jhusia, Jatawa	57.	Khorot
25.	Chero	58.	Kol
26.	Dabgar	59.	Kori
27.	Majhwar	60.	Korwa
28.	Mazhabi	61.	Lalbegi
29.	Musahar	62.	Sanaurhiya
30.	Nat	63.	Sansiya
31.	Pankha	64.	Shilpkar
32.	Parahiya	65.	Turaiha
33.	Pasi, Tarmali		

Source: Census of India, 2011

**Table 3.29 (b): List of Schedule Tribe in the Project District**

S.NO	Name of ST
1.	Bhotia
2.	Buksa
3.	Jaunsari
4.	Raji
5.	Tharu

Source: Census of India, 2011

### 3.12.8 Religion and Culture

Bageshwar is Hindu majority city with approximately 99.1% of district population following Hinduism as their religion. Muslim is second most popular religion in district with approximately 0.6 % following it. In Bageshwar district, Christianity is followed by 0.2 %. **Table 3.30** shows the Religious wise distribution of Population of Bageshwar District.

**Table 3.30: Religion wise distribution of Population of Bageshwar District**

Description	Total	Percentage
Hindu	257509	99.1
Muslims	1440	0.6
Christian	397	0.2
Sikh	46	0.0
Buddhist	102	0.0
Jain	7	0.0
Others	16	0.0
Not Stated	381	0.2

Source: Census of India, 2011

### 3.12.9 Economic Structure

The economy of the district is predominantly based on agriculture, as maximum per cent of the population resides in rural areas and their main occupation is agriculture. Kharif and Rabi are the two principal harvests grown in the district.

The **Table 3.31** given below describes two sections of workers main and marginal with a third category which is non-worker; the total number of workers at district level is 1,23,638 which is 47.57 percent of total population out of which main workers are 63.16 percent and marginal workers have a share of 36.84 percent while rest nearly 52.43 percent workers are non-workers.

**Table 3.31: Main Workers, Marginal Workers and Non-workers of Project District and Project Area**

Sl. No.	District/ Project Area	Total workers	Total worker %	Main workers	Main workers %	Marginal workers	Marginal workers %	Non-workers	Non-workers %
1.	Bageshwar	1,23,638	47.57	78,085	63.16	45,553	36.84	1,36,260	52.43

Source: Census of India, 2011

### 3.12.10 List of Villages falling in the study area

The list of villages falling in the study area has been shown in **Table 3.32**.

**Table 3.32: List of villages falling in the study Area**

S. No.	Villages	Direction	Aerial Distance from the proposed mine site
1)	Bhatni Kot	W	0.58
2)	Bang Dungariya	SW	0.88
3)	Sukyari	S	1.44
4)	Bilkhet	S	1.80
5)	Kwairali	SW	2.26
6)	Burghuna	S	2.82

<b>Mining of Soapstone from Lease Area (7.784 Ha.) at Village- Karuli, Tehsil &amp; District - Bageshwar, Uttarakhand.</b>	<b>Final EIA/EMP</b>
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7)	Mankot	S	3.74
8)	Gargaon	SW	3.10
9)	Kunara	SW	4.29
10)	Basai	S	5.14
11)	Baset	SE	4.94
12)	Suneri	SE	4.95
13)	Bantoli	SE	5.59
14)	Nayal	SE	5.57
15)	Tunera	SW	5.97
16)	Chata	S	6.60
17)	Dhunga	SW	6.92
18)	Kunkhet	SE	7.46
19)	Bhiri	S	8.13
20)	Arara	SW	8.15
21)	Matyoli	S	9.84
22)	Pagana	S	9.56
23)	Bhatgar	SW	9.39
24)	Bihargaon	SW	9.25
25)	Ghiroli	W	4.35
26)	Joshi Gaon	SW	4.23
27)	Falthiya	SW	4.54
28)	Chhati	SW	5.06
29)	Bageshwar	SW	6.40
30)	Village Tyunara	SW	7.50
31)	Bilona Sera	SW	7.94
32)	Pauri	SW	8.38
33)	Pauri Band	SW	9.40
34)	Kafoli	SW	9.17
35)	Borgaon	SW	9.48
36)	Bijori	SW	9.19
37)	Belta	SE	9.45
38)	Khali	SW	8.38
39)	Kohli Village	SW	8.42
40)	Matiyoli	SW	5.43
41)	Namtichetabagar	SW	5.73
42)	Bari Khalsa	SW	6.47
43)	Kaphalket	SW	6.75
44)	Adoli	SW	5.75
45)	Chirang	NW	1.35
46)	Gajali	N	0.91
47)	Kaulag	NW	1.79
48)	Khuldori	NW	2.55
49)	Kukrauli	NW	3.72
50)	Manikhet	NW	4.65
51)	Kukragar	NW	6.29
52)	Chamerta	NW	8.40
53)	Tulyari	NW	9.49
54)	Harwar	NW	8.26
55)	Syaldoba	NW	5.51
56)	Gwar	NW	4.90
57)	Anarsa	NW	4.64
58)	Sima	N	4.22

<b>Mining of Soapstone from Lease Area (7.784 Ha.) at Village- Karuli, Tehsil &amp; District - Bageshwar, Uttarakhand.</b>	<b>Final EIA/EMP</b>
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59)	Harsila	NW	4.64
60)	Chalkana	N	5.96
61)	Kapholi	NW	6.75
62)	Nankanyalikot	NW	8.10
63)	Pundra Pali	NW	7.65
64)	Purkot	NW	6.91
65)	Falnate	NW	6.32
66)	Chachai	NW	7.64
67)	Jakh	NW	9.36
68)	Devalchaura	NW	3.96
69)	Dungari	E	2.07
70)	Chaura	NE	2.94
71)	Chhatikhet	E	4.52
72)	Rithayat	E	5.98
73)	Naughar	E	7.54
74)	Moudiyar	E	8.88
75)	Gurgucha Upadhya	NE	4.55
76)	Papu	NE	5.06
77)	Gapani	NE	3.27
78)	Kamketpani	NE	4.29
79)	Palen	NE	5.93
80)	Batal Gaon	NE	5.39
81)	Pakar	NE	7.10
82)	Fusera	NE	7.52
83)	Gwatoli	NE	6.66
84)	Nari	NE	7.72
85)	Sundil	NE	9.07
86)	Kande Thapliya	NE	8.28
87)	Baskunda	NE	9.32
88)	Ukhal Dhar	NE	6.23
89)	Rainthal	NE	6.43
90)	Khadgera	NE	7.37
91)	Ason	NE	8.89
92)	Utaraura	NE	8.53
93)	Poling	NE	7.76
94)	Jankuri	NE	7.60
95)	Chhuriya Panaura	NE	8.78
96)	Gainar	NE	9.41
97)	Reetha Bagar	NE	7.26
98)	Lili	NE	8.55
99)	Karuli	SE	0.54
100)	Simtola	SE	1.30
101)	Gairar	SE	1.65
102)	Khuna	SE	1.86
103)	Maswari	SE	2.15
104)	Sela	SE	2.43
105)	Era Gunth	SE	3.05
106)	Ujera	SE	3.48
107)	Jol Gaon	SE	3.92
108)	Dewali Gunth	SE	4.37
109)	Dhigartola	SE	5.03
110)	Jaltha Kot	SE	6.25

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111)	Dhapoli	SE	7.17
112)	Kwairali	SE	8.17
113)	Jethai	SE	9.50
114)	Alkanaya	SE	8.14
115)	Lohar Khet	SE	7.91
116)	Menhara Gaon	SE	8.68
117)	Pang Chora	SE	9.11
118)	Bhandar	SE	9.39
119)	Jogswar	SE	8.25
120)	Bijet	Se	8.36
121)	Musoti Chakjosh	SE	7.12
122)	Kande Kanyal	SE	7.93
123)	Dharari	SE	8.36
124)	Naghar Majila	SE	9.13
125)	Jagthali Gunth	SE	9.61
126)	Delmel	SE	8.90
127)	Mithun Kot	SE	9.04
128)	Pokheri	SE	9.76
129)	Hathraiya	SE	8.74
130)	Bijepur	SE	9.15
131)	Kunera	SE	7.32
132)	Bhanker Pant	SE	7.05
133)	Majbe	SE	6.33
134)	Bakhet	SE	6.81
135)	Dofar Laggakakrt	SE	6.16
136)	Rajoli	SE	8.06
137)	Dhunga Pant	SE	9.30
138)	Banstoli	SE	8.49
139)	Dyorakh	SE	7.73
140)	Bhatgar	SE	7.14
141)	Rankanda	SE	6.37
142)	Painsiya	SE	6.10
143)	Choni	SE	5.63
144)	Thaklan	SE	4.49
145)	Bheru	SE	4.08
146)	Bhatora	SE	3.59
147)	Khunoli	SE	4.17
148)	Girari	SE	2.80
149)	Methara	SE	2.44
150)	Jal Gaon	SE	3.91
151)	Nagha Sahu	SE	5.07
152)	Bahliya Mafi	SE	5.79

### 3.13 SOCIO-ECONOMIC IMPACT ASSESSMENT

#### 3.13.1 Impact on Population Composition

No impact is envisaged on the population composition of the study area as there will be no in-migration or out-migration of villagers. Those who will be engaged in Soapstone mining will be recruited locally.

### **3.13.2 Impact on Employment**

For extraction of Soapstone the project proponent has ensured that only local people will be recruited for the operation of the upcoming mine at village Karuli. The exact number of people to be recruited will depend upon quantity of the minerals to be extracted over a period of time. In the initial period the number of such people will be less but gradually it will go up when the production will increase in a phased manner. The project proponent has planned to recruit 126 local peoples for the operation of the upcoming mine. Though marginally, the dependency rate in the study area will decline by one percent with the commencement of the above soapstone mine. This is a positive impact of the project.

### **3.13.3 Increased Supply of Soapstone**

Soapstone Powder is an important industrial mineral. The soapstone powder should be milky white, free from impurities and soapy feel. It is widely used as basic material in Cosmetic and Paper industry. It is an important raw material in the manufacture of talc in the cosmetic industry. It is also used in rubber, paper plastic and other allied industries. There is always a good demand for soapstone for industrial uses. With the commencement of the proposed mining project at village Karuli, the supply of soapstone powder in the domestic market will increase by about 30,000 per annum (maximum). This is a direct and positive impact of the upcoming mining project.

### **3.13.4 Impact on Approach Roads**

Movement of trucks and other vehicles to and fro the quarry site is expected to increase substantially, when the operation of the mine will commence. The existing roads connecting the quarry with the national and state highways are mud roads and they are narrow. There will be mud slide and traffic bottle neck if these roads are not widened and their conditions are not improved by making them paved roads. Hence, there is a wide scope for road development in the area. This is a positive impact of the upcoming mining project. The proposed mining will lead to 62 nos of PCUs in the approach road; hence there shall be negligible impact on the approach road due to the proposed mining.

### **3.13.5 Impact on Law & Order**

Since the workers will attend to their duties from their residence and return to their homes after the day's work is over there will be no law & order problem as such. On the other hand, if the workers are migrants and live in shanties closed to the mining area it may create law & order problem and ethnic issues. To meet any untoward incident one police post may be set up close to the project area.

### **3.13.6 Impact on Vulnerable Groups of People**

No impact is envisaged on vulnerable groups of people that include hospital patients, children, pregnant women and elderly persons. There will be no re-habilitation and resettlement issues that may adversely affect the people living adjoining the mine lease area. The social welfare activities to be taken up by the mine owner will definitely make positive impact on the living conditions of people including those who fall under vulnerable groups.

### **3.13.7 Income to Government**

The proposed soapstone mining at village Karuli will bring income for the state government in the form of royalty, dead rent and taxes. This is a positive impact of the project.

Extraction of soapstone may pose serious health risks if it is not handled carefully. It can affect the body adversely if it is inhaled or if it comes in contact with eyes or skin. Exposure to soapstone may damage the lungs. Shortness of breath, cough, enlargement of the ends of the fingers and heart failure may occur due to continuous exposure to soapstone dust. There are reports of cancer cases among the workers engaged in mining of soapstone. Hence, preventive measures should be taken to protect oneself from the exposure of soapstone, while working in a soapstone mine. This is a negative impact of soapstone mining. The project proponent will undertake the following preventive measures, in order to protect the workers from the exposure of soapstone:

#### **1) Consult to Physician**

A physician will be consulted if anyone develops any sign or symptom caused due to exposure to soapstone.

#### **2) Regular medical surveillances**

Regular medical surveillances of the workers will be made. In case anyone get adversely affected due to soapstone mining the miner will be medically examined and provided medical assistances regularly. They will also be medically checked annually.

#### **3) Provision of First Aid at mining site**

Extraction of soap stones, from the mining site may pose serious health risks due to dust. To meet any emergency during extraction of the minerals from the mining site and subsequent loading in the transport vehicles, provision for First Aid will be made by the project proponent. Before the affected person is removed to a doctor or health institution for necessary medical aid, the miner will be provided with First Aid.

#### **4) Tie up with the nearest PHC for medical help**

At present there are no adequate health facilities available in the mining village. To meet the medical needs of the mine workers, tie-ups with nearest hospital or Primary Health Center (PHC) will be made. Few beds will exclusively be reserved for the mine workers in the above health institutions. This will ensure timely medical aid to the affected persons.

#### **5) Supply of Masks and Gloves**

The mine workers are subject to respiratory diseases, muscular-skeletal and gastro-intestinal disorders and skin diseases. For protection from dust it will be made compulsory for all mine workers to wear masks and gloves while working in the mines.

**6) Health Camps**

Health Camps will be organized at regular intervals preferably in every quarter. Further, free medical facilities will be made available to the workers and their family members.

**7) Administration of Anti-venom injections**

Provision of Anti-venom therapy will be made available at the nearest health institution. Anti-venom injections will be administered to the mine workers in case of snake, spider and insect bites, while working in the mines.

**8) Special telephone number**

A special telephone number will be available to the mine workers. In case of emergency the miners can dial the above number for medical assistances. Vehicle will be provided to the patients in short duration for shifting to the health institution.

**9) Special Group Insurance Scheme**

All the mine workers will be covered under a Group Insurance Scheme of LIC or any other Insurance company.

**3.14 CONCLUSION**

The implementation of the soapstone mining project at village Karuli, Tehsil & District Bageshwar, Uttarakhand will generate both direct and indirect employment. It will also promote legally valid mining in the area and bring income to the state exchequer. It is expected that intending entrepreneurs will venture to set up soapstone based industrial units in the near future making the area a mixed society, dependent on industry, trade and business. At present agriculture is the main occupation of the people as eighty percent of the total working population depends on it. With the implementation of the proposed mining project the occupational pattern of the people in the area may change making more people engaged in industrial and business activities rather in agriculture. Thus there will be a gradual shifting of population from agricultural sector to mining and industry. Due to industrialization of the area, employment opportunities will further increase.

The study area is still lacking in infrastructure. It is expected that the same will improve to a great extent due to proposed mining project and associated industrial and business activities. It is therefore suggested that the commencement of the mining operation at village Karuli may be taken up on priority basis as employment opportunities are intended for the local aspirant.

**CHAPTER 4: ANTICIPATED  
ENVIRONMENTAL IMPACTS & MITIGATION  
MEASURES**

## CHAPTER 4: ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

### 4.1 DETAILS OF THE INVESTIGATED ENVIRONMENTAL IMPACTS

This chapter provides a brief overview of the potential impacts on various environmental components due to the proposed opencast mining activities.

The opencast mining operations in general cause environmental degradation and if adequate control measures are not taken to prevent/mitigate the adverse environmental impacts, these operations may cause irreversible damage to the eco-system. The environmental parameters most commonly affected by mining activities are:

- Topography and drainage;
- Air quality including Climate
- Noise levels and ground vibrations;
- Water resources and quality;
- Land use Pattern;
- Soil quality;
- Flora and Fauna;
- Socio-Economic conditions; and
- Occupational Health.

Various environmental impacts, which have been identified due to the mining activities, are discussed in the following Chapters and mitigation measures are suggested.

#### 4.1.1 Impact on Drainage

Water table in this area is very deep ranging from 75 to 90m. No water problem is envisaged in the working pits since the rain water will be coursed through the garland drain to be provided on the upper side of the mine lease area and drainage on the benches provided on the hillside by slight slopping the benches. The only source of the water shall be the rainwater which shall flow along the natural slopes. The lesse have provided five check dams to course the water and control the flow of the scree material into the nala. The check dams have been proposed to restrict scree material from going to Nala to check further water pollution. There are no water bodies within the lease area. However there are seasonal tributaries or stream inside the leasehold areas; however, rain water flows down to southern slopes towards the valley causing no problem to the habitat. Thus there is no impact on drainage pattern of the area.

### 4.2 WATER ENVIRONMENT

#### 4.2.1 Impact on Water Resources

##### *Surface Water Resources*

The topography of the area will not be largely changed in view of the proposed concurrent reclamation. During the mining activity period, there is a possibility of mixing of freshly disturbed

material with the rain water. To take care of such happenings, retaining walls have been provided along the backfilled pits and along the soil and interburden dumps.

### **Groundwater Resources**

The water table in hills is usually very deep and does not have any relevance with mining activities. However, concurrent restoration to original topography will not disturb the percolating water. The details of the site elevation and working depth are shown in **Table 4.1**.

**Table-4.1 Site Elevation and Working Depth Details**

<b>Particulars</b>	<b>Details</b>
Elevation	1109 m to 1152 AMSL
Ground Water Table	1250 mRL
Ultimate working depth	9m

### **4.2.2 Impact on Water Quality**

Mining activities cause adverse impacts due to mine drainage, siltation due to storm water and contaminated water from workshops and domestic sewage water. Various components have been identified for study of impact of the mine operations.

#### **➤ Impact on Surface Water Quality**

The impact on water quality will be confined to increased suspended solids during rain. There are no water bodies within the lease area. There are no water bodies within the lease area. However there are seasonal tributaries or stream inside the leasehold areas; however, rain water flows down to southern slopes towards the valley causing no problem to the habitat. Before the commencement of rainy season, all the mined out pit shall be prematurely backfilled so chances of accumulation of rainy water in the mining pit shall be nil during first five years. Pungar river is approximately 500 m away from the mine lease area and there will be no impact on the river due to the proposed project.

The interburden to be generated will be temporary on nature & used for the purpose of backfilling each year before commencement of monsoon so that rain water will not accumulated in the mined out pit. It is however water sprinkling on the foot track shall be carried out during summer month to suppress the dust. Retaining wall shall be proposed along the slope of dump for its stabilization. The course of drainage shall not be disturbed due to mining & allied activities.

The topography of the area will not be largely changed in view of the proposed concurrent reclamation. During the mining activity period, there is a possibility of mixing of freshly disturbed material with the rain water. To take care of such happenings, retaining walls have been provided along the backfilled pits and toe walls along the existing interburden dumps. Analysis results of surface water samples collected from rivers in the buffer zone indicate that the pH, total dissolved solids (TDS) are well below the prescribed limits.

No adverse impact was noticed. The mine water from sump will be used for water sprinkling and plantation purpose posing positive impact in buffer zone.

➤ **Impact on Ground Water Quality**

Mine working will not go beyond 1234.8 m RL & depth of pit during next five years shall be 9m & water table will not be intersected by mining operations.

**4.2.3 Wastewater Generation, Treatment & Disposal**

The total water consumption in the Proposed Soapstone Mine shall be about 5 KLD. The water is used in the following purposes.

- For dust suppression
- For domestic consumption
- For greenbelt development

It is proposed to obtain water for drinking and operations from water sources under Gram *Panchayat* of Pacahr. There will no settlement near the site as the workers will be hired from nearby villages so no significant liquid effluent will be generated.

**4.2.3.1 Measures for Minimizing Adverse Impacts**

Seasonal drainage exists near to the project site. The mining is being carried in hilly region. The problem of ground water pumping will not arise. Rain water will not accumulate in the mining pit & it will be channelized along the slopes. The mining work will usually be confined within gullet driven from north-south & a ledge of about one meter height will be kept on the outer edge so that in discrete water flow will be avoided. The interburden and top soil will be used in backfilling. Further no significant impact on water quality is anticipated as material exposed will be low grade magnesite & is very feebly react with water that too when water becomes acidic. Even of reaction takes place it gives arise to increased temporary hardness of water. Water is being supplied from the spring. No hydrological studies have been carried out in the area.

➤ **Surface Water**

- There is a possibility of mixing of freshly disturbed material with the rain water. To take care of such happenings, retaining walls have been provided along the backfilled pits and along the soil and interburden dumps.
- Monitoring of water will be carried out periodically. Water analysis will be carried out seasonally.

➤ **Ground Water Pollution**

- The domestic sewage from the canteen and toilets will be routed to septic tanks.
- Regular monitoring of water levels and quality in the existing open wells and bore wells in the vicinity will be carried out. If found necessary, additional observation wells will be sunk for monitoring the water levels and quality around the mine representing both upstream and downstream conditions.

### 4.3 IMPACT ON LAND USE

#### ➤ Land use Pattern in Core Zone

The proposed opencast mine will result in change of land use pattern of the ML area. The land degradation is expected during mining activities like excavation, overburden dumping, soil extraction etc. Land requirement for the project has been assessed considering functional needs.

Various components of land environment have been identified for study of impact of the mining operations. Details of the same are given below:

#### **Impact on land use & reclamation of mined out areas**

Opencast mining activities may alter the landscape of the lease area and also cause some disturbance to the surface features of the surrounding areas. Mining will be done after leaving 7.5 m safety barrier.

Plantation will be developed in consultation with district administration/ local authority, wherever feasible.

The Existing land use pattern is agricultural land. The Existing land use pattern indicating the area already degraded due to quarrying/pitting dumping, roads, processing plants, workshop, township etc. in a tabular form is shown in **Table 4.2**.

**Table 4.2: Existing land use pattern**

Name of land use	Forest land (ha)	Crop land (ha)	Grazing land (ha)	Waste land (ha)	Revenue land (ha)	Total (ha)
a) Pit & Quarries	-	2.301	-	-	-	2.301
b) Dumps of ore waste & Overburden	-	0.111	-	-	-	0.111
c) Mineral stack	-	0.005	-	-	-	0.005
d) Infrastructure including of office, workshop, plants & road	-	0.092	-	-	-	0.092
e) Township	-	-	-	-	-	-
f) Others	-		-	-	-	
(i) Barren land						
(ii) Crop land		5.275				5.275
<b>Total area</b>	-	<b>7.784</b>	-	-	-	<b>7.784</b>
(g) Area backfilled by mine owners	-	2.141	-	-	-	2.141
(h) Area afforested by mine owners	-	-	-	-	Nil	

**Source: Mine plan**

The impact on land form or physiography will be land use on the hilly terrain will undergo radical changes due to the open cast mining. During the next five years mining, 2.301 ha land will be degraded due to mining & allied activities. The breakup of the land to be affected during the five years and end of conceptual period of due to mining operation is shown in **Table 4.3**:

**Table 4.3: Breakup of the land to be affected during the five years and end of conceptual period of due to mining operation**

S.No.	Description	Area	Reclaimed & Rehabilitated till end of last MP/MS period	To be Reclaimed & Rehabilitated till end of present plan/scheme period	Remarks Area to be reclaimed by the end of lease
1.	Mining (Quarry)	2.301	2.301	2.301	5.950
2.	Waste Dump	0.111	0.111	0.111	0.150
3.	Office Infrastructure	0.009	0.009	0.009	0.030
4.	Processing plant	-	-	-	-
5.	Mineral Stack/Processing yard	0.005	0.005	0.005	0.025
6.	Sub grade mineral stacks	0.006	0.006	0.006	0.006
7.	Roads	0.092	0.092	0.092	0.100
8.	Water course/pond/reservoir	-	-	-	-
9.	Unutilized area	5.260	5.260	5.260	1.523
	<b>Total</b>	<b>7.784</b>	<b>7.784</b>	<b>7.784</b>	<b>7.784</b>

**Note:** All the quantities of top soil & interburden material to be generated by the end of plan/conceptual period shall be used for the purpose of reclamation over the mined unit land. Therefore no proposal for separate stacking of top soil and interburden dump has been proposed.

**(A) Mining:**

	Crop/Nap land (ha)
<b>Mines out land</b>	
(a) (i) Area already broken up	-
(ii) Area already backfilled	-
(iii) Area already reclaimed	-
(b) (i) Additional area proposed to be broken up during first 5 year	2.301
(ii) Additional area proposed to be backfilled	2.141
iii) Additional area proposed to be reclaimed	2.301

**(B) Dump:**

	Crop/Nap land (ha)
<b>Dump-Soil &amp; Interburden (IB)</b>	
(i) Area occupied by dump	Soil- 0.029 IB- 0.027
(ii) Additional area to be covered by dump	-
(iii) Dump area to be covered by protective measures	-

**(C) Plantation:**

C. Plantation	Revenue/Benap land (ha.)	Crop/Nap land (ha)
(i) Area already occupied	-	-
(ii) Area proposed to be covered under plantation in next five years	-	0.338

**Solid waste generation and management**

**Disposal of Waste:**

The top soil will be removed with the help of JCB machine, dozer, shovels, pickaxe, spade & crowbar and stacked separately. The soil intermixed with fragments and interburden rejects are low grade magnesite. Part of these rejects will be utilized in construction and maintenance of retaining walls, parapet walls, check dams and other construction works. About 15257 cum of rejects will be used for this task, and in dump yard remaining rejects about 61027 cum will be backfilled.

The quantity of top soil, interburden & mineral rejects to be generated in each year is shown in **Table 4.4:**

**Table 4.4: Details of top soil, interburden & mineral rejects**

Year	Top Soil (cum)	Interburden (cum)	Mineral Rejects (cum)
I	5107	18444	23551
II	3916	19585	23501
III	3841	17312	21153
IV	4318	16162	20480
V	6191	31968	38159
<b>Total</b>	<b>23373</b>	<b>103471</b>	<b>126844</b>

**Mitigation measures**

- Access roads from public roads will be aligned in such a way that it would cause least damage.
- The banks cut for ramp will also be restored at the closing of mine during monsoon.
- Vegetation development is proposed along the lease area as restoration work.
- Plantation is proposed along the road sides, civic amenities in consultation with local/ govt. authorities. While selecting the plant species, preference will be given for planting native species of the area.

**Storage and preservation of top soil:**

The soil will be removed with the help of JCB machine, dozer, shovels, pickaxe, spade & crowbar and loaded manually to stack on the dump yard. Stacking will commence at RL 1215m to RL 1221m in first & second year, RL 1140m to RL 1143m in third year, RL 1119m to RL

1122m in fourth & RL1125m to RL 1128m in fifth year. The spread of stacks will be undertaken through mechanically and manually both & average dump height kept 1.5m. In first year 146 m<sup>2</sup> areas was earmarked for stacking of soil with 1.5m height. In second area it is 147 m<sup>2</sup> areas. Similarly in third, fourth & in fifth year 146 m<sup>2</sup>, 145 m<sup>2</sup> and 146 m<sup>2</sup> area have been respectively earmarked for stacking of soil with 1.5m average height. The year wise spread of stack is shown in **Table 4.5**.

**Table 4.5: Details of Soil stack (year wise)**

<b>Soil Stack</b>	<b>I year</b>	<b>II year</b>	<b>III year</b>	<b>IV year</b>	<b>V year</b>
Length (m)	19.51	19.58	19.51	19.40	19.51
Width (m)	7.5	7.5	7.5	7.5	7.5
Average height (m)	1.5	1.5	1.5	1.5	1.5
Angle of repose (deg)	36	36	36	36	36

#### **Proposal for reclamation of land affected by mining activities:**

The mining will commence from the higher levels and will advance towards lower levels. Intermittent backfilling will commence from the higher levels and subsequently advance towards the lower elevation so that terraced agriculture fields would undertake in such a manner that original land use will be restored i.e. before the onset of monsoon will be handed over to cultivators for cultivation. The final backfilling will be started once the ultimate benches are formed and pit reaches the optimum economic depth. All recovery of the mineral will be of the saleable grade. The quantum of development and mineral to overburden soil and interburden in the pit is shown in **Table 4.6**.

**Table 4.6: Quantum of development and mineral to overburden soil and interburden in the pit**

<b>Year</b>	<b>Overburden Soil (cum)</b>	<b>ROM (Tonnes)</b>	<b>Interburden (cum)</b>	<b>Stripping ratio</b>
<b>I</b>	5107	28000	18444	1:0.84
<b>II</b>	3916	29000	19585	1:0.81
<b>III</b>	3841	30000	17312	1:0.71
<b>IV</b>	4318	28000	16162	1:0.73
<b>V</b>	6191	29000	31968	1:1.32
<b>Total</b>	<b>23373</b>	<b>144000</b>	<b>103471</b>	

#### **4.4 IMPACT ON AIR ENVIRONMENT**

##### **4.4.1 Change in Ambient air and GLC**

The air pollution impact of excavation in ordinary earth and boulders and rock is directly dependent upon construction methodology, annual rate of excavation, mode of transport within the construction site, mode of screening and method of crushing. The air pollution sources at the proposed project site can be broadly classified into three categories, viz. area source, line source and instantaneous point source.

Excavation by various activities in project area is construed as an area source which includes excavation pit(s) and activities happening in the excavation area like digging, dozing, hauling

and loading/unloading. The dust emission from these areas will be fugitive in nature. The excavator operations, loading/unloading operations will also cause dust emission though it will be confined to the area of operation of the machinery. The gaseous emission from their operation shall be minimal and limited within the project.

Transportation of excavated material from the project site to dumping sites area categorized as line source. Since the dumper movement on haul road will be within the project area, no adverse impact shall be felt in the settlement area.

#### 4.4.1.1 Dust Dispersion Modeling for Excavation Operation

In the present study, United States Environmental Protection Agency (USEPA-42 series) approved mathematical equations have been used to predict concentrations for different operations in project including the material transportation. To predict the particulate emissions, Envitrans AERMODCloud. (Air Dispersion Modeling Software) an interface based on ISCST3 – was used to predict changes in air quality i.e., maximum ground level concentration (GLC's) of Particulate Matter. Short term model options were opted for uniform emissions rates. The concentration of other gaseous pollutants i.e. SO<sub>2</sub> and Nox was found to be much lower than the threshold limit (80 µg/m<sup>3</sup>), the air modeling was restricted to determination of PM<sub>10</sub> and PM<sub>2.5</sub> in the present case. The emission factors adopted for various project operations are mentioned below:

Emission Factor for Excavation and Material Loading/unloading

For excavation and material handling the emission factor for PM<sub>10</sub> has been adopted as per USEPA – 42 series.

For Dozing Operation:

$$EF_{PM_{10}} \text{ (kg/hr)} = 0.34 \times s^{1.5}(\%) / M^{1.4}(\%)$$

Where,

EF<sub>PM<sub>10</sub></sub> (kg/hr) = emission factor in kg/hr

S = silt contents in percentage by weight

M = moisture content in percentage by weight

For Material Loading/unloading:

$$EF_{PM_{10}} \text{ (kg/hr)} = 0.34 [0.119 / M^{0.9}]$$

Where,

EF<sub>PM<sub>10</sub></sub> (kg/hr) = emission factor in kg/ton

M = moisture content in percentage by weight.

Emission Factor for Material Haulage within Project:

The emission rate is dependent on several factors which include soil properties, climatic conditions, vehicular traffic, wind forces and machinery operation. The Empirical equation for calculation of emission rate is as under.

$$E = k^{1.7} \cdot (s/12)^{0.7} \cdot (S/48)^{0.7} \cdot (W/2.7)^{0.7} \cdot (w/4)^{0.5} \cdot (365-p/365) \text{ g/VKT}$$

Where,

E=Emission Rate

K = Particle size multiplier

s=Silt Content of the Road surface material

S= Mean Vehicle Speed (km/hr)

W=Mean Vehicle Weight (tons)

w=Mean number of wheels

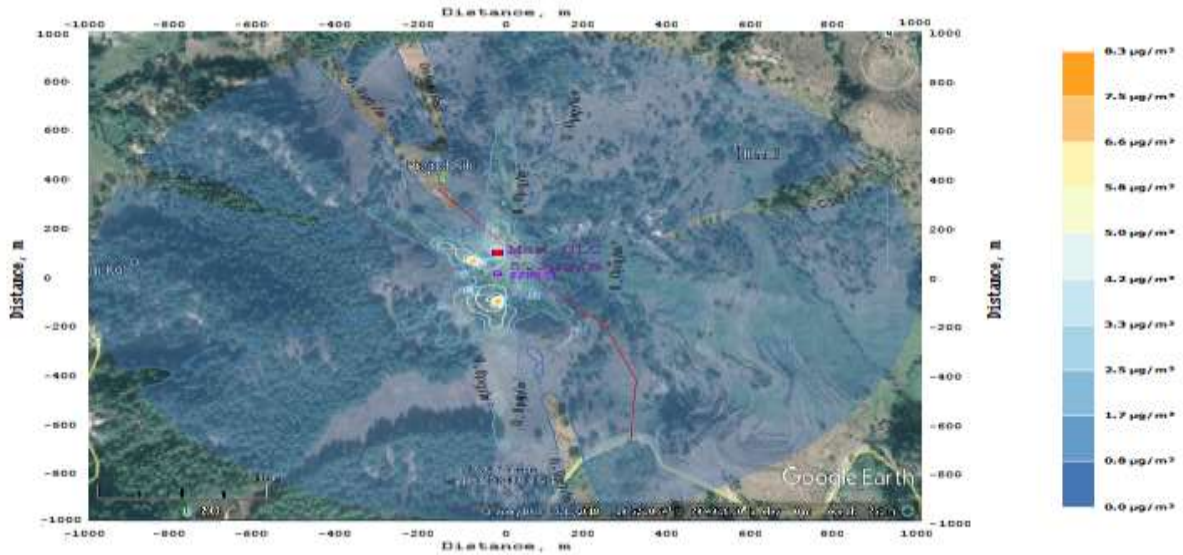
p= Number of days with at least 0.254mm of precipitation per year

**Note: The emission factor for PM<sub>2.5</sub> has been considered 60% of PM<sub>10</sub>.**

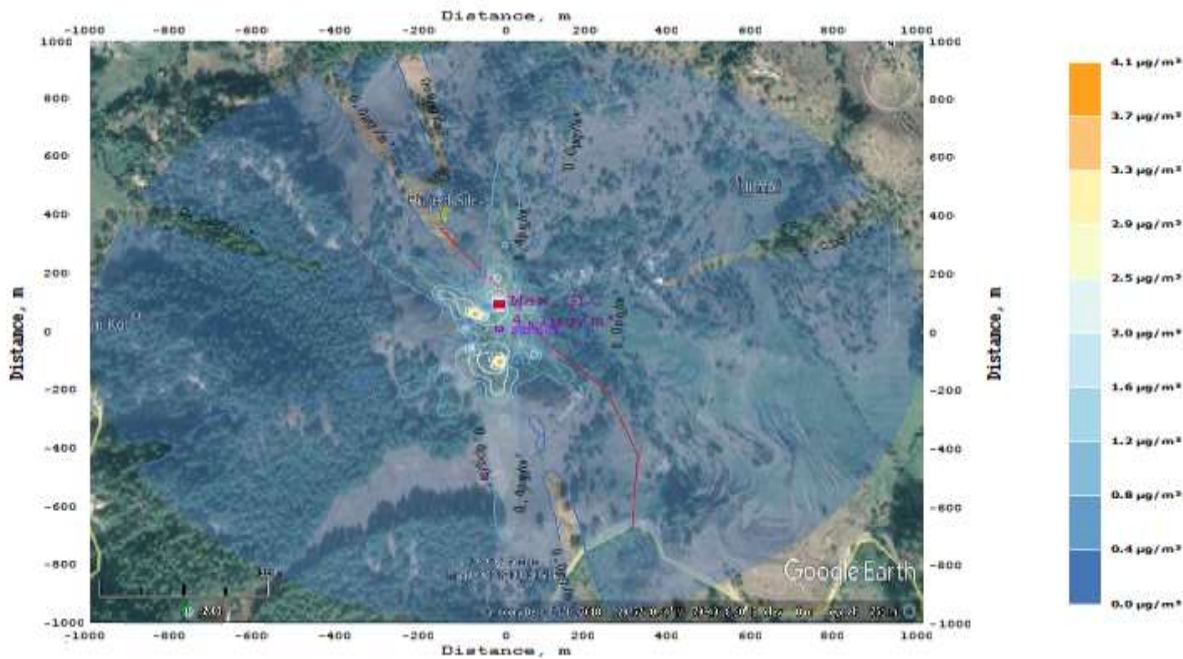
The Isopleths developed are shown in **Figure 4.1 (a)** and **Figure 4.1 (b)** for **PM<sub>10</sub>** and **PM<sub>2.5</sub>** respectively. The maximum GLC due to excavation, loading & unloading activities for **PM<sub>10</sub>** and **PM<sub>2.5</sub>** was found to be 8.3 and 4.1 µg/m<sup>3</sup> respectively and has been shown in **Table 4.7**.

**Table 4.7 : Maximum Concentration at receptors**

Location	Pollutants	N-Cord.	E-Cord.	GLC (µg/m <sup>3</sup> )
Project site	PM <sub>10</sub>	29.870275	79.824294	8.3
Project site	PM <sub>2.5</sub>	29.870275	79.824294	4.1



**Figure 4.1 (a): Isopleth of Maximum Predicted 24 hourly Ground – Level Concentrations for PM<sub>10</sub>**



**Figure 4.1 (b) : Isopleth of Maximum Predicted 24 hourly Ground – Level Concentrations for PM<sub>2.5</sub>**

#### 4.4.1.2 Resultant Impact

The resultant impact due to construction activities (excavation and crushing) on the ambient air quality for PM<sub>10</sub> and PM<sub>2.5</sub> at monitoring station project site respectively is presented in **Table 4.8** which shows that, the resultant concentration level is within the NAAQS.

**Table 4.8: Resultant levels due to excavation**

Station Name	Pollutants	Sampling Station	Max. Conc. (µg/m <sup>3</sup> )	Predicted GLC (µg/m <sup>3</sup> )	Resultant concentration (µg/m <sup>3</sup> )	NAAQS (µg/m <sup>3</sup> )
Project site	PM10	AAQ 1	62.8	8.3	71.1	100
Project site	PM2.5	AAQ 1	28.2	4.1	32.3	60

#### 4.5 PROPOSED MITIGATION MEASURES FOR DUST SUPPRESSION

**Soapstone** is a talcose rock mineral composed of hydrous magnesium silicate:  $3 \text{ MgO} \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$ . The specific gravity is around 1. Therefore emissions due to mineral handling during mining operation are not much and restricted to the lease area only. Air pollution is caused mainly due to dust generation added with gaseous emission from transportation activities along with mining operation like evacuation, loading, haulage etc. Proper mitigation measures will be practiced during mining activities to control air pollution load below the prescribed limits. The same are as follows:

##### Control of Fugitive Emissions

- Use of Personal Protection Equipment's (PPE) like dust masks, ear plugs etc. by the mine workers.
- Ambient Air Quality Monitoring will be conducted on regularly basis to assess the quality of ambient air.
- Rock breaker will be used for breaking over size boulders in order to reduce dust and noise generation, which otherwise would be generated due to secondary blasting.
- Regular water sprinkling on haul roads & loading points will be carried out.
- Development of green belt/plantation around the lease boundary, roads, dumps etc.

##### Prevention and control of Gaseous Pollution

- Open cast manual method will be adopted in this case and there is no provision for blasting. The main source of gaseous emissions would be transportation.
- Approx 125 tonnes of soapstone will be produced per day and the transportation will be done with covered materials to prevent any spillage and also prevent fugitive dust emission due to wind.
- Any gaseous emission transportation will be negligible and not impact the ambient quality.
- Exhaust emission will be monitored of the trucks and to be kept below the permissible limit.

- Proper maintenance of machines improves combustion process & makes reduction in the pollution. Good maintenance and monitoring of fuel and oil will not allow significant addition in the gaseous emission.

The sources of pollutants from mining activities are given in **Table-4.9**.

**Table 4.9: Sources of Pollutants**

Sr. No.	Source	Type of Pollutant
1	Transport of Overburden or soil for dumping/ backfill	SPM
2	Dumping of waste	SPM
3	Loading of ore	SPM
4	Transportation of ore	SPM, NO <sub>x</sub>

## 4.6 NOISE ENVIRONMENT

### 4.6.1 Noise Impact on Working Environment

As mining will be done by manual cum semi-mechanized means, noise will only be generated due evacuation, transportation activities. The noise generated by the mining activity dissipates within the mine. There is no major impact of the mining activity on the nearby villages. However, pronounced effect of above noise levels is felt only near the active working area.

The impact of noise on the villages is negligible as the villages are far located from the mine workings. Since there is no involvement of major machinery, the impact of noise levels will be minimal.

### 4.6.2 Prediction of Noise Impact on Noise level

A noise propagation modeling study has been conducted to find out the impact from the noise generated because of the estimated total traffic flow during operation phase as well as the significance of these impacts. The noise modeling has been done taking into account the additional flow of traffic due to the proposed project. DhvaniPRO is a computer program developed to undertake construction, industrial and traffic noise propagation studies for noise assessment.

#### 4.6.2.1 Outcome of the Noise level Modeling:

The outcome of the noise modeling is as follows:

- The predicted noise levels during both day and night time are within the prescribed limit and there will be no significant impact on noise due to the proposed project.

The Contour map showing noise level due to total traffic outcome has been shown in **Figure 4.2**.

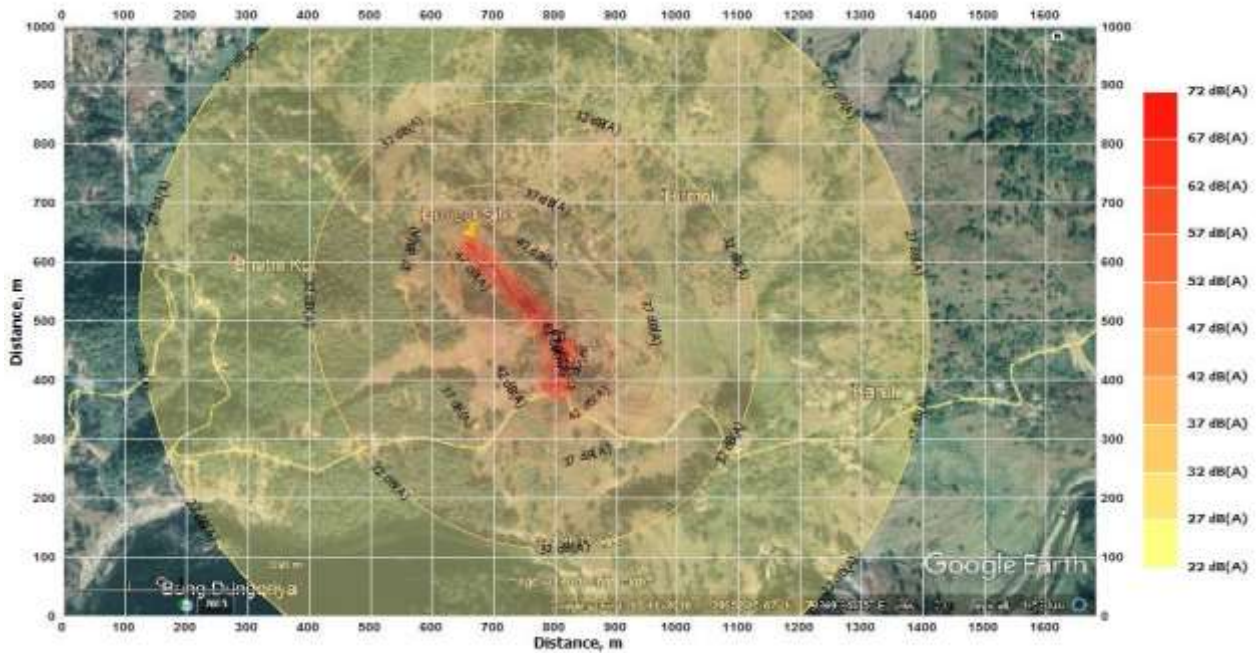


Figure 4.2:- Contour map showing noise levels due to total traffic outcome at the homogenous intersections of 2019 year

#### 4.6.3 Noise Abatement and Control

In this mine the noise level will be upto tolerable limit (90 dbA) and the noise level can be reduced by:

- Proper maintenance, oiling and greasing of transport vehicles at regular intervals will be done to reduce the generation of noise.
- Adequate silencers will be provided in all the diesel engines.
- Plantation along the sides of approach roads, around office building and mine area will be done to minimize the propagation of noise.
- Personal Protective Equipments (PPE) like earmuffs/earplugs will be provided to all operators and employees working near mining machineries or at higher noise zone.
- Periodical noise level monitoring will be done.

Frequency levels and associated mental and physical response of humans are given in **Table-4.10**.

Table 4.10: Noise Exposure Levels & Its Effects

Noise Levels dB (A)	Exposure Time	Effects
85	Continuous	Safe
85-90	Continuous	Annoyance and irritation
90-100	Short term	Temporary shift in hearing threshold, generally with complete recovery
Above 100	Continuous	Permanent loss of hearing

	Short term	Permanent hearing loss can be avoided
100-110	Several years	Permanent deafness
110-120	Few months	Permanent deafness
120	Short term	Extreme discomfort
140	Short term	Discomfort with actual pain
150 and above	Single exposure	Mechanical damage to the ear

Source: Hand Book of EIA, Rao & Wooten

#### 4.7 GREENBELT AND PLANTATION

##### Proposed Plantation at the Mine Site

The main aim of plantation in the mined out areas is to stabilize the land to protect it from rain and wind erosion. The plantation scheme broadly covers the following areas:

- Greenbelt around peripheral portions of the ML; and
- Plantation will be raised along the boundaries of the mining lease by planting the native species around ML area, backfilled and reclaimed area, around water body, etc. in consultation with the local DFO/Agriculture department. The density of the trees proposed for 5 years will be 1438 plants.

##### Greenbelt Development in ML area

The entire plantation will be done on the periphery of the reclaimed area. Precautionary measures will be taken for care of the forestation made by regular watering in the afforested area, to protect from grazing animals and proper manuring.

##### Number of Saplings to be Planted and Budgetary Estimate of the Green Cover

The breakup of the proposed afforestation programme with reclamation in progressive manner for entire life of mine is given in **Table 4.11**.

**Table 4.11: Year-wise Afforestation Schedule**

Year	Area (ha)	No of saplings
First year	0.071	71
Second year	0.059	59
Third year	0.077	77
Fourth year	0.072	72
Fifth year	0.059	59
<b>Total</b>	<b>0.338</b>	<b>338*</b>

\*Besides these 1100 more no. of more samplings will be done all along the periphery of the mine lease area/in the nearby van panchayat land.

##### Plantation Species

The plants recommended for afforestation are as per Guidelines for Developing Greenbelts, CPCB, March 2000 and listed in **Table 4.12**.

**Table 4.12: Suitable Plant Species for Green Belt Plantation**

SI.No.	Species	Family	Habit
1.	<i>Alternanthera paronychioides</i>	Amaranthaceae	Herb
2.	<i>Alternanthera pungens</i>	Amaranthaceae	Herb
3.	<i>Grangea maderaspatana</i>	Asteraceae	Herb
4.	<i>Cassia tora</i>	Fabaceae	Herb
5.	<i>Brachiaria ramosa</i>	Poaceae	Herb
6.	<i>Cynodon dactylon</i>	Poaceae	Herb
7.	<i>Eleusine indica</i>	Poaceae	Herb
8.	<i>Eragrostis tenella</i>	Poaceae	Herb
9.	<i>Saccharum spontaneum</i>	Poaceae	Herb
10.	<i>Physalis minima</i>	Solanaceae	Herb
11.	<i>Calotropis procera</i>	Asclepiadaceae	Shrub
12.	<i>Cassia occidentalis</i>	Fabaceae	Shrub
13.	<i>Croton bonplandianum</i>	Euphorbiaceae	Shrub
14.	<i>Abutilon indicum</i>	Malvaceae	Shrub
15.	<i>Ziziphus mauritiana</i>	Rhamnaceae	Shrub
16.	<i>Datura innoxia</i>	Solanaceae	Shrub
17.	<i>Solanum virginianum</i>	Solanaceae	Shrub
18.	<i>Berberis vulgaris</i>	Berberidaceae	Shrub
19.	<i>Mangifera indica</i>	Anacardiaceae	Tree
20.	<i>Ficus racemosa</i>	Moraceae	Tree
21.	<i>Cassia fistula</i>	Fabaceae	Tree
22.	<i>Ricinus communis</i>	Euphorbiaceae	Tree
23.	<i>Albizia lebbeck</i>	Fabaceae	Tree
24.	<i>Bauhinia acuminata</i>	Fabaceae	Tree
25.	<i>Butea monosperma</i>	Fabaceae	Tree
26.	<i>Dalbergia sissoo</i>	Fabaceae	Tree
27.	<i>Bombax ceiba</i>	Malvaceae	Tree
28.	<i>Azadirachta indica</i>	Meliaceae	Tree
29.	<i>Quercus leucotricophora</i>	Lauraceae	Tree
30.	<i>Melia azedarach</i>	Meliaceae	Tree
31.	<i>Luecena leucocephala</i>	Fabaceae	Tree
32.	<i>Bauhinia variegata</i>	Fabaceae	Tree
33.	<i>Terminalia bellerica</i>	Combretaceae	Tree
34.	<i>Terminalia chebula</i>	Combretaceae	Tree
35.	<i>Morus alba</i>	Moraceae	Tree
36.	<i>Delonix regia</i>	Fabaceae	Tree
37.	<i>Pinus roxburgii</i>	Pinaceae	Tree
38.	<i>Celtis australis</i>	Cannabaceae	Tree

## 4.8 BIOLOGICAL ENVIRONMENT

The baseline flora and fauna has been depicted in Section-3.11 of Chapter-3. There is no National Parks, Sanctuary, Breeding, roosting places or ecologically sensitive areas within the 10 km periphery of the mine lease area. However, most of the area surrounding to project site are covered with forest land. There no wildlife corridors in 10-km radius area.

No loss of forest resource is envisaged due to the project. No medicinal plants exist in the area.

### 4.8.1 Impact on Biodiversity

Present data have been collected through direct inventory as well as various Government Departments such as forests, agriculture, fisheries, animal husbandry and various offices to establish the pre-project biological environmental conditions. There are no endangered species, wildlife sanctuary, wildlife corridors, faunal migratory routes or eco-sensitive area near the whole study area. Save the flora/fauna around the project area, is one of the basic objective of present project. For this, mine owner agency planted a good roadside plantation along both side of the mine road.

The mitigative measures proposed are:

- Prior to mining, short awareness program will be conducted for labors to make them aware for way of working.
- No tree cutting, chopping, lumbering, uprooting of shrubs and herbs will be allowed.
- No track or new road for movement of labors or vehicles be laid in adjoining area, this will prevent fragmentation, encroachment and human – animal encounter.

## 4.9 SOCIO - ECONOMIC ENVIRONMENT

The mine area does not cover any habitation. Hence the mining activity does not involve any displacement of human settlement. The mining operation will not disturb/ relocate any village or need resettlement. Thus no adverse impact is anticipated.

The impact of mining activity in the area is positive on the socio-economic environment of the region. The proposed Soapstone Mine will be providing employment to local population and it will be give preference to the local people whenever there is requirement of man power.

### Probable Impact Assessment

#### Impact on population composition

The impact of the proposed mining project on population composition will be marginal as there will be no major immigration of people from distant areas. Only few skilled and managerial staff will be recruited from outside and the rest will be recruited locally. Similarly, there is no scope for emigration of people and there will be no displacement of people due to land acquisition. The Project Proponent will ensure that all the unskilled workers deployed for mining activities are local recruits. Further, no mining operation will be carried till it is assured that local people has been recruited and deployed for mining operation.

### **Impact on employment generation**

The proposed mining project is expected to provide Direct and Indirect employment opportunities to local people of different skills and trades. It is a positive impact that needs to be encouraged. It has been estimated that 126 workers of various categories will be employed directly.

The employment potentiality of the project is expected to ameliorate the economic condition of the families of those persons who will get employed in the proposed mining project. Further, the project will provide indirect employment to people who will be involved in segregation of extracted mining materials, petty business and service oriented industries.

### **Impact on Health**

Soapstone mining damages water supply as also a health hazard. Scarring of the lungs are the most frequently reported impacts of contact with polluted water and breathing problem due to Soapstone dust. There is risk of death from cancer of the lungs and pleura disease due to inhale of Soapstone dust. These negative impacts of Soapstone mining needs to be viewed seriously.

### **Impact on consumption pattern**

The field survey has revealed that people in the study generally poverty ridden. Increased household income may slightly change and enhance the consumption pattern of few who are burdened with poverty.

### **Impact on road development**

Movement of trucks and other vehicles to and fro the quarry is expected to increase, when mining will start. There is mule road connectivity from the quarry to existing road. The existing roads connecting the quarry with the state highways are mostly narrow mud roads. There will be mud slide and traffic bottle neck if these roads are not widened and their conditions are not improved by making them paved roads. Hence, there is ample scope for road development in and around the mining areas. It is suggested that concerned department in the Government of the state to undertake widening and strengthening of existing roads connecting the mining sites on priority basis. There should also be budgetary support for road development in and around the mining areas.

### **Impact on law & Order**

As local people will be employed to run the quarry, no law & order problem is envisaged. It is expected that the workers will attend to their duties from their residence and return to their homes after the day's work is over. There would have been law & order problem if the workers were migrants and lived in shanties closed to the mining area.

## **4.10 OCCUPATIONAL HAZARDS AND SAFETY**

Occupational safety and health is very closely related to productivity and good employer-employee relationship. The factors of occupational health in soapstone mining project are mainly dust and land degradation. Safety of employees during operation and maintenance etc. shall be as per Mines rules and regulations.

To avoid any adverse effect on the health of workers due to various pollutants, sufficient measures relating to safety and health will also be practiced:

- Provision of rest shelters for mine workers with amenities like drinking water etc.
- All safety measures like use of safety appliances, such as dust masks, helmets, shoes, safety awareness programs, awards, posters, slogans related to safety etc.
- Training of employees for use of safety appliances and first aid in vocational training center.
- Regular maintenance and testing of all equipment as per manufacturers' guidelines.
- Periodical Medical Examination (PME) of all workers by a Medical Officer
- First Aid facility is provided at the mine site.
- Close surveillance of the factors in working environment and work practices which may affect environment and worker's health.
- Working of mine as per approved mining plan and environmental plans.

#### **4.11 PUBLIC HEALTH IMPLICATIONS**

With the mitigation measures in relation to air pollution, water pollution, soil contamination and noise pollution proposed to be adopted at the mine along with green belt plantation along the periphery of Mining Lease boundary, it is expected that there will be no impact of mining on the population in the impact zone. However, the following measures shall be adopted: Health check of all villagers in the immediate vicinity of the mine shall be carried out periodically. In case any person or a group of persons is found to be suffering from any ailment, directly related to bauxite mining, their medical treatment will be carried out free of cost.

Surface water management shall be adopted to ensure that run-off from the mining area does not adversely affect natural water streams or other water bodies.

All water bodies e.g. wells and surface water sources in the vicinity of the mine, shall be periodically tested for any pollution related to mining operations and remedial action taken, if warranted.

Operators of all transport vehicles shall be instructed not to honk unnecessarily while passing through villages or near schools.

#### **4.12 CORPORATE SOCIAL RESPONSIBILITY**

Corporate Social Responsibility (CSR) refers to responsibility of a company to ensure positive impact on environment, consumers, employees, communities, stakeholders and all other members of public sphere. The CSR activities are increasingly being taken up by the project proponents not only as fulfilling of mandatory provisions but also for the formation and or enhancement of brand image. Besides the above, CSR is seen more as a responsibility towards society rather than a business promotion activity. It is the need of the day for expansion of occupational welfare. The activities to be undertaken for the local people under CSR have already been identified. It is expected that this will improve the socio-economic status of the local people and at the same time the popularity of the mining project will enhance. It is proposed to spend five

percent of the total cost of the project for the benefits of the local community under CSR activities. The total cost of the project is around Rs. 10 Lacs and the amount earmarked for CSR activities has been worked out to Rs. 1 Lac every year. It is proposed to spend the above amount during the first five years of the commissioning of the mining project. Based on 'Community Needs Survey' conducted in the study area by the Consultant appointed by the company the following activities are proposed to be taken up for the benefits of the local community. The year wise allocation of funds for the various activities proposed to be taken up under CSR programme has been shown in **Table 4.13**.

**The list of activities proposed to be taken up is indicated below:**

- a) Health Camps
- b) Drinking Water Facilities
- c) Maintenance of foot track
- d) Donation for Temple Construction
- e) Donation for cultural activities in the surrounding areas
- f) Plantation of trees.

**Table 4.13: Year wise allocation of funds for the various activities proposed to be taken up under CSR programme**

S. No.	Activities	Allocation of Fund (Rs.)
1	Health Camps	25,000
2	Drinking Water Facilities	15,000
3	Maintenance of foot track	25,000
4	Donation for Temple Construction	15,000
5	Donation for cultural activities in the surrounding areas	20,000
<b>Total</b>		<b>1,00,000</b>

For each activity the funds to be earmarked by the proponent will be decided after discussion with the local authority and the beneficiaries. It has been planned to undertake a concurrent evaluation of the activities to be taken up under the CSR programme.

#### 4.13 IMPACT ON TRAFFIC

Traffic study is carried out by understanding the existing carrying capacity of the road in the vicinity of site and flow towards State highway in the area. Then depending on the capacity of the mine, the number of trucks that will be added to the present scenario will be compared to the carrying capacity as recommended by Indian Road Congress (IRC). The existing volume of traffic and, the Level of Service are given in table below.

##### Existing Traffic Scenario & LOS

Road	V (PCU/day)	C (PCU/day)	Existing V/C Ratio	LOS
Bageshwar – Dofar Dharamgarh Road	600	1100	0.54	B



# **CHAPTER 5: ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)**

## **CHAPTER 5: ANALYSIS OF ALTERNATIVES (TECHNOLOGY & SITE)**

### **5.1 SITE ALTERNATIVES UNDER CONSIDERATION**

The Soapstone has been identified based on the result of geological investigations and exploration carried out during prospective mining.

The mining projects are site specific as such alternate sites were not considered.

### **5.2 ANALYSIS OF ALTERNATIVE TECHNOLOGY**

#### **5.2.1 Choice of Method of Mining**

Factors in the choice of an actual mining method for a given deposit are deposit characteristics, percentage recovery, requirement of health and safety and environmental concerns, production, scheduling scope of mechanization and automation, workforce requirements wage rates, land reclamation, operating and capital cost estimates. The selection of the mining method (development and extraction) is a key decision to be made in the opening up of a mine.

Surface or open pit mining is used for large, near-surface mineral deposits. Mineral is excavated, loaded into trucks, and hauled to a facility where it is crushed and ground to a uniform size for further processing. Surface mining requires the removal and disposal of layers of top soil and underlying rock commonly called the overburden. Mining must be planned so that the combine of mining processing and reclaiming the land is taken up concurrently.

The open cast mining method will be adopted because of the following reasons:

- The opencast mining operations ensure higher mineral conservation.

The method used for mining is efficient for Soapstone mining, so no alternative mining method is proposed.

# **CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME**

## CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME

### 6.1 INTRODUCTION

The industrial development of any area needs to be intertwined with judicious utilization of non-renewable resources of the study area and within the limits of permissible assimilative capacity. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharged into the environment without affecting the designated use and is governed by dilution, dispersion and removal due to physico-chemical and biological processes.

The Environment Monitoring Programme is required to ensure sustainable development in the study area (10 km) of the project site, hence it needs to be an all-encompassing plan for which the plant authorities, Government, Regulating agencies like Pollution Control Board etc. working in the region and more importantly the affected population of the study area need to extend their co-operation and contribution.

### 6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

The mitigation measures suggested in Chapter-VI will be implemented so as to reduce the impact on the environment due to the operations of the proposed project. Implementation schedule of mitigation measures is given in **Table-6.1**.

**Table 6.1 Implementation Schedule**

Sr. No.	Recommendations	Time Requirement	Schedule
1	Air pollution control measures	Before commissioning of respective units	Immediate
2	Water pollution control measures	Before commissioning of the mine	Immediate
3	Noise control measures	Along with the commissioning of the mine	Immediate
4	Ecological preservation and upgradation	Stage-wise implementation	Immediate & Progressive

#### 6.2.1 Administrative Aspects & Environmental Monitoring Program

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

Usually, as in the case of the study, an Impact Assessment study is carried over short period of time and the data cannot bring out all variations induced by the natural or human activities. Therefore, regular monitoring programme of the environmental parameters is essential to take into account the changes in the environmental quality.

### 6.2.2 Institutional Arrangements for Environment Protection and Conservation

The mine will be supervised and controlled by an independent Mines Manager supported by adequate team of technically and statutorily qualified personnel apart from the operating staff of skilled, semi-skilled, unskilled and other categories.

The organizational structure for Environment Cell for mining operations is shown in **Figure-6.1**. This Environment Cell is responsible for the management and implementation of the environmental control measures. Basically, this department will supervise the reclamation planning & management, air & water pollution control management, Liasoning with State & Central Statutory agency & Committee.

In case the monitored results of environmental pollution are found to exceed the allowable limits, the Environment Management Cell will suggest remedial action and get these suggestions implemented through the concerned authorities.

The Environment Management Cell will also co-ordinate all the related activities such as collection of statistics of health of workers and population of the region, afforestation and greenbelt development. The Environment Management Cell will review Corporate Environmental performance along with the reporting of non-compliances.



**Figure-6.1 Organization Structure for Environment Management**

### 6.3 ENVIRONMENT MONITORING PROGRAMME

Monitoring shall confirm that commitments are being met. This may take the form of direct measurement and recording of quantitative information, such as amounts and concentrations of discharges, emissions and wastes, for measurement against corporate or statutory standards, consent limits or targets. It may also require measurement of ambient environmental quality in the vicinity of a site using ecological/biological, physical and chemical indicators. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints.

The environmental monitoring will be conducted in the mine operations as follows:

- Air quality;
- Water and wastewater quality;
- Noise levels;
- Soil Quality; and
- Greenbelt Development

The details of post project monitoring are presented in **Table 6.2**.

### 6.4 REPORTING SCHEDULES

Post project monitoring will be carried out as per conditions stipulated in environmental clearance letter issued by MoEF&CC, consent issued by SPCB as well as according to CPCB guidelines. The project site is considered as core zone and the area lying within 10 km radius from the mine site is considered as buffer zone, where some impacts may be observed on physical and biological environment. In the buffer zone, slight impact may be observed and that too is occasional, table below showing the details of Post Project Monitoring programme.

Table-6.2 Post Project Monitoring Programme

Attributes	Sampling		Measurement Method	Test Procedure
	Network	Frequency		
<b>A. Air Environment</b>				
<b>Meteorological</b> • Wind direction • Relative humidity • Rainfall	Minimum 1 site in the project impact area	Regularly in one season by Weather Monitoring Station	Mechanical/automatic weather station	-
<b>Pollutants</b> PM10, PM2.5	5 locations in the project impact area (Minimum 2 locations in upwind side, 2 sites in downwind side / impact zone and 1 in core zone)	Once in a season.	Gravimetric method	-
SO2			EPA Modified West & Geake method	Absorption in Potassium Tetra Chloromercurate followed by Colorimetric estimation using P-Rosaniline hydrochloride and Formaldehyde (IS: 5182 Part - II).
NO2			Arsenite modified Jacob & Hochheiser	Absorption in dil. NaOH and then estimated colorimetrically with sulphaniamide and N (I Nephthyle) Ethylene diamine Dihydrochloride and Hydrogen Peroxide (CPCB Method).
<b>B. Water Environment</b>				
pH, Turbidity, Colour, Odour, Taste, TDS, Total Hardness, Calcium hardness, Magnesium hardness, Chloride, Fluoride, Sulphate, Nitrates, Alkalinity, Iron, Copper, Manganese, Mercury, Cadmium, Selenium,	Set of grab Samples during pre and post-monsoon for ground and surface Water in the vicinity.	Diurnal and Season wise	As per IS 10500	Samples for water quality should be collected and analyzed as per : IS : 2488 (Part 1-5) methods for sampling and testing of Industrial effluents Standard methods for examination of water and wastewater analysis published by American Public Health Association

Arsenic, Cyanide, Lead, Zinc, Chromium, Aluminum, Boron, Phenolic Compounds				
<b>C. Noise</b>				
Noise levels at Day & night time - Leq dB (A)	Mine Boundary, High noise generating areas within the lease.	Quarterly / Half yearly	As per CPCB norms	As per CPCB norms
<b>D. Soil</b>				
pH, Bulk Density, Soil texture, Nitrogen, Available Phosphorus, Potassium, Calcium, Magnesium, Sodium, Electrical Conductivity, Organic Matter, Chloride	5 locations in the project impact area	Yearly/half yearly	As per USDA Method	As per USDA Method
<b>E. Socioeconomic</b>				
<ul style="list-style-type: none"> <li>• Demographic structure</li> <li>• Infrastructure resource base</li> <li>• Economic resource base</li> <li>• Health status: Morbidity pattern</li> <li>• Cultural and Aesthetic attributes</li> <li>• Education</li> </ul>	Socioeconomic survey is based on proportionate, stratified and random sampling method	Minimum for two phases of the project	Primary data collection through Questionnaire	Secondary data from census records, statistical hard books, topo sheets, health Records and relevant official records available with Govt. agencies

## **CHAPTER 7: ADDITIONAL STUDIES**

## CHAPTER 7: ADDITIONAL STUDIES

### 7.1 PUBLIC HEARING

In consonance with the EIA notification dated 14th September 2006, vide section 1 (a) related to Public Hearing, the draft EIA/EMP report has been submitted to the Uttarakhand Environment Protection & Pollution Control Board (UEPPCB) for public hearing. The public Hearing has been conducted on 21.08.2019 at Project Site, Near Sam Ju Temple, Village-Karuli, Tehsil & District Bageshwar in the presence of ADM Bageshwar. The details of the Public Hearing along with the photographs have been attached as **Annexure VIII**.

### 7.2 RISK ASSESSMENT

The complete mining operation will be carried out under the management control and direction of a qualified mine manager. Moreover, mining staff will be sent to refresher courses from time to time to keep them alert. However, following natural/industrial hazards may occur during normal operation.

- Accident due to explosives;
- Accident due to mining equipment; and

In order to take care of above hazard/disasters, the following control measures will be adopted:

- All safety precautions and provisions of Mine Act 1951, Metalliferous Mines Regulations 1961 and Mines Rules, 1955 will be strictly followed during all mining operations;
- Entry of unauthorized persons will be prohibited;
- Firefighting and first-aid provisions in the mines office complex and mining area;
- Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use;
- Training programmes for all the employees working in hazardous premises; Under Mines rules all employees of mines shall have to undergo the training at a regular interval;
- Working of mine, as per approved plans and regularly updating the mine plans;
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines;
- Suppression of dust on the haulage roads and loading & unloading points ;
- Increasing the awareness of safety and disaster through competitions, posters and other similar drives.

#### 7.2.1 Blasting

No drilling & blasting is proposed as mineral is very soft in nature.

#### 7.2.2 Overburden & Interburden

The overburden (soil) and interburden dumps may cause landslides. High overburden dumps created at the quarry edge may cause sliding of the overburden and interburden dump or may cause failure of the pit slope due to excessive loading, thereby causing loss of life and property. Siltation of surface water may also cause run-off from overburden and interburden dumps.

### **7.2.3 Machinery**

Most of the accidents during transport by trucks, excavators and dozers and other heavy vehicles are often attributable to mechanical failures and human errors.

### **7.2.4 Water Logging**

Water logging in the mine site can be avoided by adopting following measures:

- Due care will be taken to provide retaining wall around the pits.
- Proper drainage will be maintained to eliminate inundation of working pits during rains from run-off water.
- There is no danger of flood or inundation as the ground level.
- Mining operations are not carried below the ground water table; therefore, there will be no disturbance to ground water quality due to mining activity.

### **Natural resource conservation**

- A green belt will be developed so that minimum soil erosion takes place.
- The excavated soil will be refilled in order to minimize the impact on environment.
- In any case the natural habitats of the existing flora and fauna will not be disturbed.
- Use of traditional knowledge in all aspects of conservation.
- Water conservation techniques will be employed.
- Time to time analysis of the soil, water resources etc will be done in order to analyze the negative impacts of mining activities on the environment.
- To prepare management plans for village landscapes. Villages to be seen as landscapes of diverse elements such as forests, scrub, grassland, streams/river, ponds etc.

### **7.2.5 Earthquake Management Plan**

Following measures will be undertaken:

- The project site is mainly a plain area. There will be no drilling and blasting during mining.
- The ultimate pit wall will be kept to 45° and the slope angle of the inner benches will not be greater than 60° to 65° and bench height would be 9m.
- Slope will be stabilized with the help of *Chrysopogon zizanioides* grass to stabilize the slope

### **Flood Management Plan**

- This is a soapstone mining project and the site is not close by to a water body so water bodies in the area will not be disturbed.

### Natural resource conservation

- A green belt will be developed so that minimum soil erosion takes place.
- The excavated soil will be spread over the backfilled mined out area in order to minimize the impact on environment.
- In any case the natural habitats of the existing flora and fauna will not be disturbed.
- Use of traditional knowledge in all aspects of conservation shall be utilized.
- Water conservation techniques will be employed.
- Time to time analysis of the soil, water resources etc will be done in order to analyze the negative impacts of mining activities on the environment.
- To prepare management plans for village landscapes, villages to be seen as landscapes of diverse elements such as forests, scrub, grassland, streams/river, ponds etc. The dynamics of the village as an ecosystem to be assessed, corridors to be devised between major natural landscape elements, so as to facilitate movement of species.

### 7.2.6 Safety Measures

#### Safety Measures at the proposed Open Cast Mining Project

- The opencast mines have been planned for working with shovel tipper system which requires proper benching not only for slope stability but also for movement of tippers and other machinery. The inclination of the quarry sides at the final stage i.e. at the dip most point will not exceed  $45^{\circ}$  to the horizontal. (This angle is measured between the line joining the toe of the bottom most bench to the crest of the top most bench and the horizontal line);
- The gradient of the haul road inside the pit, access trench and on the dumps will not be steeper than 1 in 16;
- The slope of the sides of the OB and IB dump to the horizontal will not exceed  $37^{\circ}$ , and the height of the OB and IB dumps has been restricted to a max of 12 m;
- The quarries will be protected by garland drains around the periphery for storm water drainage;
- A minimum safe distance of 50m will be kept between the surface edge of the quarry and the nearest public building, roads etc.

#### Measures Suggested to Avoid Accidents due to Blasting

- No drilling & blasting is proposed as mineral is very soft in nature.

#### Measures to Prevent the Danger of Overburden

- To prevent the failure of overburden slopes, especially during the rainy season, proper garland drain & bund are constructed around the dump.

### Measures to Prevent Accidents due to Trucks and Tippers

- All transportation within the main working area should be carried out under the direct supervision and control of the management.
- The vehicles must be maintained in good repairs and checked thoroughly at least once a week by a competent person authorized for this purpose by the management;
- Broad signs should be provided at each and every turning point specially for the guidance of the drivers at night;
- To avoid dangers while reversing the trackless vehicles, especially at the embankment and tripping points, all areas for reversing of lorries should, as far as possible, be made man free, and there should be a light and sound device to indicate reversing of trucks; and
- A statutory provision of the fence, constant education, training etc. will go a long way in reducing the incidence of such accidents.

## 7.3 DISASTER MANAGEMENT PLAN

### 7.3.1 Objectives of Disaster Management Plan

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation and restoration of production. For effective implementation of the Disaster Management Plan, it should be widely circulated and personnel training should be given.

The objective of the Disaster Management Plan is to make use of the combined resources of the mine and the outside services to achieve the following:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Secure the safe rehabilitation of affected area; and

In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

### Fire Fighting Facilities

Sufficient fire extinguishers will be installed at selected locations such as mine office, garage, stores etc.

### Emergency Medical Facilities

An ambulance with driver availability in all the shifts, emergency shift vehicle would be ensured and maintained to transport injured or affected persons. Number of persons would be trained in first aid so that, in every shift first aid personnel would be available.

## **CHAPTER 8: PROJECT BENEFITS**

## CHAPTER 8: PROJECT BENEFITS

### 8.1 IMPROVEMENT IN THE PHYSICAL INFRASTRUCTURE

The impact on the civic amenities will be substantial after the commencement of mining activities. The basic requirement of the community needs will be strengthened by extending health care, educational facilities developed in the township to the community, providing drinking water to the villages, building/strengthening of existing roads in the area. The proponent will initiate the above amenities either by providing or by improving the facilities in the area, which will help in uplifting the living standards of local communities.

Medical facilities will be provided in the form of first-aid facility at the mine. These medical facilities will also be available to local people in the surrounding in case of emergencies.

### 8.2 IMPROVEMENT IN THE SOCIAL INFRASTRUCTURE

- Generation of employment and improved standard of living;
- Increased revenue to the State by way of royalty, taxes and duties; and
- Superior communication and transport facilities etc.

In addition to above, due to increase in purchasing power of local habitants:

- There will be significant change in the socio-economic scenario of the area.
- The proposed project will enhance the prospects of employment. Recruitment for the unskilled and semiskilled workers for the proposed project will be from the nearby villages.
- The development of the basic amenities viz. roads, transportation, electricity, drinking water, proper sanitation, educational institutions, medical facilities, entertainment, etc. will be developed as far as possible.
- Overall the proposed project will change living standards of the people and improve the socio-economic conditions of the area.

### 8.3 EMPLOYMENT POTENTIAL

Future production planning does not indicate some change from present, in the employment. The number of unskilled labour may increase depending on the quantum of overburden removal and mineral excavation. The lessee has employed miners for raising ores & 126 Workers for removal of overburden, quarry cleaning & road repairing. The details of employment are given in Chapter-2.

The employment of local people in primary and secondary sectors of project will upgrade the prosperity of the region. These will in-turn improves the socio-economic conditions of the area. The total manpower required for the proposed mining project under various categories is 126 persons and persons will be mainly sourced from local as well as other community in and around mining project and few technical persons will be employed during operational phase from local and also from outside area. In addition to the above, contractual labour and indirect employment opportunities will also be getting benefited after installation of mining project.

## **8.4 POLICY AND ACTION PLAN ON SOCIAL RESPONSIBILITY**

A detailed Community Social Responsibility plan has been prepared and the details of the report are given below.

### **8.4.1 CSR Project Details**

Soapstone mine has proposed to provide financial assistance of Rs. 1.00 lakhs every year for the development of social infrastructure of the area.

Following measure will be taken to improve the Social infrastructure of the study area:

- Health Camps. (Rs. 25,000).
- Drinking Water Facilities. (Rs. 15,000).
- Maintenance of foot track (Rs. 25,000).
- Donation for Temple Construction. (Rs. 15,000).
- Donation for cultural activities in the surrounding areas (Rs. 20,000).

### **8.4.2 CER Project Details**

In addition to the CSR, the provision of Rs.1.00 lakh every year (1% of the total project cost) has been proposed for the Corporate Environmental Responsibility (CER).

Following measure will be taken to improve the Social infrastructure of the study area:

- Sanitation facilities. (Rs. 25,000).
- Skill Development for villagers. (Rs. 20,000).
- Awareness to local farmers to increase yield of crop and fodder (Rs. 15,000).
- Plantation in the community areas/schools and on van panchayat land of nearby villages. (Rs. 40,000).

# **CHAPTER 9: ENVIRONMENT MANAGEMENT PLAN**

## CHAPTER 9: ENVIRONMENT MANAGEMENT PLAN

### 9.1 INTRODUCTION

An EMP is prepared including all the administrative aspects of ensuring that mitigative measures are effectively monitored, after approval of the EIA. The final EIA/EMP of the proposed project will be submitted to SEAC, Uttarakhand, for obtaining environmental clearance for the project, in accordance with Environment Impact Assessment (EIA) Notification No. 1533 dt.14.09.2006. The approved Environment Management Plan will be implemented throughout the life of the project and half-yearly monitoring report showing the compliance status of conditions stipulated in Environmental Clearance letter will be submitted to MoEF&CC in every six months. An Environmental monitoring programme has been prepared for the proposed project for periodical assessment of effectiveness of implementation of Environment Management Planned to take corrective measures in case of any degradation in the surrounding environment.

To mitigate the adverse impact which will be caused due to the mining operation and overall scientific development of local habitat, environmental management plan (EMP) has been formulated and integrated with the mine planning. The details of the anticipated impacts and mitigative measures have been discussed in Chapter 4 of this report, based on the results of present environmental conditions and environmental impact assessment. The EMP has therefore been made considering implementation and monitoring of environmental protection measures during and after mining operations.

#### The aims of Environment Management Plan are:

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

### 9.2 IMPLEMENTATION OF EMP

As the major environment attributes will continue to be around the project area alone, implementation of the proposed control measures and monitoring thereof will be undertaken on a regional basis. The project proponent will ensure the implementation of the measures within the mine area and carryout efficient monitoring.

In order to implement the measures suggested for mitigating the adverse impacts on the environment, it is suggested to monitor the environmental parameters regularly.

### **9.3 ENVIRONMENTAL MONITORING**

For assessing the prevailing quality of air, water, noise, soil etc., regular monitoring of parameters are necessary. The data assessed will be helpful in predicting the impact and planning suitable measures to improve/protect the environment. In the study area, the lessee will carry out monitoring studies for ambient air quality, fugitive dust, water quality, noise levels and soil quality as per the standard procedures and schedules. The monitoring system will include:

- Monitoring stations in the buffer zone remain the same as selected in this study for Air, water, Soil, Noise etc.,
- Implementation of the planned mitigating measures.
- Monitoring the programme of implementation.

The Environmental parameters will be monitored & samples will be analyzed as per the stipulations of Indian Bureau of Mines & Uttarakhand Pollution Control Board and as per MoEF&CC Guidelines. The above monitoring proposals shall be adhered to and the results shall be intimated to the appropriate authorities for their perusal and records.

### **9.4 ORGANIZATIONAL SETUP FOR ENVIRONMENT MONITORING**

Major attributes of environment are not confined to the mining site alone. Implementation of proposed control measures and monitoring programme has an implication on the surrounding area as well as for the region. Therefore, mine management should strengthen the existing control measures as elaborated earlier in this report and monitor the efficacy of the control measures implemented within the mining area relating to the following specific areas for eco-friendly mining:

- a) Collection of air and water samples at strategic locations with frequency suggested and by analyzing thereof. If the parameters exceed the permissible tolerance limits, corrective regulation measure will be taken.
- b) Collection of soil samples at strategic locations once in every year and analysis thereof with regard to deleterious constituents, if any.
- c) Measurement of water level fluctuations in the nearby surface resources and bore wells.
- d) Measurement of noise levels at mine site, stationary and mobile sources, and adjacent villages will be done in every quarter of the year.
- e) Monitoring Ground Vibrations: Ground vibrations studies or monitoring is not required as there is no proposal of drilling/blasting for scooping operations.

#### **9.4.1 Environment Management Cell**

No cell is proposed to form; the plan will be implemented through outsourcing suitable and accredited consultants and experts.

Environmental Monitoring will be directly coordinated by the Supervisor/Owner.

Competent outsourced certified organization/lab personnel will conduct the monitoring operations. A full-fledged laboratory is not essential; part of the work will be given to competent consultants to undertake these jobs.

Regular semi-skilled manpower will be required for supervision, assistance in reclamation works followed by trained unskilled labourers to carry out other necessary operations.

#### **9.4.1.1 Functions of the Cell**

- Implementation of the mitigation measures.
- Maintain Records of the operation.
- Monitoring the programme of implementation.
- To estimate the efficiency of measures taken.
- To bring out any other unforeseen effect on environment not covered under the report.
- Inspection and regular maintenance of mining equipments and transport vehicles.

### **9.5 AIR QUALITY MANAGEMENT**

Talc is a hydrous magnesium silicate. In trade, talc often includes: (i) the mineral talc in the form of flakes and fibres; (ii) steatite, the massive compact cryptocrystalline variety of high-grade talc; and (iii) soapstone, the massive talcose rock containing variable talc (usually 50%), soft and soapy to feel. Commercial talc may contain other minerals like quartz, calcite, dolomite, magnesite, serpentine, chlorite, tremolite and anthophyllite as impurities. The properties that give talc a wide variety of uses and markets are its extreme softness and smoothness, good luster and sheen, high slip and lubricating property, low moisture content, ability to absorb oil and grease, chemical inertness, high fusion point, low electrical and heat conductivity, high dielectric strength, good retention for filler purposes, whiteness, good hiding power as pigment and high specific heat.

#### **9.5.1 Control of Fugitive Emissions**

- Use of Personal Protection Equipments (PPE) like dust masks, ear plugs etc. by the mine workers.
- Regular water sprinkling on haul roads & loading points will be carried out.
- Development of green belt/plantation around the lease boundary, roads, dumps etc.
- Ambient Air Quality Monitoring will be conducted on regularly basis to assess the quality of ambient air.

#### **9.5.2 Prevention and control of Gaseous Pollution**

Open cast manual method will be adopted in this case and there is no provision for blasting. The main source of gaseous emissions would be transportation.

Only 125 tonnes of soapstone will be produced per day and the transportation will be done with covered materials to prevent any spillage and also prevent fugitive dust emission due to wind. Any gaseous emission transportation will be negligible and not impact the ambient quality. Exhaust emission will be monitored of the trucks and to be kept below the permissible limit.

Proper maintenance of machines improves combustion process & makes reduction in the pollution. Good maintenance and monitoring of fuel and oil will not allow significant addition in the gaseous emission.

## 9.6 NOISE POLLUTION CONTROL

### 9.6.1 Noise Abatement and Control

- Proper maintenance, oiling and greasing of machines at regular intervals will be done to reduce the generation of noise.
- Adequate silencers will be provided in all the diesel engines.
- Plantation along the sides of approach roads and mine area will be done to minimize the propagation of noise.
- Personal Protective Equipment's (PPE) like earmuffs/earplugs will be provided to all operators and employees working near mining machineries or at higher noise zone.
- Periodical noise level monitoring will be done.

## 9.7 WATER QUALITY MANAGEMENT

Water for drinking and operations is required to be 7.5 KLD. The water shall be extracted from the nearby surface water resources or natural springs.

### Measures for Minimizing Adverse Impacts

Seasonal drainage exists near to the project site. The mining is being carried out in hilly region. The problem of ground water pumping will not arise. Rain water will not accumulate in the mining pit & it will be channelized along the slopes. The mining work will usually be confined within gullet driven from north-south & a ledge of about one meter height will be kept on the outer edge so that in discrete water flow will be avoided. The interburden and top soil will be used in backfilling. Further no significant impact on water quality is anticipated as material exposed will be low grade magnesite & is very feebly react with water that too when water becomes acidic. Even of reaction takes place it gives arise to increased temporary hardness of water. Water is being supplied from the spring. No hydrological studies have been carried out in the area.

### Surface Water

There is a possibility of mixing of freshly disturbed material with the rain water. To take care of such happenings, retaining walls have been provided along the backfilled pits and along the soil and interburden dumps. Monitoring of water will be carried out periodically. Water analysis will be carried out seasonally.

### Ground Water Pollution

The domestic sewage from the canteen and toilets will be routed to septic tanks. Regular monitoring of water levels and quality in the existing open wells and bore wells in the vicinity will be carried out. If found necessary, additional observation wells will be sunk for monitoring

the water levels and quality around the mine representing both upstream and downstream conditions.

### **Impact on land use & reclamation of mined out areas**

Opencast mining activities may alter the landscape of the lease area and also cause some disturbance to the surface features of the surrounding areas. Mining will be done after leaving 7.5 m safety barrier. Plantation will be developed in consultation with district administration/ local authority, wherever feasible. The Existing land use pattern is agricultural land.

The impact on land form or physiography will be land use on the hilly terrain will undergo radical changes due to the open cast mining. During the next five years mining, 2.301 ha land will be degraded due to mining & allied activities.

All the quantities of top soil & interburden material to be generated by the end of plan/conceptual period shall be used for the purpose of reclamation over the mined unit land. Therefore no proposal for separate stacking of top soil and interburden dump has been proposed.

## **9.8 WASTE MANAGEMENT**

### **Solid waste generation and management Disposal of Waste:**

The top soil will be removed with the help of JCB machine, dozer, shovels, pickaxe, spade & crowbar and stacked separately. The soil intermixed with fragments and interburden rejects are low grade magnesite. Part of these rejects will be utilized in construction and maintenance of retaining walls, parapet walls, check dams and other construction works. About 25369 cum of rejects will be used for this task, and in dump yard remaining rejects about 101475 cum will be backfilled.

### **Mitigation measures**

Access roads from public roads will be aligned in such a way that it would cause least damage.

The banks cut for ramp will also be restored at the closing of mine during monsoon. Vegetation development is proposed along the lease area as restoration work.

Plantation is proposed along the road sides, civic amenities in consultation with local/ govt. authorities. While selecting the plant species, preference will be given for planting native species of the area.

### **Storage and preservation of top soil:**

The soil will be removed with the help of JCB machine, dozer, shovels, pickaxe, spade & crowbar and loaded manually to stack on the dump yard. Stacking will commence at RL 1215m to RL 1221m in first & second year, RL 1140m to RL 1143m in third year, RL 1119m to RL 1122m in fourth & RL 1125m to RL 1128m in fifth year. The spread of stacks will be undertaken through mechanically and manually both & average dump height kept 1.5m. In first year 146 m<sup>2</sup> areas was earmarked for stacking of soil with 1.5m height. In second area it is 147

m<sup>2</sup> areas. Similarly in third, fourth & in fifth year 146 m<sup>2</sup>, 145 m<sup>2</sup> and 146 m<sup>2</sup> area have been respectively earmarked for stacking of soil with 1.5m average height.

**Proposal for reclamation of land affected by mining activities:**

The mining will commence from the higher levels and will advance towards lower levels. Intermittent backfilling will commence from the higher levels and subsequently advance towards the lower elevation so that terraced agriculture fields would undertake in such a manner that original land use will be restored i.e. before the onset of monsoon will be handed over to cultivators for cultivation. The final backfilling will be started once the ultimate benches are formed and pit reaches the optimum economic depth. All recovery of the mineral will be of the saleable grade.

**9.9 GREENBELT AND PLANTATION**

Plantation will be raised at a spacing of 7.5m along the boundaries of the mining lease by planting the native species around ML area, backfilled and reclaimed area, around water body, roads etc. in consultation with the local DFO/Agriculture department. The year wise plantation of trees has been shown in **Table 9.1**.

**Table 9.1: Year wise afforestation scheduled**

<b>Year</b>	<b>Area (ha)</b>	<b>No of saplings</b>
First year	0.071	71
Second year	0.059	59
Third year	0.077	77
Fourth year	0.072	72
Fifth year	0.059	59
<b>Total</b>	<b>0.338</b>	<b>338*</b>

**\*Besides these 1100 more no. of more samplings will be done all along the periphery of the mine lease area/in the nearby van panchayat land.**

The following characteristics should be taken into consideration while selecting plant species for green belt development and tree plantation.

- They should be fast growing and tall trees.
- They should be perennial and evergreen.
- They should have thick canopy cover.
- Plantation should be done in appropriate alternate rows around the proposed site to prevent lateral pollution dispersion.
- The trees should maintain regional ecological balance and conform to soil and hydrological conditions. Indigenous species should be preferred.

**9.10 BIOLOGICAL MANAGEMENT MEASURES**

There is a requirement to establish a stable ecosystem with both ecological and economic returns. Minimization of soil erosion and dust pollution enhances the beauty of the core and the

buffer zone. To achieve this, it is planned to increase plantation activities. The basic objectives of plantation are as follows:-

- Improvement of Soil quality.
- Quick vegetative cover to check soil erosion.
- Improvement in mining site stability.
- Conservation of biological diversity.
- As dust receptor which likely to produce during mining.

**9.10.1 Greenbelt Development Plan**

Green belt is plantation of trees for reducing the pollution as they absorb both gaseous and particulate pollutant, thus removing them from atmosphere. Green plants form a surface capable of absorbing air pollutants and forming sinks for pollutants. It improves the aesthetic value of local environment. Under present project, green belts have been planned with emphasis on creating biodiversity; enhance natural surroundings and mitigating pollution. The greenbelt development plan aims to overall improvement in the environmental conditions of the region. The plan with a five-fold objective addresses issues such as providing sink for air pollutants likely to emitted from the project; enhancing the forest cover for increasing the biodiversity of the region; providing aesthetic value to the project area enhancing the ecological equilibrium of the area; and to a large proportion in combating soil erosion.

- Afforestation on degraded forest area, forest protection / conservation will be carried out every year by the mine owner.
- This activity will promote the emergence of the primary succession species; hence it will be a silvicultural operation, extremely important for maintaining ecology and environmental health of the area.
- This helps in regeneration & establishment of pioneer plant species saving expose land & land cutting.

These plantations will be carried out around mining zone and both sides of the mine road. About twice the area recommended for mining will be used for afforestation/greenbelt as per the “Forest (Conservation) Amendment Rule, 2004”.

The scheme of plantation around the project site is given as follows:

Afforestation will be put under a protective regulatory framework to ensure that it is not degraded or disturbed. No ecologically disruptive activity will be allowed in this zone.

The suggestive measures under EMP are given in **Table 9.2**.

**Table 9.2: Key suggestive measures under EMP**

Impact Predicted	Suggestive measure
Disturbance of free movement / living of wild fauna	<ul style="list-style-type: none"> <li>• Awareness camps will be conducted for labours to make them aware about sensitivity/importance of forest life.</li> <li>• No tract or new road for movement of labours or</li> </ul>

	<p>vehicles be laid in reserve forest area, this will prevent forest fragmentation, encroachment and human – animal encounter.</p> <ul style="list-style-type: none"> <li>• Care will be taken that noise produced during vehicles movement for carrying ore materials are within the permissible noise level. Higher noise level in the forest area will lead to restless and failure in detection of calls of mates and young ones.</li> <li>• Care will be taken that no hunting of animals carried out by labours.</li> <li>• If wild animals are noticed crossing the core zone, it will not be disturbed at all.</li> <li>• Labours will not be allowed to discards food, plastic etc., which can attract animals near the core site.</li> <li>• Only low polluting vehicle will be allowed for carrying ore materials. All vehicles allowed in the project site area will have to provide pollution under control certificate at the end of three months.</li> <li>• No honk will be allowed in the forest area, noise level will be within permissible limit (silent zone-50dB during day time) as per noise pollution (regulation and control), rules, 2000, CPCB norms.</li> </ul>
Harvesting of forest flora	<ul style="list-style-type: none"> <li>• No tree cutting, chopping, lumbering, uprooting of shrubs and herbs should be allowed.</li> <li>• No pilling of ore material should in the reserve forest area.</li> <li>• Collections of economically important plants will be fully restricted.</li> </ul>

### **9.11 OCCUPATIONAL HAZARDS AND SAFETY**

Occupational safety and health is very closely related to productivity and good employer-employee relationship. The factors of occupational health in proposed Soapstone Mining Project are mainly dust and land degradation. Safety of employees during operation and maintenance etc. shall be as per Mines rules and regulations.

To avoid any adverse effect on the health of workers due to various pollutants, sufficient measures relating to safety and health will also be practiced:

- Provision of rest shelters for mine workers with amenities like drinking water etc.
- All safety measures like use of safety appliances, such as dust masks, helmets, shoes, safety awareness programs, awards, posters, slogans related to safety etc.
- Training of employees for use of safety appliances and first aid in vocational training center.

- Regular maintenance and testing of all equipment as per manufacturers' guidelines.
- Periodical Medical Examination (PME) of all workers by a medical Officer
- First Aid facility is provided at the mine site.
- Close surveillance of the factors in working environment and work practices which may affect environment and worker's health.
- Working of mine as per approved mining plan and environmental plans.

## **9.12 ENVIRONMENTAL POLICY**

The Owner of proposed Soapstone Mine believes that responsible environmental stewardship comprises diligent application of well-established natural resource management, controls and practices for the protection, reclamation of the mined out land, preservation of biodiversity and proper disposal of waste following the best environmental practices during the process of mining of soapstone.

Environmental policy prescribed for standard operating process to bring into focus any violation/deviation of the environment and forest norms/conditions that the company operations will implement operational and risk management practices that provide for maximum protection of people and the environment. To this end, the owner resolves that company will follow the below mentioned practices:

Operate in accordance with prescribed industry standards while complying with all applicable environmental, health and safety laws and regulations.

- Establish and maintain a well-defined environmental, health and safety management system to guide its operations.
- Ensure that all employees, officers and directors understand and adhere to its environmental, health and safety management program.
- Provide operations with the necessary resources, expertise and training to effectively carry out its EHS management programs.
- Engage employees at all levels in programs directed towards minimizing adverse effects on the environment resulting from mining activity.
- Work proactively with governments and the public in the development of cost effective and realistic regulations that promote enhanced environmental, health and safety protection.
- Promote environmental awareness among its employees, their families and the communities in which it operates.
- Require those who provide services and products to practice good environmental stewardship.
- Mitigate its environmental impacts through efficient use of resources, and the reduction of input materials and waste.
- Maintain a high degree of emergency preparedness.

### 9.13 BUDGET ALLOCATION FOR EMP IMPLEMENTATION

It is necessary to include the environmental cost as a part of the budgetary cost component. The project authorities propose to undertake the following environmental works to achieve the environmental quality as desired. The budget for EMP implementation for the period of 5 years has been shown in **Table 9.3**.

**Table 9.3: Budget for Environmental Management Plan**

S. No.	Measures	Cost (In Rs.)
1.	Water Sprinkling for dust suppression	50,000
2.	Environmental Monitoring : (i) Ambient Air Quality Monitoring (ii) Ambient Noise Monitoring (iii) Water Quality Sampling & Analysis (iv) Soil Quality Sampling & Analysis	1,00,000
3.	Plantation of 1438 trees along with their maintenance for green belt	1,43,800
4.	Cost for Retaining wall/Toe wall	74,700
<b>Total</b>		<b>3,68,500</b>

### 9.14 CORPORATE ENVIRONMENTAL RESPONSIBILITY (CER)

The cost towards Corporate Environmental Responsibility (CER) has been shown in **Table 9.4**.

**Table 9.4: Budget for Corporate Environmental Responsibility (CER) (per year)**

S. No.	Measures	Cost (In Rs.) (per year)
1.	Sanitation facilities	25,000
2.	Skill Development for villagers	20,000
3.	Awareness to local farmers to increase yield of crop and fodder	15,000
4.	Plantation in the community areas/schools and on van panchayat land of nearby villages	40,000
<b>Total</b>		<b>1,00,000</b>

### 9.15 CONCLUSION

As discussed, it is safe to say that the project is not likely to cause any significant impact on the ecology of the area, as adequate preventive measures will be adopted to contain the various pollutants within permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigative technique, as well as to control the pollutants released from the premises of the proposed Soapstone Mine.

## **CHAPTER 10: SUMMARY AND CONCLUSIONS**

## CHAPTER 10: SUMMARY AND CONCLUSIONS

### 10.0 INTRODUCTION

#### 10.1 PURPOSE OF THE REPORT

M/s Balraj Associates proposes the Soapstone Mine extending over an area of 7.784 ha (30,000 TPA (maximum) of Soapstone) in Village-Karuli, Tehsil & District-Bageshwar, Uttarakhand. The proposal for TOR was considered in its meeting dated 09th February 2019 and since the project is greater than 5 ha, therefore comprehensive EIA report shall be prepared. The draft Environmental Impact Assessment report has been prepared to comply with the standard Terms of Reference (ToR), under EIA notification of the MoEF&CC dated 14th September, 2006 and amended thereof, for seeking environmental clearance for mining of soapstone in the applied mining lease area.

#### 10.2 IDENTIFICATION OF PROJECT & PROJECT PROPONENT 10.2.1 Identification of Project

The Proposed Soapstone mine is executed over an area of 7.784 ha in Village- Village-Karuli, Tehsil & District-Bageshwar, Uttarakhand. The maximum production rate is of 30,000 TPA of soapstone production.

The cost of the project is Rs.10 lakhs.

#### 10.2.2 Project Proponent

M/s Balraj Associates is a private company. The proposed Soapstone Mine extends over an area of 7.784 Ha (30,000 TPA (maximum) of Soapstone) in Village- Karuli, Tehsil & District - Bageshwar, Uttarakhand. The LOI of proposed Soapstone Mine was granted in favour of M/s Balraj Associates for period of 50 years by the Govt. of Uttarakhand. The proposed rate of production is 30,000 TPA (maximum) of soapstone. The estimated project cost is Rs 10 lakhs. The expected life of mine is 50 years.

#### Address of the applicant

M/s Balraj Associates

Bhawan No 12, Ward Piyana,

Tehsil & Dist- Pithoragarh (Uttarakhand)

### 10.3 BRIEF DESCRIPTION OF PROJECT

#### 10.3.1 Nature of the Project

The proposed Soapstone Mine, project will adopt opencast manual cum semi mechanized method. The mine is executed over a lease area of about 7.784 ha, for the production of 30,000 TPA of soapstone.

Therefore as per the EIA Notification dated 15th January, 2016 and 1st July, 2016, the project comes under "B1" Category since the area is greater than 5 ha.

### 10.3.2 Size of the Project

The proposed Soapstone mining project extends over an area of 7.784 ha with the target maximum production capacity of mine is about 30,000 TPA (maximum) of Soapstone.

### 10.3.3 Anticipated Life of Project and Cost of the Project

The projected life of the mine is 50 years. The cost of the project is about Rs. 10 lakhs.

### 10.3.4 Location of the Project

The proposed Soapstone Mine lease comes under Village-Karuli Tehsil & District-Bageshwar, Uttarakhand. Geo-graphically the ML area extends from North Latitude 29°52'2.62" N to 29°52'17.80" N and East Longitude 79°49'25.71" E to 79° 49' 39.22" E with an elevation of about 1187 m reduced level (RL). The area falls in Survey of India topo sheet No. 53 O/13.

## 10.4 PROJECT DESCRIPTION

### 10.4.1 Salient Features of Mine Lease

The salient features of mine lease are given in **Table 10.1** below:

**Table 10.1: Salient Features of mine lease area**

Sr. No.	Parameter	Description
1	Name of the Mine	Proposed Soapstone Mining Project at Village Karuli, Tehsil & District Bageshwar
2	Mining Capacity	30,000 (maximum) TPA of Soapstone
3	Longitude Latitude	29°52'2.62" N to 29°52'17.80" N and 79°49'25.71" E to 79° 49' 39.22" E
4	Method of mining	Opencast semi mechanized method
5	Total ML area	7. 784 Ha
6	Extent of mechanization	Excavator shall be deployed for extraction of top soil, interburden and mineral. No drilling and blasting will be done.
7	Bench height & width	3m
8	Bench Slope	60° to 65°
9	Slope of track	1:8 to 1:20
10	Transportation of Material	The mineral will be supplied in the local market by trucks/tippers.
11	Manpower	126 persons
12	Water Requirement	7.5 KLD
13	Source of Water	Village Panchayat
14	Greenbelt development / Plantation (Mine life end)	0.338 ha
15.	No. of saplings proposed in the next 5 years	1438

#### 10.4.2 Mine Development and Production

The mining will be done semi-mechanized way in open cast method in quite a systematic manner by forming 6m high benches. However, there may be minor variation in the width and height which the lessee will keep on mending. The top soil and interburden to be scrapped with the help of JCB machine, dozer, shovels, pickaxe, spade & crowbar and will be stacked separately in dump yard located near the working pit. The developmental working will be done by construction of road/track to different working benches, removal of top soil and interburden. The soil will be filled into the bags, loaded on mules and unload into stockyard.

Year wise Production details are given in **Table 10.2** below.

**Table 10.2: Year wise Production of Soapstone Mine**

Years	Saleable soapstone (Tonnes)
1st	28000
2nd	29000
3rd	30000
4th	28000
5th	29000
<b>Total</b>	<b>144000</b>

The quantity of soil, interburden from pit to be generated during next five years is given in **Table 10.3** below:

**Table 10.3: Quantity of Top Soil and interburden of Soapstone Mine**

Years	Top Soil (cum)	Interburden (cum)
1st	5107	18444
2nd	3916	19585
3rd	3841	17312
4th	4318	16162
5th	6191	31968
<b>Total</b>	<b>23373</b>	<b>103471</b>

#### 10.4.3 Method of Mining

The mining will be carried out in three pits and will be open cast semi-mechanized method in quite a systematic manner by forming 3m height and 3m width benches. The face slope of benches shall be 60° – 65° with 45° overall pit slope. Average thickness of soil has been considered as 0.50m & it shall be stacked separately. All operations of mining will be carried by using JCB as well as conventional manual means using crowbars, spades and chisel etc as well as by using excavator. The production has been proposed in quarry of the ML area. No deep hole drilling and blasting is proposed.

## 10.5 IMPACT ON LAND USE, RECLAMATION OF MINED OUT AREAS AND AFFORESTATION PROGRAMME

### Impact on land use & reclamation of mined out areas

Opencast mining activities may alter the landscape of the lease area and also cause some disturbance to the surface features of the surrounding areas. Mining will be done after leaving 7.5 m safety barrier.

Plantation will be developed in consultation with district administration/ local authority, wherever feasible.

The Existing land use pattern is agricultural land. The impact on land form or physiography will be land use on the hilly terrain will undergo radical changes due to the open cast mining. During the next five years mining, 2.240 ha land will be degraded due to mining & allied activities.

### **Proposal for reclamation of land affected by mining activities:**

The mining will commence from the higher levels and will advance towards lower levels. Intermittent backfilling will commence from the higher levels and subsequently advance towards the lower elevation so that terraced agriculture fields would undertake in such a manner that original land use will be restored i.e. before the onset of monsoon will be handed over to cultivators for cultivation. The final backfilling will be started once the ultimate benches are formed and pit reaches the optimum economic depth. All recovery of the mineral will be of the saleable grade.

Plantation will be raised in 7.5m barrier zone along the boundaries of the mining lease area by planting the native species around ML area, backfilled and reclaimed area, around water body, roads etc. in consultation with the local DFO/Agriculture department. The details of the year wise plantation have been shown in **Table 10.4**.

**Table 10.4: Year wise Afforestation scheduled**

Year	Area (ha)	No of saplings
First year	0.071	71
Second year	0.059	59
Third year	0.077	77
Fourth year	0.072	72
Fifth year	0.059	59
<b>Total</b>	<b>0.338</b>	<b>338*</b>

**\*Besides these 1100 more no. of more samplings will be done all along the periphery of the mine lease area/in the nearby van panchayat land**

## 10.6 LAND USE PATTERN

Presently (pre-mining), the land covered under the mine lease area is non-forest agricultural land.

## 10.7 BASELINE ENVIRONMENTAL STATUS

### 10.7.1 Soil Quality

Eight soil samples were collected in and around the mine lease area to assess the present soil quality of the region. In the study area, variations in the pH of the soil were found to be slightly basic (7.42 to 7.69). Electrical conductivity (EC) is a measure of the soluble salts and ionic activity in the soil. In the collected soil samples the conductivity ranged from 268 – 440  $\mu\text{mhos/cm}$ .

Based on the results, it is evident that the soils are not contaminated by any polluting sources.

### 10.7.2 Meteorology

Meteorological data at the site was monitored during 1<sup>st</sup> March 2019 to 31<sup>th</sup> May 2019 representing winter season.

### 10.7.3 Ambient Air Quality

Ambient Air Quality Monitoring (AAQM) has been carried out at five locations during pre-monsoon season from March to May 2019. The minimum and maximum level of PM<sub>10</sub> recorded within the study area was in the range of 41.7.1  $\mu\text{g/m}^3$  to 62.8  $\mu\text{g/m}^3$  with the 98th percentile ranging between 58.2  $\mu\text{g/m}^3$  to 61.4  $\mu\text{g/m}^3$ . The minimum and maximum level of PM<sub>2.5</sub> recorded within the study area was in the range of 16.2  $\mu\text{g/m}^3$  to 28.2  $\mu\text{g/m}^3$  with the 98th percentile ranging between 23.2  $\mu\text{g/m}^3$  to 27.7  $\mu\text{g/m}^3$ . The minimum and maximum concentration of SO<sub>2</sub> recorded within the study area was 5.4 to 8.4  $\mu\text{g/m}^3$  with the 98th percentile ranging between 5.8  $\mu\text{g/m}^3$  to 8  $\mu\text{g/m}^3$ . The minimum and maximum level of NO<sub>2</sub> recorded within the study area was in the range of was 7.6  $\mu\text{g/m}^3$  to 17.3  $\mu\text{g/m}^3$  with the 98th percentile ranging between 12.0  $\mu\text{g/m}^3$  to 16.7  $\mu\text{g/m}^3$ . The results thus obtained indicate that the concentrations of PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>2</sub> in the Ambient Air are well within the National Ambient Air Quality (NAAQ) standards for Industrial, Residential, Rural and other areas.

### 10.7.4 Water Quality

To assess the physical and chemical properties of water in the region, water samples from 8 locations were collected from various water sources around the mine lease area.

The pH was varying for ground water from 7.38 to 7.72 and the surface water are 7.26 to 7.82. The total dissolved solids in ground water are varying from 242 mg/l to 276 mg/l whereas in surface water varying from 242 mg/l to 279 mg/l. The chloride level in the ground water samples collected in the study area were ranging from 114 mg/l to a maximum of 24 mg/l, in surface water samples 13 mg/l to 22 mg/l. The hardness is varying from the hardness is varying from 158 mg/l to 190 mg/l, in surface water samples 148 mg/l to 177 mg/l.

The results indicate groundwater is generally in conformity with the drinking water standards (IS: 10500) and surface water is in conformity with IS-2296 standards.

### 10.7.5 Noise Levels

Ambient noise levels were measured at Five locations around the proposed mine site. Assessment of average logarithm night time Leq (Ln) varies from 35.4 to 46.2 dB (A) and the average logarithm daytime Leq (Ld) varies from 41.7 to 51.3 dB (A) within the study area.

### 10.7.6 Ecological Environment

Based on the field studies and review of published literature, it is observed that there are two Schedule-I species present in the study area of the mine lease area i.e. Indian Leopard and Asiatic Black Bear. There are no wildlife sanctuaries and National Parks within the study area of 10-km radius. However, the nearest RF from the mine lease is Gairar Reserve Forest at a distance of 0.6 km.

### 10.7.7 Social Environment

According to the 2011 census of India, Bageshwar has a population of 2,59,898. The total SC population in Bageshwar district is 72,061 which is 27.72% of the total population, while ST population is 1982, which is 0.76% of the total population. The literate population in Bageshwar district is 1,79,483, out of which male & female are 97,546 and 81,937 respectively. The male literates represent 54.35% while female represent 45.65% of the total population.

## 10.8 ANTICIPATED ENVIRONMENTAL IMPACTS

### 10.8.1 Impact on Air Quality

Soapstone mine where  $PM_{10}$  and  $PM_{2.5}$  will be the main pollutants generated in mining activities. The emissions of Sulphur dioxide ( $SO_2$ ), Nitrogen Oxide ( $NO_2$ ) contributed by diesel operated equipment and vehicles movement were considered marginal as branded make and vehicles with PUC certificate will be operated only. Fugitive dust and particulates are major pollutants occurred in the mining activities. Fugitive emissions will be settled by 70- 80% by use of multiple water sprinklers. Prediction of impacts on air environment will be made with proposed production and net increase in  $PM_{10}$  and  $PM_{2.5}$  emissions at the proposed site and at the 10 km radius of study area due to mining activities.

Air pollution sources in the operating mine was classified into two categories

- i. Loading and unloading of mineral and OB, IB
- ii. Transportation on the haul road

### 10.8.2 Impact on Water Resources

#### Surface Water Resources

The topography of the area will not be largely changed in view of the proposed concurrent reclamation. During the mining activity period, there is a possibility of mixing of freshly disturbed material with the rain water. To take care of such happenings, retaining walls have been provided along the backfilled pits and along the soil and interburden dumps.

#### Groundwater Resources

The water table in hills is usually very deep and does not have any relevance with mining activities. However, concurrent restoration to original topography will not be disturbing the percolating water.

### 10.8.3 Impact on Water Quality

The impact on water quality will be confined to increased suspended solids during rain. The dumps will be secured with toe walls and rainy water will not carry significant suspended material.

### 10.8.4 Impact on Noise Levels and Ground Vibrations

With the mining operations, due to the deployment of machinery, operation for mine development, excavation and transportation of soapstone and men, it is imperative that noise levels would increase. Assessment of average logarithm night time Leq (Ln) varies from 35.4 to 46.2 dB (A) and the average logarithm daytime Leq (Ld) varies from 41.7 to 51.3 dB (A) within the study area. It is also observed that these incremental noise levels will not significantly affect the existing ambient noise levels.

### 10.8.5 Impact on Soil

The environmental impacts of the mining activities on topsoil are based on the quantity of removal of topsoil and its dumping. In the present project as it is proposed to temporarily store the topsoil and use it for plantation schemes, no impact of dozing of topsoil is envisaged.

The soil erosion from overburden and interburden dumps is not envisaged in the present project, as sufficient measures as detailed in the EMP would be undertaken.

### 10.8.6 Impact on Flora and Fauna

There is no forest area in the core zone area of the lease. As the mining activity is restricted to core zone, no significant impact on the flora of the buffer zone due to the proposed mining of Soapstone is anticipated.

It is proposed to include *Alternanthera paronychioides*, *Cassia tora* and *Holoptelea integrifolia* in the plantation program as they serve as sinks for gaseous emissions. Extensive plantation comprising of pollutant resistant trees will be undertaken, which will serve not only as pollution sink but also as a noise barrier.

The incremental dust generations due to the mining operations, at the boundary of the mine lease are insignificant and it is also expected that with the adoption of mitigatory measures as suggested in EMP, the impact due to operation of the mine will be minimal on the terrestrial ecosystem and also on the adjacent forest area.

The impact on the fauna of the buffer zone due to the mining activity will be marginal. The proposed progressive plantation over a period of time will reduce the impact, if any, on the fauna.

### 10.8.7 Impact on Land Use Pattern

The proposed opencast mine will result in change the land use pattern of the ML area. The land degradation is expected during mining activities like excavation, overburden dumping, soil

extraction etc. Land requirement for the project has been assessed considering functional needs.

### 10.8.8 Impact on Socio - Economic Aspects

The mine area does not cover any habitation. Hence the mining activity does not involve any displacement of human settlement. No public buildings, places, monuments etc exist within the lease area or in the vicinity. The mining operation will not disturb/ relocate any village or need resettlement. Thus no adverse impact is anticipated.

The impact of mining activity in the area is positive on the socio-economic environment of the region. The proposed Soapstone Mine will be providing employment to local population and it will be give preference to the local people whenever there is requirement of man power.

## 10.9 ENVIRONMENTAL MANAGEMENT PLAN

The summary of environmental mitigation measures are given in **Table-10.5**.

**Table-10.5: Proposed Environmental Mitigation Measures**

<b>Impact Predicted</b>	<b>Suggestive measure</b>
Disturbance of free movement / living of wild fauna	<ul style="list-style-type: none"> <li>• Awareness camps will be conducted for labours to make them aware about sensitivity/importance of forest life.</li> <li>• No tract or new road for movement of labours or vehicles be laid in reserve forest area, this will prevent forest fragmentation, encroachment and human – animal encounter.</li> <li>• Care will be taken that noise produced during vehicles movement for carrying ore materials are within the permissible noise level. Higher noise level in the forest area will lead to restless and failure in detection of calls of mates and young ones.</li> <li>• Care will be taken that no hunting of animals carried out by labours.</li> <li>• If wild animals are noticed crossing the core zone, it will not be disturbed at all.</li> <li>• Labours will not be allowed to discards food, plastic etc., which can attract animals near the core site.</li> <li>• Only low polluting vehicle will be allowed for carrying ore materials. All vehicles allowed in the project site area will have to provide pollution under control certificate at the end of three months.</li> <li>• No honk will be allowed in the forest area, noise level will be within permissible limit (silent zone-50dB during day time) as per noise pollution (regulation and</li> </ul>

	control), rules, 2000, CPCB norms.
Harvesting of forest flora	<ul style="list-style-type: none"> <li>• No tree cutting, chopping, lumbering, uprooting of shrubs and herbs should be allowed.</li> <li>• No pilling of ore material should in the reserve forest area.</li> <li>• Collections of economically important plants will be fully restricted.</li> </ul>

## 10.10 ANALYSIS OF ALTERNATIVES

The Soapstone has been identified based on the result of geological investigations and exploration carried out by the Geological Survey of India (GSI). The mining projects are site specific as such alternate sites were not considered.

The mine is operated by opencast cum semi-mechanized method of mining. No other alternative technologies can be used because of the hard nature of the ore. Proposed mine is using eco-friendly measures to minimize the impact of mining on the surrounding environment.

## 10.11 COST ESTIMATES

The details of the cost to for the Environmental Management plan for 5 years, the budget for Corporate Environmental Responsibility (CER) (per year) and year wise allocation of funds for the various activities proposed to be taken up under CSR programme has been given in **Table 10.6**, **Table 10.7** and **Table 10.8** respectively.

**Table-10.6: Budget for Environmental Management Plan**

S. No.	Measures	Cost (In Rs.) (per year)
1.	Water Sprinkling for dust suppression	50,000
2.	Environmental Monitoring : (i) Ambient Air Quality Monitoring (ii) Ambient Noise Monitoring (iii) Water Quality Sampling & Analysis (iv) Soil Quality Sampling & Analysis	1,00,000
3.	Plantation of trees along with their maintenance for green belt	1,43,800
4.	Cost for Retaining wall/Toe wall	74,700
<b>Total</b>		<b>3,68,500</b>

**Table 10.7: Budget for Corporate Environmental Responsibility (CER) (per year)**

S. No.	Measures	Cost (In Rs.) (per year)
1.	Sanitation facilities	50,000
2.	Skill Development for villagers	30,000
3.	Awareness to local farmers to increase yield of crop and fodder	40,000
4.	Plantation in the community areas/schools and van panchayat land of nearby villages	50,000
<b>Total</b>		<b>1,70,000</b>

**Table 10.8: Year wise allocation of funds for the various activities proposed to be taken up under CSR programme**

S. No.	Activities	Allocation of Fund (Rs.)
1	Health Camps	25,000
2	Drinking Water Facilities	15,000
3	Maintenance of foot track	25,000
4	Donation for Temple Construction	15,000
5	Donation for cultural activities in the surrounding areas	20,000
<b>Total</b>		<b>1,00,000</b>

## 10.12 ADDITIONAL STUDIES

### 10.12.1 Risk Assessment and Disaster Management Plan

The complete mining operation will be carried out under the management control and direction of a qualified mine manager holding Mines Manager's Certificate of Competency. Moreover, mining staff will be sent to refresher courses from time to time to keep them updated.

### 10.12.2 Disaster Management Plan

Emergency preparedness is an important aspect in the planning of Disaster Management. Personnel would be trained suitably and prepared mentally and physically in emergency response through carefully planned, simulated procedures. Similarly, the key personnel and essential personnel shall be trained in the operations.

## 10.13 PUBLIC CONSULTATION

### 10.13.1 Public Hearing

In consonance with the EIA notification dated 14th September 2006, vide section 1 (a) related to Public Hearing, the draft EIA/EMP report has been submitted to the Uttarakhand Environment Protection & Pollution Control Board (UEPPCB) for public hearing. The public Hearing has been conducted on 21.08.2019 at Project Site, Near Sam Ju Temple, Village-Karuli, Tehsil & District Bageshwar in the presence of ADM Bageshwar.

## 10.14 PROJECT BENEFITS

The impact on the civic amenities will be substantial after the commencement of mining activities. Medical facilities will be provided in the form of first-aid facility at the mine. These medical facilities will also be available to local people in the surrounding in case of emergencies.

- Generation of employment and improved standard of living;
- Increased revenue to the State by way of royalty, taxes and duties; and
- Superior communication and transport facilities etc.

The employment of local people in primary and secondary sectors of project will upgrade the prosperity of the region.

#### **10.15 CONCLUSIONS**

- The mining operations will meet the compliance requirements of MoEF&CC;
- Community impacts will be beneficial, as the project will generate significant economic benefits for the region;
- Adoption of Best Available Technology and Best Management Practices with more environmental friendly process; and
- With the effective implementation of the Environment Management Plan (EMP) during the mining activities, the proposed project can proceed without any significant negative impact on environment.

# **Chapter 11: DISCLOSURE OF CONSULTANT ENGAGED**

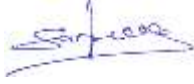
## Chapter 11: DISCLOSURE OF CONSULTANT ENGAGED

Declaration by Experts contributing to the EIA: Mining of Soapstone from Lease Area (7.784 Ha.) at Village- Karuli, Tehsil & Bageshwar, Uttarakhand. I, Sanjeev Sharma hereby certify that I was a part of the EIA team in the following capacity that developed the above EIA.

EIA coordinator

Name: Sanjeev Sharma

Signature and Date:




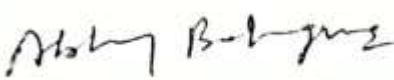
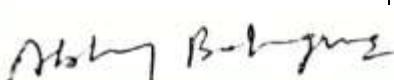



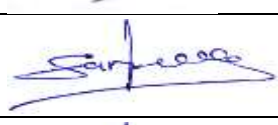




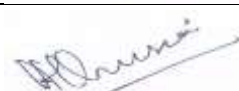
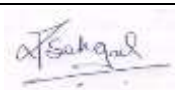
13-06-2019

Period of Involvement: March, 2019 to Till date

Contact Information: eis@enviroinfrasolutions.com

### Functional area experts:

S. No.	Functional Areas	Name of the experts	Involvement (period and task)	Signature and date
1.	AP	Sanjeev Sharma	March, 2019 to Till date	
2.	WP	Anoop Kishore Mishra	March, 2019 to Till date	
3.	SHW	Sanjeev Sharma	March, 2019 to Till date	
4.	SE	Abhay Bahaguna	March, 2019 to Till date	
5.	EB	Abhay Bahaguna	March, 2019 to Till date	
6.	HG	Ishan Jain	March, 2019 to Till date	
7.	GEO	B. M. Sinha	March, 2019 to Till date	
8.	SC	ML Sharma	March, 2019 to Till date	
9.	AQ	Sanjeev Sharma	March, 2019 to Till date	
10.	NV	Sanjeev Sharma	March, 2019 to Till date	

11.	LU	Yasir Ahmed	March, 2019 to Till date	
12.	RH	Anoop Kishore Mishra	March, 2019 to Till date	
<b>Functional Area Associate (FAA)</b>				
1.	AP & NV	Rishabh Sehgal	March, 2019 to Till date	

Declaration of association in the EIA

Declaration by the Head of the accredited consultant organization/ authorized person

I, ML Sharma hereby, confirm that the above-mentioned experts prepared the EIA of Mining of Soapstone from Lease Area (7.784 Ha.) at Village- Karuli, Tehsil & District - Bageshwar, Uttarakhand. for M/s Balraj Associates. I also confirm that the consultant organization shall be fully accountable for any mis-leading information mentioned in this statement.



Signature:

Name: ML Sharma

Designation: Director

Name of the EIA consultant organization: Enviro Infra Solutions Pvt. Ltd.

NABET Certificate No. & Issue Date: NABET/EIA/1619/IA 0018 dated January 05 2017