

DRAFT EIA/EMP REPORT

FOR OBTAINING ENVIRONMENTAL CLEARANCE

(Category - B1, under item 1 (a), as per EIA Notification 14th September' 2006 and its subsequent amendments till date)

FOR

“BOULDER STONE MINE”

Location: Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya

Production Capacity: - 4,97,110 TPA of ROM (Boulder stone: 3,97,690TPA & Waste/Subgrade: 99,420TPA)

Area: - 4.99 Ha

Proposed Mining Lease Validity: - 30 Years



- Details of ToR** : Issued by SEIAA, Meghalaya vide letter no. ML/SEIAA/MIN/EKH/81/2020/4/1346 dated 15th Dec, 2020
- Baseline data Generation** : December 2022 to February 2023(Winter Season)
- Project Cost** : Rs. 463.6804Lacs

PROMOTER

Shri Khrikshon Lyngkhoi

R/o: K.L.Complex, Demseiniong, Shillong,
East Khasi Hills, Meghalaya

ENVIRONMENTAL CONSULTANT

Gaurang Environmental Solutions Pvt. Ltd.

#102, SNG, Shree Ratna Apartment,
PeetalFactory,JhotwaraRoad, Bani Park, Jaipur-302016

E-mail: gaurangenviro@gmail.com

NABET Accreditation: NABET/EIA/2023/ RA0192

May, 2023

Project:- Boulder Stone Mine

Applicant:- Sh. KhrikshonLyngkhoi

INDEMNIFICATION

Utmost care has been taken in preparation of this report vis a vis for proposed Boulder Stone Mine situated at Village- SyllaiMadan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya promoted by **Shri KhrikshonLyngkhoi**. The data incorporated in the report is generated through information received from clients in form of their Mining Plan received through e-mail, secondary information, besides stakeholder's interaction and inputs. Due care has been taken to represent facts and figures and sources acknowledged. The purpose of this document is to facilitate environmental appraisal of the proposal and as such the exercise has been scientifically carried out. The Consultant stand indemnified against any consequences arising out of any inadvertent omissions.

REVISION HISTORY

| | |
|----------------|-------------------------|
| Report No. | GESPL_501/EIA/2022-23/ |
| Type of report | DraftEIA/EMP Report |
| Revision No. | 00 |
| Issue to | Shri Khrikshon Lyngkhoi |
| Issue Date | 03.06.2023 |





National Accreditation Board for Education and Training



Certificate of Accreditation

Gaurang Environmental Solutions Pvt. Ltd., Jaipur

**102, SNG Shree Ratna Apartments, Near Tambi Petrol Pump, Jhotwara Road, Banipark, Jaipur,
Rajasthan-302016**

The organization is accredited as **Category-'A'** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations, Version 3: for preparing EIA-EMP reports in the following Sectors –

| S. No. | Sector Description | Sector (as per) | | Cat. |
|--------|---|-----------------|-----------|------|
| | | NABET | MoEFCC | |
| 1. | Mining of minerals including opencast / underground mining | 1 | 1 (a) (i) | A |
| 2. | Offshore and onshore oil and gas exploration, development & production | 2 | 1 (b) | A |
| 3. | Thermal power plants | 4 | 1 (d) | B |
| 4. | Mineral beneficiation | 7 | 2 (b) | A |
| 5. | Metallurgical industries (ferrous & non-ferrous) | 8 | 3 (a) | A |
| 6. | Cement Plants | 9 | 3 (b) | A |
| 7. | Chemical fertilizers | 16 | 5 (a) | A |
| 8. | Synthetic organic chemicals industry | 21 | 5 (f) | A |
| 9. | Distilleries | 22 | 5 (g) | A |
| 10. | Isolated storage & handling of hazardous chemicals | 28 | - | B |
| 11. | Airports | 29 | 7 (a) | A |
| 12. | Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes | 31 | 7 (c) | A |
| 13. | Common hazardous waste treatment, storage and disposal facilities | 32 | 7 (d) | A |
| 14. | Bio-medical waste treatment facilities | 32A | 7 (da) | B |
| 15. | Ports, harbours, break waters and dredging | 33 | 7 (e) | A |
| 16. | Highways, | 34 | 7 (f) | B |
| 17. | Common Effluent Treatment Plants (CETPs) | 36 | 7 (h) | B |
| 18. | Common Municipal Solid Waste Management Facility (CMSWMF) | 37 | 7 (i) | B |
| 19. | Building and construction projects | 38 | 8 (a) | B |
| 20. | Townships and Area development projects | 39 | 8 (b) | B |

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated Dec 24, 2020 and supplementary assessment minutes dated April 6, 2021, posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/21/1612 dated Feb 01, 2021. The accreditation needs to be renewed before the expiry date Gaurang Environmental Solutions Pvt. Ltd following due process of assessment.



Sr. Director, NABET
Dated: July 16, 2021

Certificate No.
NABET/EIA/2023/RA 0192 (Rev.02)

Valid till
Dec 07, 2023




| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Sh. KhrikshonLyngkhoi | Disclosure of Consultant Engaged |




DISCLOSURE OF CONSULTANT ENGAGED

Declaration by Experts contributing to the EIA of Proposed “**Boulder Stone Mine**” of 4, 97,110 TPA of ROM (Boulder stone: 99,420 TPA & Waste/Subgrade: 3, 97,690 TPA) capacity coming up at Village- SyllaiMadan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya of Sh. Khrikshon Lyngkhoi.

I hereby, certify that I was a part of the EIA team in the following capacity that developed the above EIA.




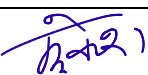





| EIA Coordinator | | Signature & Date |
|-----------------------|---|--|
| Name | Neha Bhargava |  |
| Period of Involvement | 2022-23 | |
| Contact Information | #102, SNGShriRatna Apartment, Near Tambi Petrol Pump, Peetal Factory, JhotwaraRoad, Jaipur – 302016 Email-id:- gaurangenviro@gmail.com | |

Functional Area Experts:-

| S. No. | Functional Areas | Name of the Expert/s | Involvement (Period & Task**) | Signature & Date |
|--------|------------------|----------------------|--|---|
| 1 | AP | PoojaYadav | ➤ Prediction of air pollution impact and its management. |  |
| 2 | WP | PoojaYadav | ➤ Prediction of water pollution and its management. ➤ Water balance. |  |
| 3 | SHW | PoojaYadav | ➤ Identification of nature of waste, categorization, and quantity of generated OB/ waste. ➤ Prediction of waste pollution and its management. |  |



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|---|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Sh. Khrikshon Lyngkhoi | Disclosure of Consultant Engaged |

| | | | | |
|----|-----|-------------------------|---|---|
| 4 | SE | Gajendra Singh Rathore | <ul style="list-style-type: none"> ➤ Secondary data of Census of India, 2011. ➤ Socio Economic Impact Assessment. |  |
| 5 | EB | Dr. Yati Kachhawa | <ul style="list-style-type: none"> ➤ Identification of species (flora and fauna). ➤ Prediction of Impact and management. |  |
| 6 | HG | Mr. Mukesh Suroliya | <ul style="list-style-type: none"> ➤ Hydrogeological survey for assessing aquifer distribution of the area ➤ Water resource evaluation of the area. |  |
| 7 | GEO | Mr. Mukesh Suroliya | ➤ Field Survey for assessing the regional and local geology of the area. |  |
| 8 | AQ | Mallikarjuna M. Guttula | ➤ Air Quality Modelling and its interpretation. |  |
| 9 | NV | Mallikarjuna M. Guttula | <ul style="list-style-type: none"> ➤ Prediction of Noise pollution. ➤ Mitigation measures |  |
| 10 | LU | Vinod Kumar Verma | ➤ Satellite imagery and Inference |  |
| 11 | RH | Ginni Barotia | <ul style="list-style-type: none"> ➤ Assessment of risk involved, if any. ➤ Management Plan for safety. |  |
| 12 | SC | Pradyuma A. Deshpande | <ul style="list-style-type: none"> ➤ Identification of existing quality of soil. ➤ Prediction of Impact and its management. |  |

***One TM against each FAE may be shown**


****Please attach additional sheet if required**

Team Member

Declaration by the Head of the Accredited Consultant Organization

I, Vipul Khandelwal, hereby, confirm that the above mentioned experts prepared the EIA of Proposed “Boulder Stone Mine” of 4, 97,110 TPA of ROM (Boulder stone: 99,420 TPA & Waste/Subgrade: 3, 97,690 TPA) capacity coming up at Village- Syllai Madan, Laitkynew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya of Sh. Khrikshon Lyngkhoi. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

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|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Sh. KhrikshonLyngkhoi | Disclosure of Consultant Engaged |

| | |
|---|---|
| Signature |  |
| Name | VipulKhandelwal |
| Designation | Director |
| Name of the EIA Consultant Organization | Gaurang Environmental Solutions Pvt. Ltd. |
| NABET Certificate No. & Issue Date | NABET/EIA/2023/RA 0192 (Rev.02) |

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| IV | COPY OF APPROVED MINING PLAN ALONG WITH APPROVAL LETTER | |
| V | COPY OF CLUSTER CERTIFICATE | |
| VI | ENVIRONMENTAL MONITORING REPORT | |
| VII | MAP SHOWING CORNER COORDINATES ON GOOGLE MAP | |
| VIII | COPY OF ToR | |

Project:-Boulder Stone Mine

Applicant:- Sh. Khrikshon Lyngkhoi

EIA/EMP REPORT



| | |
|--|-----------------------------------|
| Project:- Boulder Stone Mine | |
| Applicant:- ShriKhrikshonLyngkhoi | Chapter – I - Introduction |

CHAPTER-I

INTRODUCTON

| | |
|--|-----------------------------------|
| Project:- Boulder Stone Mine | |
| Applicant:- ShriKhrikshonLyngkhoi | Chapter – I - Introduction |

CHAPTER-I INTRODUCTION

1.1 PURPOSE OF THE REPORT

Gaurang Environmental Solutions Pvt. Ltd. has been assigned the job by Shri Khrikshon Lyngkhoi to carry out Environmental Impact Assessment (EIA) studies and preparation of EIA report with suitable EMP for the proposed Boulder Stone Mine situated at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya. The project activity is listed at item 1(a) B1 Mining of Minerals in Schedule of EIA Notification, 2006 and subsequent amendments thereafter as category “B” project and hence require prior Environmental Clearance.

However, as per the EIA Notification No. S. O. 3977 (E) dated 14th August’ 2018& S.O. 1795 dated 20.04.2022 – EC proposal of Boulder Stone Mining and other Minor mineral Mining in Cluster situation “Cluster of mine lease of area ≥ 5 hectares with individual lease size ≤ 250 ha. The total cluster area is 9.22Ha.

As per the Ministry of Environment, Forest & Climate Change Office Memorandum dated 12th December 2018 “If the cluster or an individual lease size exceeds 5 ha the EIA/EMP be made applicable in the process of grant of prior Environmental Clearance.

Details of the cluster are as below:-

| S. No. | Name of the Mine | Area (Ha.) | Mineral | Distance from the approved Mining Plan of KhrikshonLyngkhoi’s mine(m) |
|--------------|------------------------|-------------|---------------|---|
| 1. | Shri KhrikshonLyngkhoi | 4.99 | Boulder Stone | - |
| 2. | Sh. KhrikshonLyngkhoi | 4.23 | Boulder Stone | 10 |
| Total | | 9.22 | -- | -- |

Hence, the project is treated as “B1” category project.

The objective of the Environmental Impact Assessment (EIA) report is:-

- To identify, predict and evaluate the environmental, economical, and social impact due to project activities;
- To provide information on the environmental consequences for decision making and;
- To promote environmentally sound and sustainable development through the identification of appropriate alternatives and mitigation measures.

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Baseline studies for one season i.e. Winter Season (December 2022 to February 2023) along with field surveys were conducted and potential environmental impacts of the project activities are identified, assessed and their mitigation measures are documented in this EIA/ EMP report.


1.2 REGULATORY COMPLIANCES

| Legal Provisions | Letter Nos. | Date | Annexure No. |
|--|---|------------|--------------|
| NOC from DorbarShnongLaitkynsew | -- | 31.10.2017 | I |
| Involvement of No Forest land from the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong | KH/9/NOC/STONE/41/Pt.V/14 | 13.04.2018 | II |
| LOI issued by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. | KH/8/ML/Stone/69/ | .2018 | III |
| Approval of Mining Plan with PMCP from the GoI, Directorate of Mineral Resources, Shillong | | | IV |
| Cluster certificate (500m radius) from the Gov. of Meghalaya, Directorate of Mineral Resources, Shillong | DMR/MM/169/2018/1130 | 25.9.2029 | V |
| TOR Granted for Environmental Clearance by SEIAA, Meghalaya | ML/SEIAA/MIN/EKH/81/2020/4/1346 | 15.12.2020 | VIII |
| Public hearing Conducted by MSPCB | Draft EIA/EMP report is being submitted for Public Hearing. | - | - |
| No litigation is pending against the project in the court of law as the information provided by Project Proponent. | | | |

1.3 IDENTIFICATION OF PROJECT & PROJECT PROPONENT

1.3.1 IDENTIFICATION OF THE PROJECT

The proposed project “Boulder Stone Mine” is situated at SyllaiMadan, Laitkynsew, LaitlyngkotKhyrimSyiemship, District- East Khasi Hills, State: Meghalaya.

| | | |
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The total lease area of the project is 4.99Ha. The mining activity will be carried out by open cast semi-mechanized method.

1.3.2 INTRODUCTION OF PROJECT PROPONENT

Shri KhrikshonLyngkhoi, Applicant of mining lease for Boulder Stone, area 4.99hectare is interested to involve in mining with this mining lease situated at SyllaiMadan, Laitkynsew, LaitlyngkotKhyrimSyiemship, District- East Khasi Hills, State: Meghalaya.

Details of the Project Proponent are as given below:-

| | |
|---------------------------------|--|
| Name & Address of the Applicant | Applicant: - Shri KhrikshonLyngkhoi R/o K.L. Complex, Demseiniong, Shillong,East Khasi Hills, Meghalaya |
|---------------------------------|--|

1.4 BRIEF DESCRIPTION OF NATURE, SIZE, LOCATION OF THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY, REGION.

1.4.1 BRIEF DESCRIPTION AND NATURE OF PROJECT

The Letter of Intent has been sanctioned in favour of Shri Khrikshon Lyngkhoi vide letter no.KH/8/ML/Stone/69/Dated 2018by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong.The proposed mine is spread over an area of4.99 ha.with mineable reserves of about 35,82,600Tonnes to produce 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA). The proposed mining operations will be carried out by open cast semi - mechanized method.

1.4.2 SIZE

The size and magnitude of the lease area is as given below:-

Table 1.1: Size or Magnitude

| S. No. | Particulars | Details | | |
|--------|--------------------|------------|---------|--|
| 1. | Lease Area (Ha.) | 4.99 | | |
| 2. | Cluster Area (Ha.) | 9.22 | | |
| S. No. | Name of the Mine | Area (Ha.) | Mineral | Distance from the approved Mining Plan of GVIL Shale |

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| | | | | Mine (meters) |
|---|---------------------------|---|---------------|----------------------|
| 1. | Shri KhrikshonLyngkhoi | 4.99 | Boulder Stone | - |
| 2. | Sh. KhrikshonLyngkhoi | 4.23 | Boulder Stone | 10 |
| Total | | 9.22 | -- | -- |
| 3. | Total Mineable Reserves | 35,82,600Tonnes | | |
| 4. | Life of Mine | 9.5 or say 10Years | | |
| 5. | Production | 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA) | | |
| 6. | Period of the Lease | 30 | | |
| 7. | Total Man Power (Nos.) | 67 | | |
| <i>Source: Approved Mining Plan with PMCP</i> | | | | |

1.4.3 LOCATION OF THE PROJECT

The proposed Boulder Stone Mine is situated at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya.

The geographical location with respect to boundary pillars of the proposed mine are:-

Table 1.1: Geographical Position of the Boundary Pillars

| Pillars | Latitude (N) | Longitude (E) |
|---|---------------------|----------------------|
| A. | 25°24'12.636" | 91°51'40.788" |
| B. | 25°24'13.356" | 91°51'40.248" |
| C. | 25°24'14.292" | 91°51'39.384" |
| D. | 25°24'14.976" | 91°51'39.132" |
| E. | 25°24'17.424" | 91°51'40.716" |
| F. | 25°24'14.929" | 91°51'52.164" |
| G. | 25°24'12.708" | 91°51'55.008" |
| H. | 25°24'10.584" | 91°51'52.02" |
| <i>*Source:- Approved Mining Plan with PMCP</i> | | |

1.4.4 IMPORTANCE TO THE COUNTRY, REGION

The need and the importance of this Mine Project is mainly for the construction purpose for development (Private as well as Government projects).



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The mineral excavated from this mining project could be directly used as boulders of different sizes for River Anti-erosion, Dam construction, embankment works etc.

The mining activities will increase better employment opportunities. Average income level which is the indicator of socio-economic status of house hold is expected to increase with greater dependency on mining industry.

1.5 EIA PROCESS

As per EIA Notification dated 14th September 2006, as amended from time to time; this project falls in Category “B” under project or activity 1(a) (Mining of Minerals).

The prior Environmental Clearance process for proposed project will comprise of three stages. These stages in sequential order are:-

1. Scoping
2. Public Consultation
3. Appraisal

The flow-chart depicting these stages to obtain the prior Environmental Clearance for Category B project from SEIAA, Meghalaya is as given below in Figure 1.1.:-



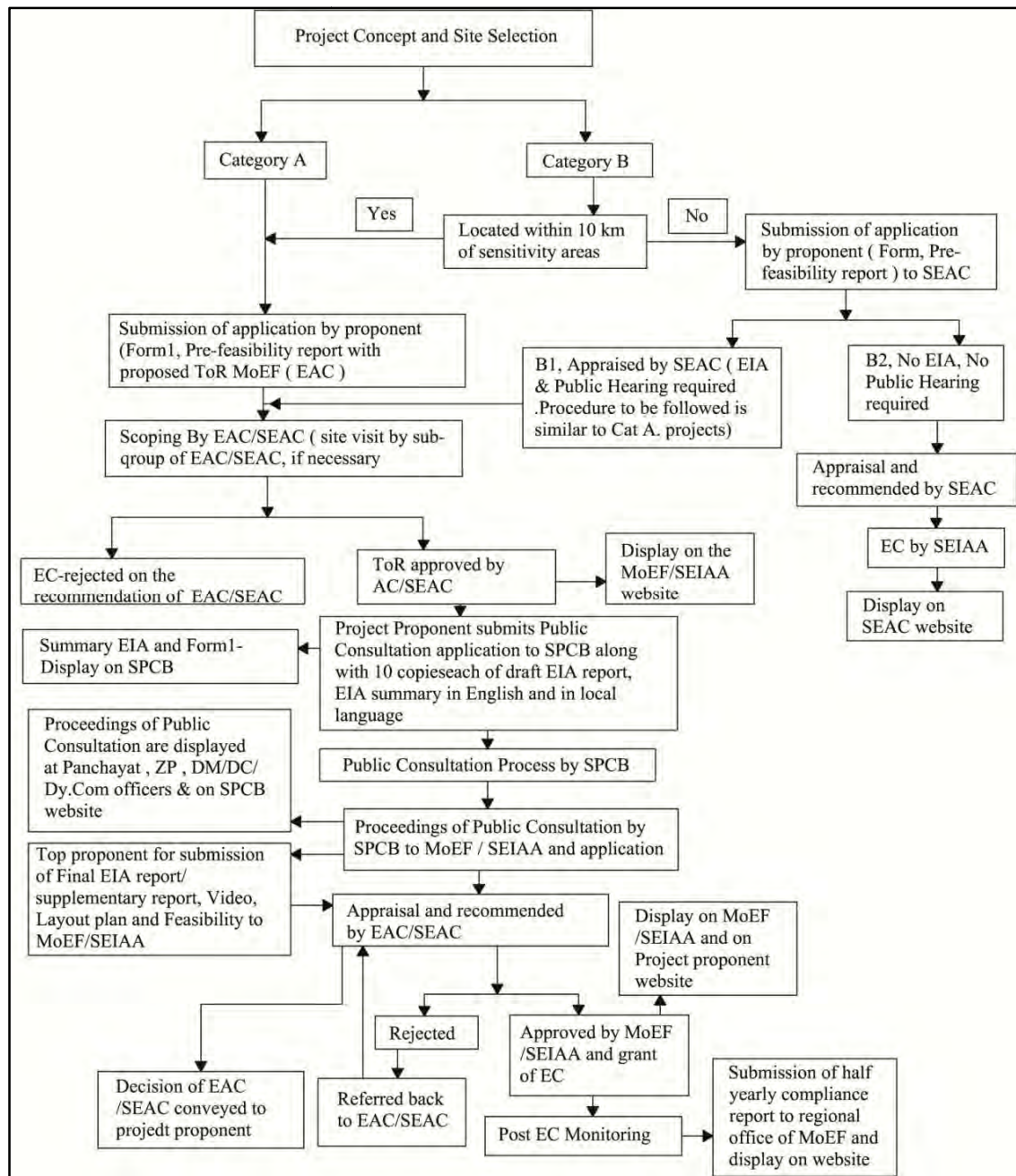


Figure 1.1: Stages for obtaining prior Environmental Clearance

1.6 SCOPE OF THE STUDY/ COMPLIANCE OF THE TOR

Terms of Reference for the Boulder Stone Minewere accorded by SEIAA, Shillong (Meghalaya). The point wise compliance of the approved TOR is as under:-



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| TOR Ref. | TOR Detail | Implementation / Plan |
|-----------------|---|---|
| 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. | This is a Greenfield project. Hence, it 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 Letter of Intent has been issued in favour of Shri KhrikshonLyngkhoi vide letter no. KH/8/ML/Stone/69/10515 Dated 20.08.2018 by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. This specifies the PP is the rightful lessee. Enclosed as Annexure – III . |
| 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 and mining technology and should be in the name of lessee. | As desired all the documents including approved Mining Plan along with Progressive Mine Closure Plan and this draft EIA/EMP report are compatible with one another in terms of the mine lease area, production levels, waste generation and its management. Enclosed as annexure IV |
| 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 Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone). | Map showing all corner coordinates of the mining lease area along with other geomorphology & geology features and other ecological features of the study area is Enclosed as Annexure VII . Map showing land use and other ecological features of the study area (core and buffer zone) is given in chapter III and also enclosed as annexure IX |
| 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 | The geological map of the area, geomorphology of land forms, existing minerals and mining history of the area, water bodies, streams and river along with soil characteristics has been given in Chapter – III, Sub-Section – 3.2 of EIA/ EMP Report. |



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| | and mining history of the area, important water bodies, streams and river and soil characteristics. | |
| 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 land proposed for mining activities are in harmony with the Letter of Intent issued in favour of Shri KhrikshonLyngkhoi vide letter no. KH/8/ML/Stone/69/ Dated.2018 by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. This specifies the PP is the rightful lessee. Enclosed as Annexure – III . Thus, the land use policy of the State is in sync. |
| 7. | It should be clearly stated whether the proponent company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA report with description of the prescribed operating process/ procedures to bring into focus any infringement/ deviation/ violation of the environmental or forest norms/ conditions? | Details are given below:- |

Environmental Policy

Sh. KhrikshonLyngkhoi is engaged in Boulder Stone Mines situated at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya affirms commitments to maintain clean & sustainable environment through continual improvement of environment performance as an integral part of business philosophy.

In order to achieve this goal we stand committed to:-

- Carry out operations in an environmental responsible manner to comply with applicable legal & other requirements related to environmental aspects.
- Adopting environmental friendly alternatives to environment aspects.
- Involve in social welfare & environmental development activated for locality around the lease hold area.
- Efficient use of natural resources, energy and equipments.
- Ensure environment related information, dissemination and training to our employees.

Providing the resources necessary for employees and associates to conduct their work in accordance with applicable environmental regulations.



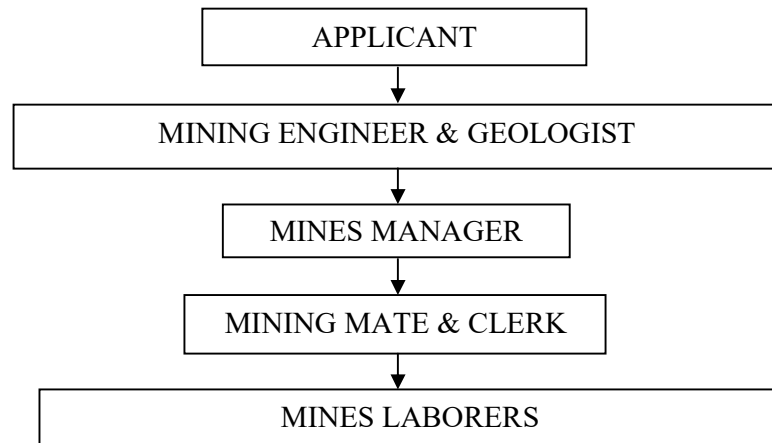
STANDARD OPERATING PROCEDURE

A statement showing the responsibilities assignment for compliance of various statutory provisions applicable to the company are as under:-

| S. No. | Relevant Acts/Rules | Functional Person Responsible |
|--------|--|--|
| 1. | Air (Prevention and Control of Pollution) Act,1981 | Environmental Officer/ Mining Engineer |
| 2. | Water (Prevention and Control of Pollution) Act,1974 | Environmental Officer/ Mining Engineer |
| 3. | Environmental Protection Act, 1986 | Environmental Officer/ Mining Engineer |
| 4. | Any other Rules, Regulations and Notifications related to Mining | Environmental Officer/ Mining Engineer |
| 5. | Compliance of regulatory requirements | Environmental Officer/ Mining Engineer |
| 6. | Overall Compliance Management | Environmental Officer/ Mining Engineer |

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 hierarchical system or administrative order of the Company to deal with the environmental issues is as given below:-



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.

Environmental Officer/Mining Engineer will appraise the highest authority on quarterly basis regarding the performance of the mine on environmental measures.

8. Issues relating to mine safety, including subsidence study in case of underground mining and slope study in case of open cast

No underground workings exist in the lease area. Hence, subsidence study was not desirable.
Slope Study

| | | |
|-----|--|--|
| | <p>mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.</p> | <p>As per MMMCR’ 2016 pit slope at 45° will be maintained to balance between operational and economic efficiency and safety. Slope angle at 45° will be maintained.</p> <p><u>Blasting Study</u></p> <ul style="list-style-type: none"> ➤ Blasting will be done by the authorized contractors. ➤ Controlled & delayed blasting will be carried out. |
| 9. | <p>The study area will comprise of 10Km 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.</p> | <p>Draft EIA report comprise of 10 km zone around the mine lease from lease periphery and details of waste generation, life of mine/lease period has been discussed in chapter 2 (sub-section 2.9.4 Section 2.9 & subsection 2.8.1.4 of section 2.8 respectively)</p> |
| 10. | <p>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.</p> <p>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.</p> | <p>The map showing along with tabulated form for land use of the study area showing forest area, agriculture land, grazing land, water bodies, human settlement etc. has been given at Chapter- III, Sub - Section - 3.4.1 of EIA/ EMP Report.</p> <ul style="list-style-type: none"> ➤ No any national park, Wildlife Sanctuary and conservation reserve is located within the 10 km periphery of the mine. <p>Map showing land use of the study area are is shown in Chapter – III</p> <p>Land use plan of the mine lease area to encompass pre-operational, operational and post–operational phases is given in Chapter – II, Sub-Section –2.5.6 of EIA/ EMP Report.</p> <p><u>Change of Land use</u></p> <p>Pre-Operational:- The mining activity undertaken will be progressive with removal of vegetation and soil cover. The top soil will be stored at non mineralized area and used for plantation. The impact on the area due to this will be insignificant and perceived over the extent of broken up area.</p> <p>Operational:- The proposed mining will be initiated horizontally (extend the pit) to nullify the perceived impact. The magnitude of impact will gradually reduce with effective EMP planning. The plantation plan will gradually inflate the adversity of impact and topography of the mined out area will gradually change impacting the lease area only.</p> |



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| | | Post-Operational:- With effective EMP, the post mining scenario will have lush green cover to enrich the eco-system with maximum pit area of 4.35 ha. out of which 4.15 ha. area will be converted into water reservoir and rest 0.20 ha. area will be backfilled and reclaimed and rehabilitated by plantation. The aesthetics of the area will mitigate the impact to harmonize development of conservation. |
| 11. | Details of the land for any overburden 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. | <ul style="list-style-type: none"> ➤ No OB dump is proposed outside the mine lease area. ➤ No R & R issues are involved (as per RFCTLARR Act' 2013). |
| 12. | A certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees. | No forest land is involved within the lease area. The same has been authenticated from the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong vide letter No. KH/9/NOC/STONE/41/Pt.V/14 dated 13.04.2018. Enclosed as Annexure – II. |
| 13. | Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated. | The area is not covered under Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. |
| 14. | 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 | No any national park, Wildlife Sanctuary and conservation reserve is located within the 10 km periphery of the mine lease area. Impact |



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| | surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted. | Habitat Loss & fragmentation: Mitigation Measures 1. Safe passage to Existing Wild-life 2. Restoration of habitat 3. Physiographic change of Habitat (Land Management) 4. Barbed wired fencing to prevent fall of animals in the mining pits 5. Anti-poaching /anti-depredation activity 6. Provision of hired vehicle for Rapid Response Team 7. Health Camps and Cattle Immunization 8. Awareness, Training and Capacity building |
| 15. | Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed), if any, within 10Km 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 toproximity of the ecologically sensitive areas as mentioned above, should be obtained fromthe Standing Committee of National Board of Wildlife and copy furnished. | No any national park, Wildlife Sanctuary and conservation reserve is located within the 10 km periphery of the mine lease area. |
| 16. | A detailed biological study of the study area [core zone and buffer zone (10 Km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, 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 along with budgetary | A detailed biological study of flora and fauna (core and buffer zone) has been carried out and the outcome has been given in Chapter – III, Sub-Section – 3.8 of EIA/ EMP Report. |



| | | |
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| | <p>provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.</p> | |
| 17. | <p>R&R Plan/compensation details of the ProjectAffected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & ResettlementPolicy 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 sectoralprogrammes of line departments of the StateGovernment. It may be clearly brought out whether the village(s) located in the mine leasearea 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.</p> | <ul style="list-style-type: none"> ➤ There is no habitation within the mine lease area. ➤ Hence, as per the RFCTLARR Act' 2013 (Right to Fair Compensation, Transparency in Land Acquisition, Rehabilitation & Resettlement) is not applicable in this project. |
| 18. | <p>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</p> | <ul style="list-style-type: none"> ➤ One – season data i.e. Winter Season (December, 2022 toFebruary, 2023) was collected as per guidelines. ➤ AAQ data includes PM₁₀, PM_{2.5}, NO_x, SO₂, CO including mineralogical composition of PM₁₀ particularly for free silica was carried. ➤ The detailed report along with data generated for air pollutants and micro-meteorological parameters i.e. Wind speed, direction, Temperature, Monitoring Period, Location etc. are given in Chapter – III of EIA/ EMP Report at the following pages:- |



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, should be given.

| S. No. | Particulars | Table No. | Page Nos. |
|--------|----------------------------|-----------|-----------|
| 1. | Land Environment (Soil) | 3.3 | 70-71 |
| 2. | Water Environment | 3.4 | 73-76 |
| 3. | Ambient Air Quality | 3.8 | 80-81 |
| 4. | Noise Level | 3.11 | 82-83 |
| 5. | Biological Environment | 3.12-3.21 | 91-114 |
| 6. | Socio-Economic Environment | 3.22-3.25 | 117,120 |

The monitoring station selected represents the whole of study area is as described under:-

| Sampling Location | Distance (Km) | Direction | Components |
|-------------------|---------------|-----------|-------------------------|
| Mine Site | -- | -- | Air, Water, Noise, Soil |
| Pomlum | 1.3 | ENE | Air, Water, Noise, Soil |
| Mawkajem | 1.1 | ESE | Air, Water, Noise, Soil |
| Dymmlew | 2.7 | SSE | Air, Water, Noise, Soil |
| Umktieh | 2.7 | S | Air, Water, Noise, Soil |
| Lewmawlong | 2.0 | WNW | Air, Water, Noise, Soil |
| Setthliew | 5.15 | NNW | Air, Water, Noise, Soil |

Environmental Monitoring Report is enclosed as **Annexure VI**.

19. 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.
- In order to predict the impact AERMOD version 8.8.0 Dispersion Model, based on steady state Gaussian Plume Dispersion, was used for air quality modeling.
- Impact of movement of vehicles for transportation of Mineral**
- The AERMOD Version 8.8.0 view dispersion model used for air quality prediction includes the transportation, dispersion and transformation of emissions emitted into the air.
- The isopleths showing air quality contours indicating the location of site, sensitive receptors, and pre-dominant wind direction has been given in Chapter - IV, Sub-Section - 4.4.1 of EIA/ EMP Report.



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| 20. | The water requirement for the project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should be indicated. | Water Requirement: - 5.0 KLD (1.00 KLD will be used for domestic purpose, 2.0 KLD for Dust Suppression and 2.00 KLD for plantation). Source: - Water demand will be met through tanker supply of nearby village/water stream. Detailed water balance has been given in Chapter- II, Sub-Section -2.5.3 of EIA/ EMP Report. |
| 21. | Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided. | Water demand will be met through tanker supply of nearby water stream. |
| 22. | Description of water conservation measures proposed to be adopted in the project should be given. | To conserve water following measures will be adopted:- ➤ The daily consumption of water 5.0 KLD. ➤ The same will however, gradually get reduced with effective water conservation measures like pit water for plantation. ➤ Post-monsoon and Pre-monsoon groundwater level will be monitored regularly. |
| | Details of rainwater harvesting proposed in the project, if any, should be provided. | ➤ Garland drain will be channelized to settling tanks of 1.0m x 1.0m x 1.0m size. ➤ It will be regularly de-silted especially after rains. ➤ At conceptual stage, 4.15 ha. area will be excavated which will be converted into water reservoir. |
| 23. | 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. | Impact of the project on the water quality, both surface and groundwater has been assessed and detailed in Chapter – IV, Sub-Section- 4.3.2 along with necessary safeguard measures. The proposed safeguard measures to minimize the impact of mining on surface & ground water is as given below:- <u>Impact on Surface Water</u> ➤ There will be no change in the natural drainage pattern of the area (buffer) due to mining. ➤ Garland drains and settling ponds will arrest the wash off and prevent the impact. <u>Impact on Ground Water</u> ➤ The ultimate pit level will be above the Ground water table. Hence, water table will not be intersected by mine |



| | | <p>workings.</p> <p>➤ The domestic waste water (0.70 KLD) will be channelized into septic tank followed by soak pit.</p> <p><u>Mitigation</u></p> <p>➤ Hydro-census will be carried out to monitor the quality, fluctuation etc.</p> <p>The budget allocated for water pollution measures has been incorporated in Environmental Protection Measures in Chapter – IV, Sub-Section – 4.9 of EIA/ EMP Report.</p> | | | | | | | | | | | | |
|--------|---|--|--------|-------------|--------------|----|-------------------|------|----|------------------|------|----|--------------------|------|
| 24. | 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. | <p>As per the approved Mining plan, the ground water table will not be altered due to mining activities/operation as it will be operated above the ground water table.</p> <p>Hence, no intersection of ground water table.</p> | | | | | | | | | | | | |
| 25. | 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. | <p>➤ No prominent stream or seasonal nallah is passing through the lease area. However, the rain water will follow the natural course of drainage.</p> <p>➤ Therefore, no intersection of water table will occur. Hence, project will not cause any significant impact on hydrology.</p> | | | | | | | | | | | | |
| 26. | 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. | <p>The detail of the elevation, ground water table and working level is given below:-</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr style="background-color: #d9ead3;"> <th style="text-align: center;">S. No.</th> <th style="text-align: center;">Particulars</th> <th style="text-align: center;">Levels (mRL)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Highest Elevation</td> <td style="text-align: center;">1785</td> </tr> <tr> <td style="text-align: center;">2.</td> <td>Lowest Elevation</td> <td style="text-align: center;">1765</td> </tr> <tr> <td style="text-align: center;">3.</td> <td>Ultimate Pit Limit</td> <td style="text-align: center;">1715</td> </tr> </tbody> </table> <p>*Source: - Approved Mining Plan with PMCP</p> | S. No. | Particulars | Levels (mRL) | 1. | Highest Elevation | 1785 | 2. | Lowest Elevation | 1765 | 3. | Ultimate Pit Limit | 1715 |
| S. No. | Particulars | Levels (mRL) | | | | | | | | | | | | |
| 1. | Highest Elevation | 1785 | | | | | | | | | | | | |
| 2. | Lowest Elevation | 1765 | | | | | | | | | | | | |
| 3. | Ultimate Pit Limit | 1715 | | | | | | | | | | | | |



27. A time bound progressive greenbelt development plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the project. Phase wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. 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.

A time bound progressive greenbelt development plan in tabular form is given below:-

| Ecology: Stage Wise Cumulative Plantation | | | | | | | | | | |
|--|-----------------------|---------------------|-------------------|---------------------|------------------------|---------------------|-----------------------|---------------------|-------------------|---------------------|
| REQUIREMENTS FOR PLANTS FOR AFFORESTATION AND RECLAMATION | | | | | | | | | | |
| Year | Un-worked Area | | Waste Dump | | Backfilled Area | | Top Soil Dumps | | Total | |
| | Area (Ha.) | No. of Trees | Area (Ha.) | No. of Trees | Area (Ha.) | No. of Trees | Area (Ha.) | No. of Trees | Area (Ha.) | No. of Trees |
| Existing | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| I | 0.06 | 150 | -- | -- | -- | -- | -- | -- | 0.06 | 150 |
| II | 0.06 | 150 | -- | -- | -- | -- | -- | -- | 0.06 | 150 |
| III | 0.06 | 150 | -- | -- | -- | -- | -- | -- | 0.06 | 150 |
| IV | 0.06 | 150 | -- | -- | -- | -- | -- | -- | 0.06 | 150 |
| V | 0.06 | 150 | -- | -- | -- | -- | -- | -- | 0.06 | 150 |
| End of the life of mine | 0.10 | 250 | 0.15 | 375 | 0.20 | 500 | -- | -- | 0.45 | 1125 |
| Total | 0.40 | 1000 | 0.15 | 375 | 0.20 | 500 | -- | -- | 0.75 | 1,875 |

28. 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

Impact on local transport Infrastructure
 ➤ Tippers will be brought by the buyers of the Stone.

| S. | Particulars | Remark |
|-----------|--------------------|---------------|
|-----------|--------------------|---------------|



| <p>(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 Indian Road Congress Guidelines.</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr style="background-color: #d9ead3;"> <th style="width: 10%;">No.</th> <th style="width: 60%;"></th> <th style="width: 30%;"></th> </tr> <tr> <td style="text-align: center;">1.</td> <td>Total production per day</td> <td>➤ 1657.03 TPD of Mineral</td> </tr> <tr> <td style="text-align: center;">2.</td> <td colspan="2">Tippers will be brought by the buyers of the Stone.</td> </tr> </table> | No. | | | 1. | Total production per day | ➤ 1657.03 TPD of Mineral | 2. | Tippers will be brought by the buyers of the Stone. | | <p>The impact due to transportation has been estimated using AERMOD View 8.8.0 and details has been given in Chapter – IV, Sub-Section – 4.4.1 of EIA/ EMP Report.</p> |
|--|---|---|--|--|----|--------------------------|--------------------------|----|---|--|--|
| No. | | | | | | | | | | | |
| 1. | Total production per day | ➤ 1657.03 TPD of Mineral | | | | | | | | | |
| 2. | Tippers will be brought by the buyers of the Stone. | | | | | | | | | | |
| 29. | <p>Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.</p> | <p>According to Mines Rule 1955, following temporary infrastructure facilities will be provided:-</p> <ul style="list-style-type: none"> ➤ Mine Office (On-site); inclusive of vocational training; ➤ Rest Shelter; ➤ Drinking Water Facilities; ➤ Conservancy Facilities; ➤ First-Aid Facilities. | | | | | | | | | |
| 30. | <p>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.</p> | <p>The conceptual post mine land use and reclamation and rehabilitation plan of mined out area is given below:-</p> | | | | | | | | | |

| S. No. | Description | Plantation | Water Body | Public Use | Undisturbed | Total |
|--------|-----------------------------|------------|------------|------------|-------------|-------|
| 1 | Top Soil Dump | 00 | 00 | 00 | 00 | 00 |
| 2 | Waste Dump | 0.15 | 00 | 00 | 00 | 0.15 |
| 3 | (a) Excavation (Voids) | 00 | 4.15 | 00 | 00 | 4.15 |
| | (b) Excavation (backfilled) | 0.20 | 00 | 00 | 00 | 0.20 |
| 4 | Road | 00 | 00 | 00 | 00 | 00 |
| 5 | Built Up Area | 00 | 00 | 00 | 00 | 00 |
| 6 | Township Area | 00 | 00 | 00 | 00 | 00 |
| 7 | Afforestation | 0.40 | 00 | 00 | 00 | 0.40 |
| 8 | Mineral Storage | 00 | 00 | 00 | 00 | 00 |
| 9 | Processing | 00 | 00 | 00 | 00 | 00 |
| 10 | Undisturbed Area | 00 | 00 | 00 | 0.09 | 0.09 |

| | Total | 0.75 | 4.15 | 00 | 0.09 | 4.99 |
|-----|--|---|-------------|-----------|-------------|-------------|
| 31. | 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. | | | | | |
| | | <p>Anticipated Occupational Health Impacts</p> <p>Physical Hazards:- It includes:-</p> <ul style="list-style-type: none"> ➤ Mechanical; ➤ Electrical; ➤ Noise and Vibration. <p>Chemical Hazards:- It includes:-</p> <ul style="list-style-type: none"> ➤ Fugitive Dust; ➤ Particulate Matter; ➤ Silica; CO; Fumes (Sulphur Dioxide, Oxides of Nitrogen). <p>Proposed Preventive Measures</p> <ul style="list-style-type: none"> ➤ It's an open cast method of mining, timing of exposure of workers due to high noisy and dusty zone will be restricted. ➤ Use of Personal Protective Equipment (PPE's) to protect the worker from the residual risk; ➤ Basic facilities such as adequate drinking water supply, rest shelters etc. will be provided. <p>Medical Examination Schedule</p> <ul style="list-style-type: none"> ➤ All workers will be subjected to Initial Medical Examination at the time of appointment. ➤ Periodical Medical Examination will be conducted at least once in five years. ➤ All the examination stated in Form – O under Rule – 29 – B as per Mines Rule' 1955 will be carried out. <p>The schedule Pre-placement Medical Examination and Periodical Medical Examination along with the preventive measures have been detailed in the EMP of the Chapter – VII, Sub – Section – 7.3.3 of EIA/ EMP Report.</p> | | | | |
| 32. | 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 | | | | | |
| | | <p>There will be insignificant impact on public health due to project implications. As the zone was identified based on incremental GLC's. It was observed to be 2.0 – 3.0Km around the mineral transportation routes. To minimize the impact due to dust generation following precautions will be taken:-</p> | | | | |



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| | budgetary allocations. | <ul style="list-style-type: none"> ➤ Proper avenue plantation will be carried out along the kuccha road. ➤ The speed of the vehicles will be maintained low (25 Kmph). It will minimize the fugitive dust generation. ➤ However, due to low speed more vehicular exhausts will generate. To control the vehicular exhausts PUC certified vehicles will be used. ➤ Vehicles will be covered with tarpaulin covers. ➤ The impact zone of 2-3 Km radius will have massive social agro forestry campaign undertaken. ➤ The haul road emissions will be significant due to the wake formation of mobilization of vehicles. |
| 33. | 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. | Based on the secondary data and public hearing comments, suggestions the mitigations is suggested with the time frame and budget allocation. |
| 34. | Detailed Environmental Management Plan to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project. | Based on the baseline study and impact prediction, the detailed Environmental Management Plan has been prepared. All the possible environmental issues were addressed properly. The detailed Environmental Management Plan is given in Chapter – X. |
| 35. | 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. | This draft EIA/EMP report is being submitted for public consultation.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 will be provided and incorporated in the final EIA/ EMP Report of the Project. |
| 36. | Details of litigation pending against the project, if any, with direction/ order passed by any Court of Law against the project should be given. | There is no litigation pending against the project/ direction passed by any court of law against the project. |



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|-----|---|---|--------------------|---------------------------------------|---|
| 37. | The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out. | S. No. | Particulars | Capital Cost (Rs. In Lacs) | Recurring Cost (Rs. In Lacs) |
| | | 1. | Project Cost | 463.6804 Lacs | -- |
| | | 2. | EMP Cost | 7.75 | 4.45 |
| 38. | A Disaster Management Plan shall be prepared and included in the EIA/ EMP Report. | A Disaster Management Plan has been given in Chapter– VI, Sub-section – 7.2 of EIA/ EMP Report. | | | |
| 39. | 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. | <ul style="list-style-type: none"> ➤ The mining and associated activities in the mineral bearing areas bring about gains in gross domestic product. India is considered a hub for limestone supplies and exports with low profit margins. ➤ There is a large gap between the demand and supply of mineral. The new project aims to fill the demand – supply gap through optimum allocation and excavation of natural resources required to meet the demand effectively. | | | |
| 40. | The Action Plan on the compliance of the recommendations of the CAG as per Ministry's circular No. J-11013/71,12016-14. I (M) dated 25.10.2017 need to be submitted at the time of appraisal of the project and included in the EIA/EMP Report. | Complied. | | | |
| 41. | The activities and budget earmarked for Corporate Environmental Responsibility (CER) shall be as per Ministry's O.M. No.22-65/2017-IA.III dated 01.05.2018 and the action plan on the activities proposed under CER shall be submitted at the time of the project included in the EIA/EMP Report. | The mitigation measures and budget will be given under the Management Plan. As per the Office Memorandum September 30, 2020 based on public hearing points the mitigation measures activities will be allocated and the budget will be allotted. | | | |
| 42. | Compliance of the Ministry's Office Memorandum No.F: 3-50/2017-IA.III [Pt), dated 30.05.2018 on the Judgement of Hon'ble Supreme Court, dated the 2nd August, 2017 in Writ Petition (Civil) No.114 of 2014 in the matter of Common Cause | The same is noted and complied. | | | |



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versus Union of India needs to be submitted and included in the EIA/EMP Report.

Besides the above, the below mentioned general points are also to be followed:-

| | | |
|----|--|---|
| a. | All documents to be properly referenced with index and continuous page numbering. | All documents have been properly referenced with index, page numbers and continuous page numbering. |
| b. | Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated. | The data presented in the report especially in table, along with the period in which the data was collected and the source has been incorporated. |
| c. | 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. | All the analysis/ testing reports of water, air, soil and noise has been enclosed as Annexure –VI. |
| d. | Where the documents provided are in a language other than English, an English translation should be provided. | English translation has been provided for each document. |
| e. | The Questionnaire for Environmental Appraisal of industrial projects as devised by the Ministry shall also be filled and submitted. | The questionnaire for environmental appraisal of mining projects as devised by the Ministry is enclosed. |
| f. | While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4 th August, 2009, which are available on the website of this Ministry should also be followed. | All instruction mentioned in O.M. No. J-11013/41/2006-IA.II (I) dated 4 th August, 2009 are being complied with. |
| g. | Changes, if any made in the basic scope and project parameters (as submitted in Form-1 and the F.R. for securing the TOR) should be brought to the attention of MoEF with reasons for such changes and permission should be sought, as the TOR may also have | There is no change made in the basic scope and project parameter. |



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| | 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. | | | | | | | | | | | |
|--------|---|---|--------|-------|--------------|----|--------------|--------------------------------|----|------------------------------|----|---|
| h. | As per the circular no. J-11011 16L8/201.0-1A.lfl) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environmental 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. | This is proposed mine. It is being appraised first time for Environmental Clearance. Hence, not applicable. | | | | | | | | | | |
| i. | 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. | <table border="1"> <thead> <tr> <th>S. No.</th> <th>Plans</th> <th>Annexure No.</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Surface Plan</td> <td rowspan="3">Enclosed in Mining Plan</td> </tr> <tr> <td>2.</td> <td>Geological Maps and Sections</td> </tr> <tr> <td>3.</td> <td>Sections of the mine pit and external dumps</td> </tr> </tbody> </table> | S. No. | Plans | Annexure No. | 1. | Surface Plan | Enclosed in Mining Plan | 2. | Geological Maps and Sections | 3. | Sections of the mine pit and external dumps |
| S. No. | Plans | Annexure No. | | | | | | | | | | |
| 1. | Surface Plan | Enclosed in Mining Plan | | | | | | | | | | |
| 2. | Geological Maps and Sections | | | | | | | | | | | |
| 3. | Sections of the mine pit and external dumps | | | | | | | | | | | |

Additional Conditions

| i | Letter of Intent (LOI) should be renewed as the validity has expired. | The Letter of Intent has been sanctioned in favour of Shri Khrikshon Lyngkhoi vide letter no. KH/8/ML/Stone/69/10515 Dated 20.08.2018 by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. which is enclosed as Annexure – III . LOI extension will be submitted with final EIA/EMP report. | | | | | | |
|-------------|---|---|-------------|---------|------|---|---------|--|
| ii | Site photographs together with photographs and other related details of site visits by resource persons of NABET accredited consultant of project proponent, with their names and profession/ designation, together with date(s) of visit, date(s) of data collection including name of instrument/ machine | <p>Details of Site Visit NABET accredited Consultant along with their Name, designation and dates are as given below:-</p> <table border="1"> <thead> <tr> <th>Particulars</th> <th>Details</th> </tr> </thead> <tbody> <tr> <td>Name</td> <td>: Gaurang Environmental Solutions Private Limited</td> </tr> <tr> <td>Address</td> <td>: 102, SNG Shri Ratna Apartment Peetal Factory, Jhotwara Road,</td> </tr> </tbody> </table> | Particulars | Details | Name | : Gaurang Environmental Solutions Private Limited | Address | : 102, SNG Shri Ratna Apartment Peetal Factory, Jhotwara Road, |
| Particulars | Details | | | | | | | |
| Name | : Gaurang Environmental Solutions Private Limited | | | | | | | |
| Address | : 102, SNG Shri Ratna Apartment Peetal Factory, Jhotwara Road, | | | | | | | |



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| | actually used in the field, during preparation of EIA report, is to be clearly highlighted in the EIA/ EMP report. | | Jaipur-302016 |
| | | NABET Accreditation No. | : NABET/ EIA/ 2023/ RA 0192 (Rev. 01) dated July 16, 2021 valid upto Jan 19, 2023 |
| | | Mr. VidyaBhushanTri vedi | : EIA Coordinator |
| | | Dr. YatiKachhawa | : Functional Area Expert |
| | | Mr. Vinod Kumar Verma | : Functional Area Expert |
| iii | A comprehensive Environment Management Plan and Regional Environment Management Plan is to be furnished in the EIA/EMP. | Noted. | |
| iv | Plagiarism check certificate for EIA/EMP report has to be furnished. | Noted. | |
| v | Boundary pillars with the height not less than 2.5 feet above the ground level and 1.5 feet below ground and minimum 8 inches on all face of pillar should be erected. | Noted. | |
| vi | GPS coordinates of each pillars should be carved/painted clearly on the pillars with Red colour. | GPS coordinates of each pillars will be carved/painted clearly on the pillars. | |
| vii | Source of data taken from external sources is to be mentioned clearly. | The source of data taken from external sources has been mentioned clearly in EIA/EMP report. | |

1.7 POST – ENVIRONMENTAL CLEARANCE MONITORING

The Company/Lessee/Owner will submit a half yearly compliance report in respect of stipulated prior Environmental Clearance terms and conditions on 1st June and 1st December of each calendar year. The latest such compliance report will be displayed on the website of the concerned regulatory authority.

1.8 GENERIC STRUCTURE OF ENVIRONMENTAL IMPACT ASSESSMENT

In terms of EIA Notification of the MoEF&CC, New Delhi dated 14th September 2006 and its subsequent amendments, the generic structure of the EIA document is as under:-

| | | |
|---|--|--------------------|
|  | Gaurang Environmental Solutions Pvt. Ltd. | Page 38 |
| | Report Ref: GESPL_501/EIA/2022-23/ | Rev. No. 00 |

| | |
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| Project:- Boulder Stone Mine | |
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Table 1.2: Generic structure of EIA document

| S. No. | Chapters | Page Nos. |
|---------------|--|------------------|
| 1 | Introduction | 14-41 |
| 2 | Project Description | 42-56 |
| 3 | Description of the Environment | 57-124 |
| 4 | Anticipated Environmental Impact & Mitigation Measures | 125-147 |
| 5 | Analysis of Alternatives (Technology and Site) | 148-149 |
| 6 | Environmental Monitoring Programme | 150-157 |
| 7 | Additional Studies | 158-164 |
| 8 | Project Benefits | 165-168 |
| 9 | Environmental Cost Benefit Analysis | 169-170 |
| 10 | Environmental Management Plan | 171-179 |
| 11 | Summary & Conclusion | 180-198 |
| 12 | Disclosure of Consultant Engaged | 199-201 |

| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – II–Project Description |

CHAPTER - 2

PROJECT DESCRIPTION



| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – II–Project Description |

2.0 PROJECT DESCRIPTION

2.1 TYPE OF PROJECT

The proposed project is an open cast semi-mechanized method of “Boulder Stone Mine” catering to Shri Khrikshon Lyngkhoi. The mine is situated at Village- Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya. The mining lease area is 4.99 ha. having production capacity of 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA).

2.2 NEED FOR THE PROJECT

The need and the importance of this Mine Project is mainly for the construction purpose for development (Private as well as Government projects).

The mineral excavated from this mining project could be directly used as boulders of different sizes for River Anti-erosion, Dam construction, embankment works etc.

The mining activities will increase better employment opportunities. Average income level which is the indicator of socio-economic status of house hold is expected to increase with greater dependency on mining industry.

2.3 LOCATION OF THE PROJECT (MAPS SHOWING GENERAL LOCATION, SPECIFIC LOCATION, PROJECT BOUNDARY & PROJECT SITE LAYOUT)

The mine is situated at Village- Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya. The geographical position of the Mining Lease Boundary Pillars is given in Table 2.1.

Table 2.1: Geographical Position of the Boundary Pillars

| Pillars | Latitude (N) | Longitude (E) |
|---------|---------------|---------------|
| A. | 25°24'12.636" | 91°51'40.788" |
| B. | 25°24'13.356" | 91°51'40.248" |
| C. | 25°24'14.292" | 91°51'39.384" |
| D. | 25°24'14.976" | 91°51'39.132" |
| E. | 25°24'17.424" | 91°51'40.716" |



| | |
|--|---|
| Project:- Boulder Stone Mine | |
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| | | |
|----|---------------|---------------|
| F. | 25°24'14.929" | 91°51'52.164" |
| G. | 25°24'12.708" | 91°51'55.008" |
| H. | 25°24'10.584" | 91°51'52.02" |

**Source:- Approved Mining Plan with PMCP*

The map showing general location of the proposed mine is given in Figure 2.1 and specific location along with project boundary is given in Figure 2.2.



| | |
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| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – II–Project Description |

2.4 SIZE OR MAGNITUDE OF OPERATION

The size and magnitude of the project is as given below:-

Table 2.2: Size or Magnitude

| S. No. | Particulars | Details |
|---------------|------------------------|--|
| 1. | Lease Area (Ha.) | 4.99 |
| 2. | Mineable Reserves (MT) | 35,82,600 Tonnes |
| 3. | Proposed Production | 4, 97,110 TPA of ROM (Boulder stone: 3,97,690 TPA & Waste/Subgrade: 99,420TPA) |



| | |
|--|---|
| Project:- Boulder Stone Mine | |
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| | | |
|----|------------------------|---------------|
| 4. | Period of the Lease | 30 Years |
| 5. | Total Man Power (Nos.) | 67 |
| 6. | Elevation | 1785-1765 mRL |
| 7. | Ultimate Pit Limit | 1715 mRL |

2.5 INFRASTRUCTURE (PROJECT REQUIREMENTS)

2.5.1 AMENITIES/ FACILITIES

The site services like rest room shelter, first-aid facility, mines office, stores, drinking water facilities, toilets etc. will be provided to the workers at the mine site during operational phase.

However, the nearest basic amenities/ facilities available within 10Km study area and is given Table 2.3.

Table 2.3: Basic Amenities/ Facilities within the Study Area

| S. No. | Nearest Amenities | Distance & Direction (From Lease Boundary) | | |
|--------|------------------------------------|---|------------------------------|------------------|
| 1. | Police Station | Pynursla Police Station-10.6 KM, SSE | | |
| 2. | Post Office | Pynursla Post Office-10.9 KM, SSE | | |
| 3. | Power supply | Nil | | |
| 4. | Educational Facilities | Educational Facilities | Distance (Km) | Direction |
| | | | (From Lease Boundary) | |
| | | RCLP SCHOOL | 1.0 | ESE |
| | | J. S. MEMORIAL SCHOOL | 5.3 | NNW |
| | | Kyntiew Shaphrang Higher Secondary School Laitlyngkot | 5.0 | NNW |
| | Wah Shnong L. P School Laitlyngkot | 5.85 | NNW | |
| 5. | Medical Facilities | Medical Facilities | Distance (Km) | Direction |
| | | | (From Lease Boundary) | |
| | | LAITLYNGKOT PHC | 5.0 | NNW |
| | | Kynton-U-Mon Veterinary Dispensary | 13.15 | NNE |
| | Station Sick Quarter | 15.0 | NNW | |

**Source: - Google Earth*



| | |
|--|---|
| Project:- Boulder Stone Mine | |
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2.5.2 POWER

No power is required due to day shift working. Hence, no electricity is required. Electricity is required only for office use.

2.5.3 NEAREST SOURCE OF WATER SUPPLY AND DEMAND

The daily water demand will be 5.0KLD. Out of which 1.00KLD will be used for domestic purposes, 2.0 KLDfor plantation and 2.0 KLD for dust suppression. Water demand will be met through tanker supply of nearby water stream or other water sources.

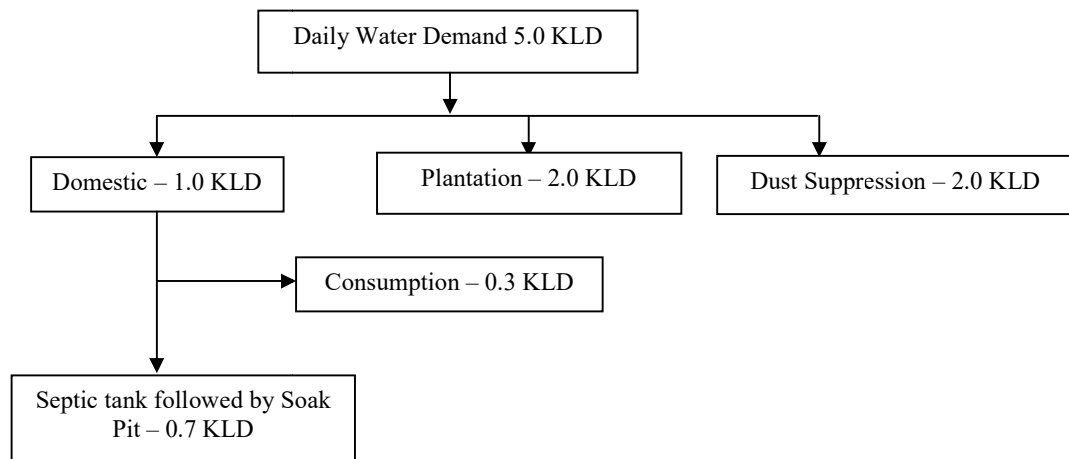


Figure 2.3: Water Balance

2.5.4 MANPOWER REQUIREMENTS

The proposed project will generate employment opportunities for about 67 people. Preference will be given to eligible local people for employment. In spite of direct employment, there will also be many indirect employment opportunities. The list of technical and non-technical staff is presented in Table 2.4.

Table 2.4: Manpower (Technical and Non-Technical) Requirement

| S. No. | Particulars | Nos. |
|--------|----------------|------|
| 1 | Highly Skilled | 5 |
| 2 | Skilled | 17 |
| 3 | Semi - Skilled | 20 |
| 4 | Un-Skilled | 25 |



| | |
|--|---|
| Project:- Boulder Stone Mine | |
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| | |
|--------------|-----------|
| Total | 67 |
|--------------|-----------|

2.5.5 LAND OWNERSHIP/OCCUPANCY

Table 2.5: Land Use of the Mine Lease Area

| S. No. | Type of Land | Area (Ha.) | Ownership |
|--------------|--------------|-------------|-----------|
| 1. | Private Land | 4.99 | Private |
| Total | | 4.99 | - |

2.5.6 LAND USE PATTERN

The land use for mining and allied purposes is given in Table 2.6.

Table 2.6 (a) : Land use Pattern

| S. No. | Land Use Category | Pre-Operational (Ha.) | Operational (Ha.) | Post-Operational (Ha.) |
|--------------|---------------------------------|--------------------------|----------------------|---------------------------|
| 1 | Top Soil Dump | -- | 0.01 | -- |
| 2 | Overburden Dump | -- | 0.15 | 0.15 |
| 3 | Pit & Quarry Area | -- | 3.95 | 4.35 |
| 4 | Road | -- | 0.05 | -- |
| 5 | Infrastructure/Plant/Crusher | -- | 0.40 | -- |
| 6 | Afforestation | -- | 0.30 | 0.40 |
| 7 | Mineral Storage | -- | -- | -- |
| 8 | Waste/Sub – grade stack yard | -- | -- | -- |
| 9 | Reclamation* | -- | -- | * |
| 10 | Undisturbed Area | 4.99 | 0.13 | 0.09 |
| Total | | 4.99 | 4.99 | 4.99 |

**Shown at table no. 2.6 (b)*

Table 2.6 (b):Reclamation

| Conceptual Land Degradation | Proposed Reclamation | |
|--------------------------------|----------------------|--|
| | Area in Ha. | Measures |
| 4.90 | 0.55 | Green belt and afforestation of waste dump by plantation |
| | 3.45 | Bottom benches shall be converted for water storage |



| | |
|--|---|
| Project:- Boulder Stone Mine | |
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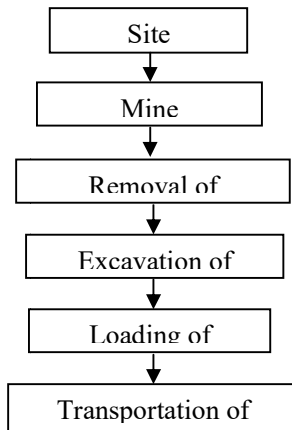
| | | |
|--|------|--|
| | 0.20 | Back-filling with waste & rejects and subsequent afforestation |
|--|------|--|

2.6 PROPOSED SCHEDULE FOR APPROVAL AND IMPLEMENTATION

Mining activities will be started after grant of Environmental Clearance. Mining activities will be commencing as per the five year Mining Plan.

2.7 TECHNOLOGY AND PROCESS DESCRIPTION

The proposed mining operations will be carried out by open cast semi-mechanized method. Various mining activities such as excavation of mineral, loading and transportation will be carried out to ensure maximum mineral conservation and minimum environmental degradation. The process flow diagram given below depicts the mining process:-



2.8 PROJECT DESCRIPTION

2.8.1 GEOLOGY

2.8.1.1 Regional Geology

The generalized stratigraphic sequence of the region is given below:-

Table 2.7: Regional Geology

| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – II–Project Description |

| Geological Age | Group Name | Formation Name | Rock Type |
|------------------------|-------------------|-------------------------------|---|
| Recent | Newer Alluvium | Unclassified | Sand, Silt and Clay |
| -----UNCONFIRMITY----- | | | |
| Pleistocene | Older Alluvium | Unclassified | Sand, Clay, Pebble, Gravel and boulder deposits |
| -----UNCONFIRMITY----- | | | |
| Mio- Pliocene | Dupitula Group | Unclassified | Mottled Clays, Feldspathic sandstone and conglomerate. |
| -----UNCONFIRMITY----- | | | |
| Oligo- Miocene | Garó Group | Chengopara Formation | Sand, Siltstone, Clay, Mart |
| | | Baghmara Formation | Feldspathic Sandstone, Pebble, Conglomerate, Clay, Silty Clay. |
| | | Simsang Formation | Boulder Stonee, Sandstone, Mart |
| Eocene | Jaintia Group | Kopili Formation | Siltstone-sandstone altemations, sand |
| | | Shella Formation | Altemation of sandstone- lime stone |
| | | Langpar Formation | Calcareous Boulder Stonee, Sandstone, Limestone |
| Upper Cretaceous | Khasi Group | Mahadek Formation | Arkose(glauconitic) |
| | | Bottom Conglomerate Formation | Conglomerate, Arkose |
| | | Jadukata Formation | Sandstone- Conglomerate altemation |
| -----UNCONFIRMITY----- | | | |
| Jurassic | Sylhet Trap | - | Basalt, alkali Basalt, Rhyolite acid tuff. |
| -----UNCONFIRMITY----- | | | |
| Pre- Cambrian | - | Intrusives (Acid and Basic) | Ponphyritic and coarse granites, aplite, quartz vein,epidiorite, dolerite, basalt |
| | | Shillong Group | Quartzite, Phyllite, Conglomerate |
| -----UNCONFIRMITY----- | | | |
| Archaean | - | Gneissic Complex | Biotite- gneiss, Biotite- Hornblend gneiss, granitic gneiss, |



| | |
|--|---|
| Project:- Boulder Stone Mine | |
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| | | | |
|--|--|--|--|
| | | | Migmatite, mica-schist, sillimanite- quartz schist, biotite-granulite- amphibolites, pynoxene-granulite etc. |
|--|--|--|--|

2.8.1.2 Local Geology

The Boulder Stone is exposed at few places within lease area. The Boulder Stone has strike is unknown as area is not exposed/outcropped and Dip seems vertical in absence of workings. No fault, fold and geological disturbances are observed in the area. The succession of rocks in the lease area is as given below:-

Table 2.8: Local Geology

| Geological Age | Group Name | Formation Name | Rock Type |
|------------------------|----------------|------------------|---------------------------|
| Recent | Newer Alluvium | Unclassified | Sand, Silt and Clay |
| -----UNCONFIRMITY----- | | | |
| Eocene | Jaintia Group | Shella Formation | Calcareous Boulder Stonee |

2.8.1.3 Geological and Mineable Reserves as per UNFC Classification

The mineral reserves as per UNFC are as follows:-

Table 2.9: Geological Reserves

| A) Total Mineral Reserves | UNFC Code | Boulder Stone (Tonnes) |
|---------------------------------|-----------|------------------------|
| Proved Mineral Reserves | 111 | 16,44,400 |
| Probable Mineral Reserves | 121 & 122 | 19,38,200 |
| Total Mineable Reserves | | |
| B) Total Remaining Resources | | |
| Feasibility Mineral Resources | 211 | 2,90,190 |
| Pre-Feasible Mineral Resources | 221+222 | 8,30,630 |
| Measured mineral resources | 331 | |
| Indicated Mineral resources | 332 | |
| Inferred Mineral Resources | 333 | 9,22,940 |
| Reconnaissance mineral resource | 334 | |



| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – II–Project Description |

2.8.1.4 Proposed Rate of Production when Mine is fully Developed and expected Life of the Mine

The mineable reserves are 35,82,600Tonnes. The production in the period of mining plan will be around 17,90,030T in 5 years, thus balance reserves will 17,92,570 T (i.e. 35,82,600-17,90,030). The production target is 3,97,690 T, thus balance reserves will be sufficient for $17,92,570/3,97,690=4.50$ years.

Thus, total life of the mine is $5+4.50=9.50$ or Say 10 years.

2.8.2 MINING

2.8.2.1 Method for Developing and Working the Deposits

The mining will be done by open cast semi-mechanized method of mining. The salient features of mode of working as per approved Mining Plan with PMCP are:-

- The mining will be carried out by open – cast semi-mechanized method.
- The bench height and width will be kept 6m.
- Total seven benches will be developed i.e. from Bench levels 1781 mRL (Top Bench), 1775 mRL, 1769 mRL,1763 mRL, 1757 mRL, 1751mRL, 1745 mRL (lowest bench).
- The bench slope will be providing 85°.
- The loading will be from pits or from stocks.

2.8.2.2 Extent of Mechanization

The details of equipment's proposed to be used in mining operation are listed below:-

Table 2.10: Extent of Mechanization

| S. No. | Type of Machinery | Number |
|---------------|---|-------------------------------------|
| 1. | Compressor of 120 psi | 3 mobile/Tractor mounted or stable |
| 2. | Jack Hammer and other pneumatic | 3 Jack Hammer, 3 pneumatic breakers |
| 3. | Hydraulic Excavator with rock breaker arrangement | 3 |
| 4. | Long hole drill machine | 1 |
| 5. | Tractor with water tank | 2 |
| 6. | Tipper 10-20 tonne capacity | 9 |
| 7. | Other machineries | As needed |



| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – II–Project Description |

| | | |
|---|---------------|--|
| 8 | Crusher Plant | |
|---|---------------|--|

2.8.3 YEAR-WISE DEVELOPMENT PROPOSED DURING PLAN PERIOD

The year wise development of mines for the plan period is as given below:-

Table 2.11: Proposed Year Wise Development during Plan Period

| Year | ROM (T) | Mineral Boulder Stone(T) | Waste/ sub-grade (T) |
|-----------------|------------------|--------------------------|----------------------|
| 1 st | 430320 | 344260 | 86060 |
| 2 nd | 430320 | 344260 | 86060 |
| 3 rd | 437580 | 350060 | 87520 |
| 4 th | 442200 | 353760 | 88440 |
| 5 th | 497110 | 397690 | 99420 |
| Total | 22,37,530 | 17,90,030 | 4,47,500 |

**Source:- Approved Mining Plan with PMCP*

2.8.4 BLASTING PARAMETERS

2.8.4.1 Broad Blasting Parameters

Table 2.12: Broad Blasting Parameters

| Deep Hole Blasting | |
|---------------------------|-----------------------------|
| Deep Hole Drill rod | 6 meters effective length |
| Deep Hole Drill Machine | Down the hole drill |
| Burden | 3 meter |
| Spacing | 4 meter |
| Hole Diameter | 4 inch (100mm) |
| Short Hole | |
| Drill rod | 1.5 meters effective length |
| Drill machine | Jack Hammer |
| Burden | 0.8 meter |
| Spacing | 1.0 meter |
| Hole Diameter | 32 mm |



| | |
|-------------------------------------|----------------------------------|
| Project:- Boulder Stone Mine | |
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2.8.4.2 Explosive to be used

Blasting will be done by various types of explosives, following types of explosive area used in the mine:

Slurry explosive (AN based) viz. power gel, Acquadyne, Superdyne etc. are proposed as primer. Blasting agent is proposed as ammonium nitrate fuel oil (ANFO) mixture.

The ANFO mixture will be readily produced at site by mixing ammonium nitrate (94.5%) with diesel oil (5.5%). If ANFO is not allowed the other slurry explosive may be used.

Initiation is proposed by half second delay detonators.

2.8.4.3 Powder Factor

| Deep Hole | | |
|---|---|--|
| Charges per hole is 0.125 kg of primer, 5.5 kg per meters of blasting agent and one detonator (as required by Mines Manager). | | |
| Powder Factor | : | $\frac{\text{Effective Depth of hole} \times \text{Burden} \times \text{Spacing} \times \text{Bulk Density}}{\text{Total charge in Kg}}$ |
| | : | $\frac{6 \times 3 \times 4 \times 2.2}{0.125 + 33}$ |
| | : | $158.4/33.125 = 4.78$ Tonnes of rock/ Kg of explosive |
| Short Hole | | |
| Charges per hole are 0.125 kg of primer, 0.45 kg of blasting agent and One detonator. | | |
| Powder Factor | : | $\frac{\text{Effective Depth of hole} \times \text{Burden} \times \text{Spacing} \times \text{Bulk Density}}{\text{Total charge in Kg}}$ |
| | : | $\frac{1.5 \times 0.8 \times 1 \times 2.2}{0.125 + 0.45}$ |
| | : | $2.64/0.575 = 4.59$ tons of rock/kg of explosive |

**Secondary blasting will not be needed*

2.8.4.4 Storage of Explosive

About 200 Kg portable magazine is proposed for storing the explosive.

ANFO mixing shed is proposed for manufacture of ANFO. A room will be provided for storage of Ammonium Nitrate.



| | |
|--|---|
| Project:- Boulder Stone Mine | |
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The lessee should apply for explosive magazine for 200 Kg capacity to the competent authority and for ANFO mixing shed to the competent authority.

2.9 CONCEPTUAL MINING PLAN

Conceptual Mining Plan is considered to know the ultimate limit of the workings at the end of mining, when mineable mineral deposit exhaust. The maximum limit of upper crust and depth of the workings at the end of lease period is considered for preparation of Conceptual Mining Plan. The site of waste dump, site service, plantation etc. in such a place that these sites should not get any disturbance by mining during the life of mine. The aforesaid aspects of the conceptual mining plan proposed are as follows:-

2.9.1 MINERAL RESERVES

The Mineable reserves of the mine are 35,82,600 Tonnes.

2.9.2 FINAL SLOPE ANGLE TO BE ADOPTED

Considering the stability of rocks the ultimate pit slope proposed is 45° from vertical.

2.9.3 ULTIMATE EXTENT & SIZE OF PIT

The ultimate extent and size of the pit will be as follows at the conceptual stage:-

| | |
|--|-------------------------------|
| Length | 2370metermax. |
| Width | 123 meter average |
| Depth | Upto 1715 mRL, or 60m maximum |
| <i>Source: As per Approved Mining Plan with PMCP</i> | |

2.9.4 ULTIMATE CAPACITY OF DUMPS

About 4,47,500Tonne of waste/subgrade will be generated during the plan period. Out of which, maximum waste will be used in construction and maintenance of approach roads, construction of site services and remaining waste will be dumped temporarily in/outside the lease areatowards Southern side in the area in 0.15 ha.for 8.0m height in two terraces of 4m height each. The waste dump will be stabilized by retaining walls of rubble stone. Parapet wall and drain will also be constructed towards the lower altitude side to check the wash off during monsoon and at the end of life of mine, waste will be used for backfilling of some part of excavated area.



| | |
|-------------------------------------|----------------------------------|
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| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – II–Project Description |

2.10 DESCRIPTION OF MITIGATION MEASURES INCORPORATED INTO THE PROJECT TO MEET ENVIRONMENTAL STANDARDS, ENVIRONMENTAL OPERATING CONDITIONS, OR OTHER EIA REQUIREMENTS

- Safety barrier of 7.5m will be left from the lease boundary as per statutory requirement.
- To mitigate the negative impact of mining, a phase wise green belt will be developed in an area of 0.75 ha. (15 %) including backfilled area, waste dump and un-disturbed area with about 1,875 trees over a period of 5 Years/ end of life of mine.
- Water reservoir for an area of 3.45 Ha. (Bottom benches) will be developed which will develop to improve the aesthetic beauty of the area and will increase the local groundwater table.
- All environmental mitigation measures proposed for the project is detailed in **Chapter-IV.**

2.11 ASSESSMENT OF NEW & UNTESTED TECHNOLOGY FOR THE RISK OF TECHNOLOGICAL FAILURE

Not applicable. Opencast semi-mechanized mining method will be adopted for mining operations.

| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – III–Description of Environment |

CHAPTER - 3

DESCRIPTION OF ENVIRONMENT

| | |
|-------------------------------------|--|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – III–Description of Environment |

3.0 DESCRIPTION OF ENVIRONMENT

3.1 INTRODUCTION

EIA process requires the primary baseline data collection to know the information on the biophysical, social and economic settings of the mine site. The criteria of the baseline data collection was based on the impact zone which was expected to be around 2-3 Km. The stations were considered based on their sensitivity by considering the close proximity with the sensitive zones like reserve forests, expected high pollutant concentration zones and transportation route etc. The baseline data have been collected as per CPCB guidelines in the month of December, 2022 to February, 2023.

The criteria based on wind profile adopted while selecting the monitoring locations representing the whole study area as described under:-

- One location on the upwind depending upon the wind profile/pattern.
- Two locations on the downwind side depending upon wind pattern (predominant directions).
- One location covering the sensitive areas within the vicinity.
- One location covering the transportation convergences route.
- One location covering the major habitation.
- One location on the downwind direction where the max GLC's are falling.

The monitoring station selected is as described under:-

Table 3.1: List of Monitoring Stations

| Sampling Location | Distance (Km) | Direction | Components |
|-------------------|---------------|-----------|-------------------------|
| Mine Site | -- | -- | Air, Water, Noise, Soil |
| Pomlum | 1.3 | ENE | Air, Water, Noise, Soil |
| Mawkajem | 1.1 | ESE | Air, Water, Noise, Soil |
| Dymmlew | 2.7 | SSE | Air, Water, Noise, Soil |
| Umktieh | 2.7 | S | Air, Water, Noise, Soil |
| Lewmawlong | 2.0 | WNW | Air, Water, Noise, Soil |
| Setthliew | 5.15 | NNW | Air, Water, Noise, Soil |



| | |
|--|---|
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Baseline data generation was carried out by M/s Noida Testing Laboratories, NABL Accredited laboratory. Environmental Monitoring Report is enclosed as **Annexure –VI**.

3.2 ENVIRONMENTAL SETTING

| S. No. | Particulars | Details | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|-------------------------|--|---------|---------------|---------------|-----------------------|---------------|---------------|------|---------------|---------------|------|---------------|---------------|-----------------|---------------|---------------|----|---------------|---------------|----|---------------|---------------|----|---------------|---------------|----|---------------|--------------|
| 1. | Name of the Project | Boulder Stone Mine | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Location | Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Lease Area | 4.99 Ha. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Land Type | Private Land | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Latitude & Longitude | <table border="1"> <thead> <tr> <th>Pillars</th> <th>Latitude (N)</th> <th>Longitude (E)</th> </tr> </thead> <tbody> <tr> <td>A.</td> <td>25°24'12.636"</td> <td>91°51'40.788"</td> </tr> <tr> <td>B.</td> <td>25°24'13.356"</td> <td>91°51'40.248"</td> </tr> <tr> <td>C.</td> <td>25°24'14.292"</td> <td>91°51'39.384"</td> </tr> <tr> <td>D.</td> <td>25°24'14.976"</td> <td>91°51'39.132"</td> </tr> <tr> <td>E.</td> <td>25°24'17.424"</td> <td>91°51'40.716"</td> </tr> <tr> <td>F.</td> <td>25°24'14.929"</td> <td>91°51'52.164"</td> </tr> <tr> <td>G.</td> <td>25°24'12.708"</td> <td>91°51'55.008"</td> </tr> <tr> <td>H.</td> <td>25°24'10.584"</td> <td>91°51'52.02"</td> </tr> </tbody> </table> <p><i>*Source:- Approved Mining Plan with PMCP</i></p> | Pillars | Latitude (N) | Longitude (E) | A. | 25°24'12.636" | 91°51'40.788" | B. | 25°24'13.356" | 91°51'40.248" | C. | 25°24'14.292" | 91°51'39.384" | D. | 25°24'14.976" | 91°51'39.132" | E. | 25°24'17.424" | 91°51'40.716" | F. | 25°24'14.929" | 91°51'52.164" | G. | 25°24'12.708" | 91°51'55.008" | H. | 25°24'10.584" | 91°51'52.02" |
| Pillars | Latitude (N) | Longitude (E) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A. | 25°24'12.636" | 91°51'40.788" | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B. | 25°24'13.356" | 91°51'40.248" | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C. | 25°24'14.292" | 91°51'39.384" | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D. | 25°24'14.976" | 91°51'39.132" | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| E. | 25°24'17.424" | 91°51'40.716" | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F. | 25°24'14.929" | 91°51'52.164" | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| G. | 25°24'12.708" | 91°51'55.008" | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| H. | 25°24'10.584" | 91°51'52.02" | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Elevation | Lowest -1765 mRL; Highest –1785mRL | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. | Nearest Habitation | Laitkynsew(1.3 Km, ENE) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. | Nearest Major Town | Shillong (18 Km,N) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. | Nearest Highway | <table border="1"> <thead> <tr> <th>Highway</th> <th>Distance (Km)</th> <th>Direction</th> </tr> <tr> <th colspan="3">(From Lease Boundary)</th> </tr> </thead> <tbody> <tr> <td>AH 2</td> <td>1.0</td> <td></td> </tr> <tr> <td>SH 5</td> <td>6.3</td> <td>NW</td> </tr> <tr> <td>Laityngkot Road</td> <td>5.4</td> <td>NNW</td> </tr> </tbody> </table> | Highway | Distance (Km) | Direction | (From Lease Boundary) | | | AH 2 | 1.0 | | SH 5 | 6.3 | NW | Laityngkot Road | 5.4 | NNW | | | | | | | | | | | | |
| Highway | Distance (Km) | Direction | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (From Lease Boundary) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| AH 2 | 1.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SH 5 | 6.3 | NW | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Laityngkot Road | 5.4 | NNW | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11. | Nearest Railway Station | Guwahati Junction (87Km towardsNNW) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12. | Nearest Airport | Shillong Airport (34Km towards NNE) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13. | Nearest Tourist Places | None within 10 Km radius | | | | | | | | | | | | | | | | | | | | | | | | | | | |



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|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – III–Description of Environment |

| | | | | |
|----------------------|---|--|------------------------------|------------------|
| 14. | Defense Installations | None within the 10 km radius | | |
| 15. | Archaeological Sites | None within the 10 km radius | | |
| 16. | State – Interstate Boundary, International Boundary | None within the 10 km radius | | |
| 17. | Eco-sensitive Zones | None within the 10 km radius | | |
| 18. | Protected Area | None within the 10 km radius | | |
| 19. | Reserved/Protected Forest | Protected Forest- 14.5 km North | | |
| 20. | Nearest Streams/Rivers/Water Bodies | A river is flowing approx. 620 m East of the Mine. A stream is flowing 910 m West of the mine. | | |
| 20. | Public Building Places | Educational Facilities | Distance (Km) | Direction |
| | | | (From Lease Boundary) | |
| | | RCLP SCHOOL | 1.0 | ESE |
| | | J. S. MEMORIAL SCHOOL | 5.3 | NNW |
| | | Kyntiew Shaphrang Higher Secondary School Laitlyngkot | 5.0 | NNW |
| | | Wah Shnong L. P School Laitlyngkot | 5.85 | NNW |
| | | Medical Facilities | Distance (Km) | Direction |
| | | | (From Lease Boundary) | |
| | | Laitlyngkot PHC | 5.0 | NNW |
| | | Kynton-U-Mon Veterinary Dispensary | 13.15 | NNE |
| Station Sick Quarter | 15.0 | NNW | | |

| | | | | | |
|-----|--|-------------------------|-------------------|----------------|--|
| 21. | Other Industries/ Mines (Within 500m radius) | | | | |
| | S. No. | Name of the Mine | Area (Ha.) | Mineral | Distance from the approved Mining Plan of Khrikshon Lyngkhoi's mine (m) |
| | 1. | Sh. Khrikshon Lyngkhoi | 4.99 | Boulder Stone | - |
| | 2. | Sh. Khrikshon Lyngkhoi | 4.23 | Boulder Stone | 10 |
| | Total | | 9.22 | -- | -- |

22. Seismic Zone V

Source: - Distances measured from Google Earth and are indicative pertinent to the project.

3.3 COLLECTION OF BASELINE DATA

Environmental data has been collected in relation to proposed mine for:-

1. Land Environment
2. Water Environment
3. Air Environment
4. Noise Environment
5. Biological Environment
6. Socio-Economic Environment

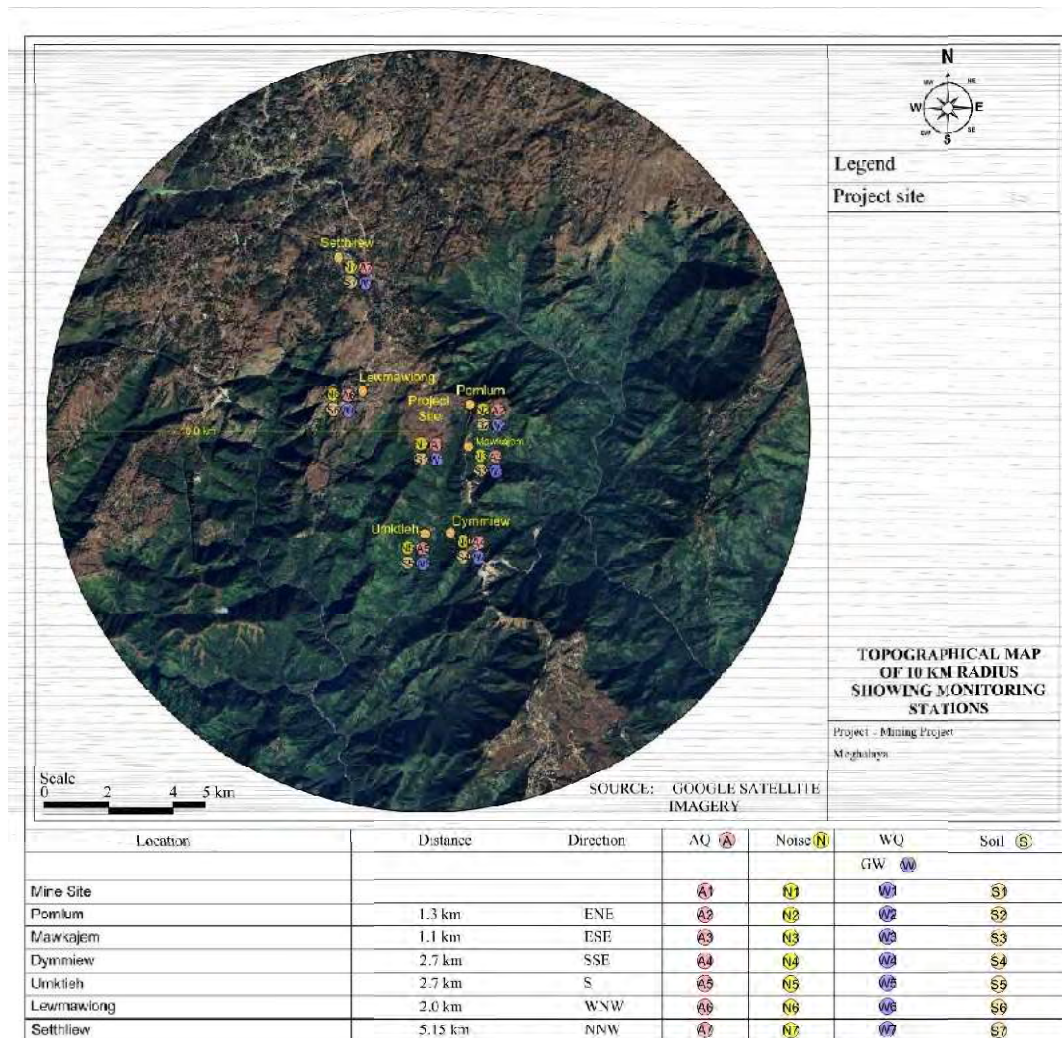


Figure 3.1: Map Showing Study area with Monitoring Stations (10Km)



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3.4 LAND ENVIRONMENT

The details of study area, collection of relevant satellite data, data processing and interpretation using geospatial techniques and generation of required output are discussed below.

Study area

The project is for the environmental clearance of “**Boulder Stone Mine**” located at **Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, East Khasi Hills District, Meghalaya** promoted by **Sh. Khrikshon Lyngkhoi**. The district occupies an area of 2,748 sq. km and it lies between 25°00’07”N to 25°00’41” North Latitude and 91°00’21”E to 92°09” East Longitude. The region is mostly hilly with deep gorges and ravines on the southern portion. The most important physiographic feature of the district is the Shillong Plateau interspersed with river valley. East Khasi Hills region is predominantly covered with evergreen and semi-evergreen forest. Shifting cultivation and terrace farming are the primary agricultural activities practiced in the region. The district has a variety of climates, from temperate in the plateau to warmer tropical and subtropical regions in the north and south. The project site is part of the non-forest rocky terrain of Khasi Hills.

Satellite Data and Tools

In this study, the multispectral satellite imageries of Sentinel-2 and digital elevation data from SRTM were used. In order to analyze the data, Visual interpretation technique along with supervised classification scheme were implemented. Software like ArcGIS Desktop and Google Earth Pro were used for this analysis.

Topographical maps of the study area: -The Survey of India Toposheet No –on 1:50,000 scale covering a part of East Khasi Hills district, was used as a reference map.

Computer hardware and software: ASUS Notebook PC intel CORE i3 with Google Earth Pro and ArcMap 10.8 image analysis software were used for the processing and spatial analysis of remote sensing data. Arc GIS version 10.8 was used for performing spatial analyses and creating land use land cover maps.

Spatial observations:

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The raw high resolution multispectral satellite data such as IRS-P6 (LISS-IV), Sentinel-2 for evaluating land use patterns and SRTM for elevation data provide handsome amount of information about the earth features due to their high spatial and spectral resolution. Some of their important specifications are listed below:

Table: Satellite Data Specifications

| NAME OF SATELLITE | SENSORS | SPATIAL RESOLUTION | SPECTRAL BANDS | Altitude |
|--------------------------|--------------------------------|---------------------------|--|-----------------|
| 1. SRTM | Imaging Radars | 30 to 90 meters | C-band & X-band | 233 km |
| 2. Sentinel-2 | Multispectral Instrument (MSI) | 10 to 60 meters | Total: 13 bands Bands used (10 m resolution): B2- Blue: 490 nm B3- Green: 560 nm B4- Red: 665 nm B8- VNIR: 842 nm | 786 km |

Data and Methodology

Modern geospatial technologies such as satellite Remote Sensing (RS) and Geographical Information System (GIS) were employed in this project. For the present study area, the latest high resolution multispectral sensor data of Sentinel-2 were used to analyze the Land use and Land cover for the time-frame December 2022 – February 2023 as the baseline period. Sentinel-2 data with spatial resolution of 10 m was used to cover the whole 10 km of buffer around the project site for Level-III classification. Ministry of Environment and Forests and Climate Change (MoEF&CC), New Delhi classification scheme was implemented for current land use study. Firstly, the required satellite data were acquired from authentic platforms in GeoTIFF format, which were then imported to ArcMap 10.8 and processed for further data analysis and map creation. The images were geometrically rectified to the common local UTM coordinate system which is UTM zone 46N and the area of interest was masked out of the respective images.

Some pre-processing (DIP) techniques were employed to enhance the quality of the image. Visual Interpretation technique was used for the identification of LULC classes in the project area and surroundings within 10 km radius followed by Supervised Classification method.

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Visual image interpretation

Visual image interpretation is a technique for categorizing satellite imagery in which the interpreter's training affects both observation and inference. Location, size, shape, shadow, tone/color, texture, pattern, height/depth, site (elevation, slope, and aspect), situation, and association are crucial keys in visual interpretation. Size is an object's most distinctive quality. Numerous ground features, both man-made and natural, have very distinctive shapes that can be used as references in photo and image interpretation. A remote sensing system's electromagnetic radiation (EMR) data can be shown in grayscale tones ranging from black to white. To make colour composite images, we might employ additive color-combining techniques. Texture is defined as the distinctive positioning and arrangement of tonal or colour repetitions. The spatial positioning of objects in a landscape is called a pattern. Scale does not affect texture or pattern. The shadow in the picture offers a real hint for identifying an object, such as its height. One of the most diagnostic aspects of picture interpretation is the capacity to perceive or quantify the height (elevation) or depth (bathymetry) of a feature or landform. Physical aspects of the site (elevation, slope, aspect, and kind of surface cover) economical (land value, proximity to water). Situation and association are important keys to understand the arrangement and orientation of feature in relation to one another.

Digital Image Analyses

Post visual interpretation, the LULC classification was performed by the supervised classification technique. The training samples were trained by Support Vector Machine classifier with accuracy of 85%. The satellite imageries were classified into seven broad categories namely; **evergreen forest, dense scrub, barren land, agriculture, built-up and water body**. The total area cover within 10 km radius was calculated **324.256 sq. km**. The study findings for the baseline period are discussed below.

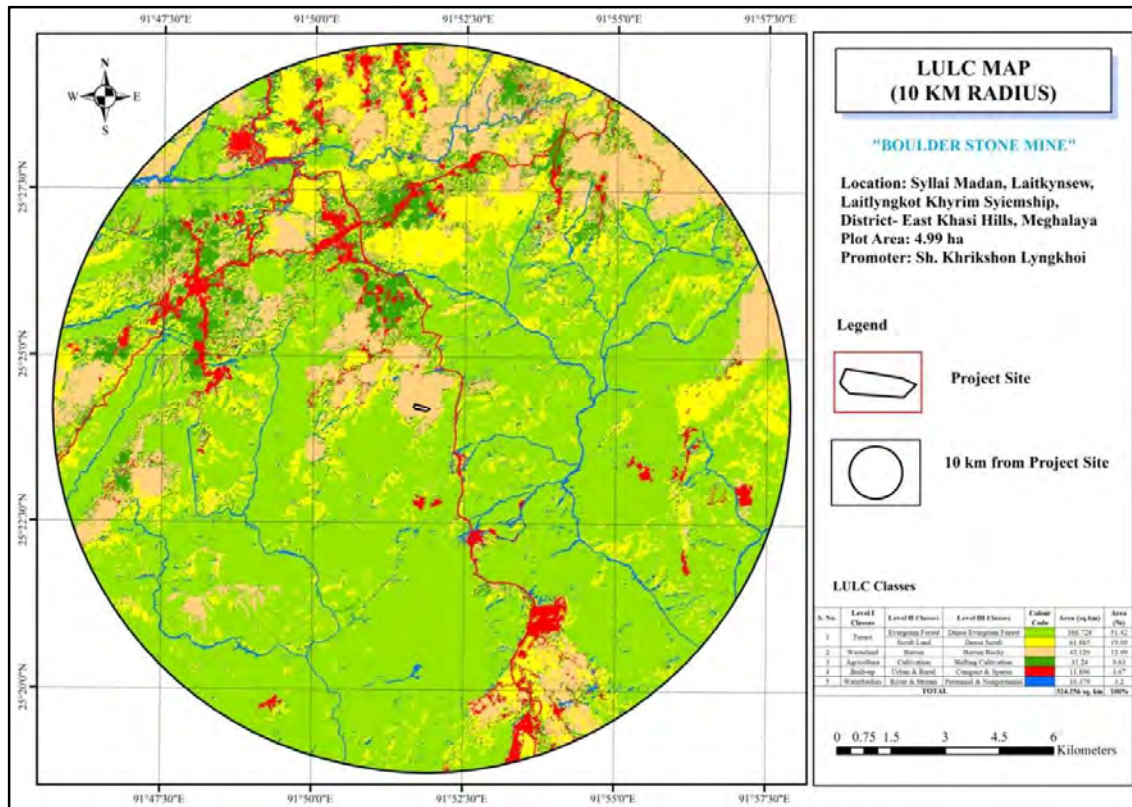


Figure 3.2: Land use of the study area

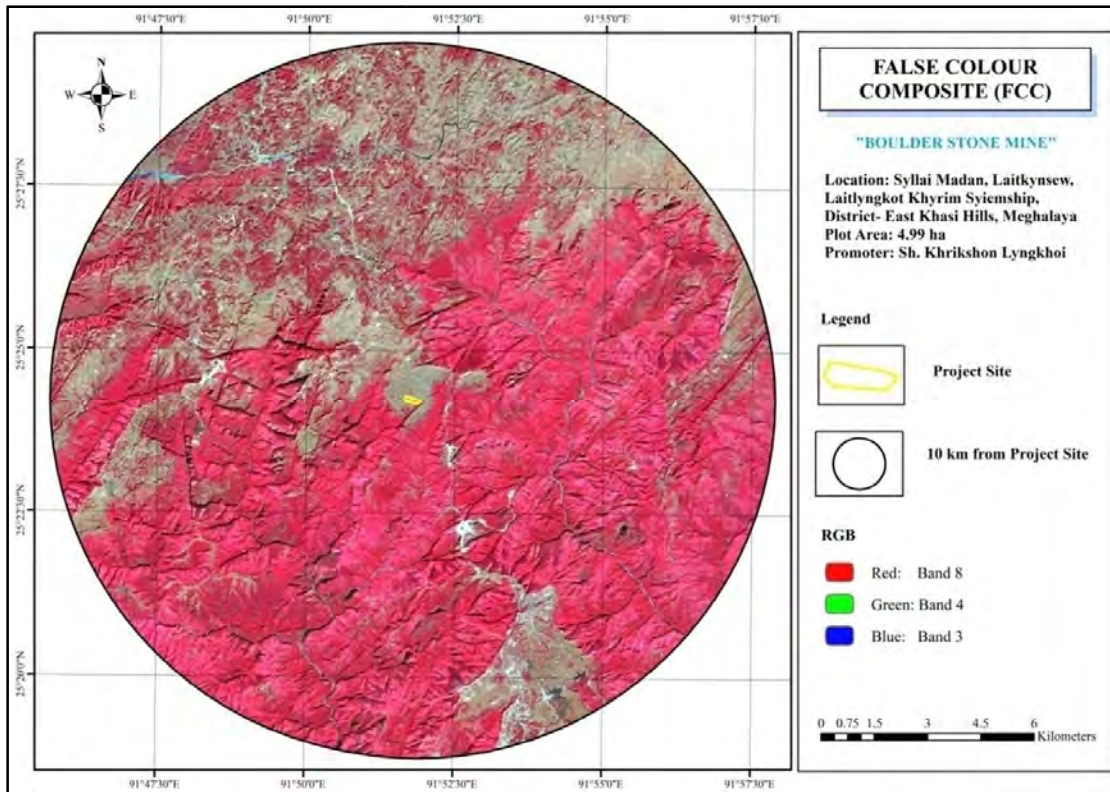


Figure 3.3: False Colour Composite Map of the study area

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Delineation of elevation, slope and aspect

Digital Elevation Model (DEM) generated from stereo pair of Shuttle Radar Topography Mission (SRTM) was used for delineating physiographic parameters viz. **elevation, slope and aspect, contour and drainage** by using Arc Map 10.8 software. Specifications of SRTM were mentioned in table 1. For 3d surface analysis, maps like DEM, drainage, terrain and contour were also generated. The highest and the lowest points observed in the study area are 1951 meters and 282 meters respectively. The terrain map is showcasing the hillshade, slope of the hills and their orientation with respect to the sun angle. The following drainage map (figure-3.4) is indicating the stream order ranking from 1 to 5 which shows their hierarchy within the drainage system. The Strahler stream order also called as “top down” system reflects the morphology of a catchment and its basis is the watershed line of the catchment. At last the contour map was generated displaying the undulations of the surface. It is observed that the project site is situated at a hilly terrain with elevation ranging between 1500 meter and 1700 meter.

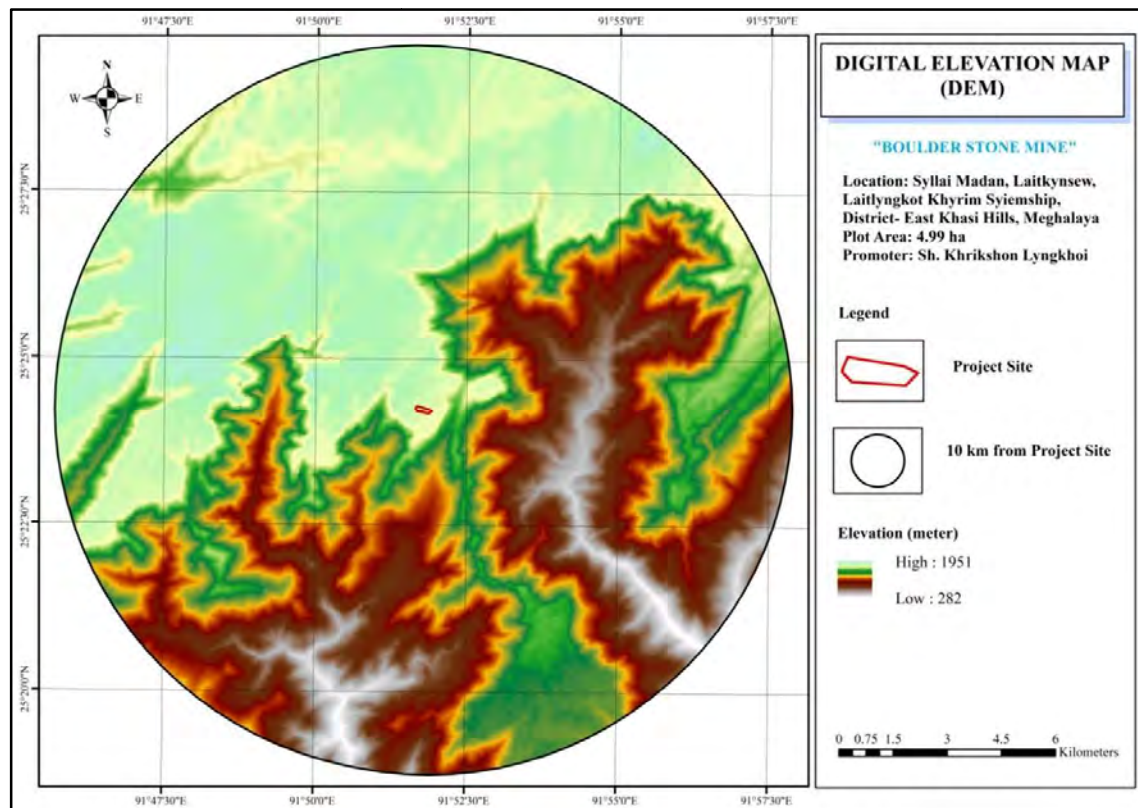


Figure 3.4: Digital Elevation Model Map of the study area

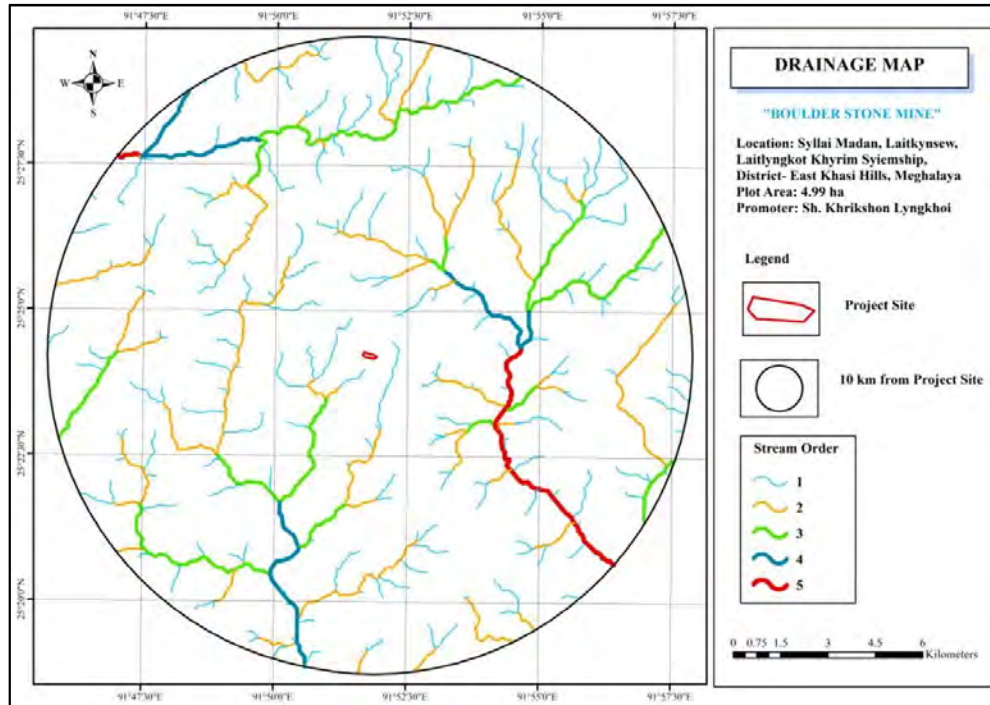
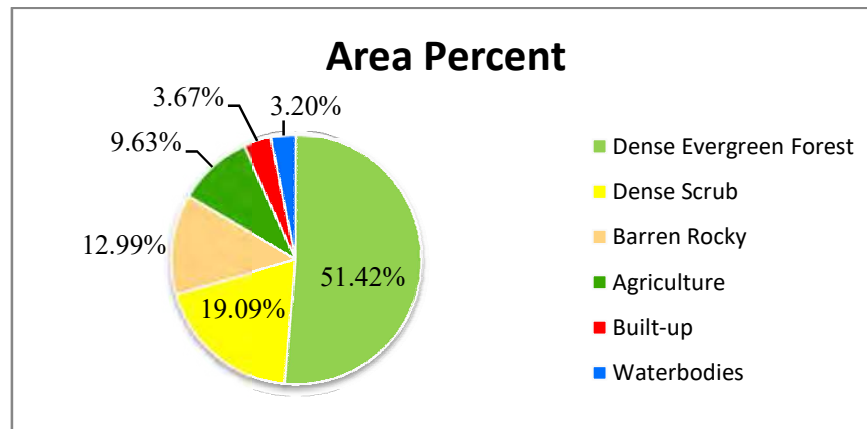


Figure 3.5: Drainage Map of the study area

3.4.1. Description of Land use

The analysis reveals that forest class including dense forest and scrub land cover the largest area of 166.728 sq. km and 61.885 sq. km respectively which together contribute to 70 % of the total study area. This indicates that the study region is predominantly a forest area. The second highest cover is barren land with 42.129 sq. km (12.99%). Cultivated area contributes to 9.63% of the total area covering 31.24 sq. km area. Built-up area covers 11.896 sq. km (3.67%) area. Waterbodies including perennial and non-perennial rivers and streams cover the least area with 10.379 sq. km (3.2%) area. {Refer chart 3.1} & {Refer table 3.2}.

Chart no. 3.1: Land use Classification and percentagewise distribution



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Table no. 3.2: Landuse Breakup of the study area

| S. No. | Level I Classes | Level II Classes | Level III Classes | Colour Code | Area (sq.km) | Area (%) |
|--------------|-----------------|------------------|--------------------------|-------------|-----------------------|-------------|
| 1 | Forest | Evergreen Forest | Dense Evergreen Forest | | 166.728 | 51.42 |
| | | Scrub Land | Dense Scrub | | 61.885 | 19.09 |
| 2 | Wasteland | Barren | Barren Rocky | | 42.129 | 12.99 |
| 3 | Agriculture | Cultivation | Shifting Cultivation | | 31.24 | 9.63 |
| 4 | Built-up | Urban & Rural | Compact & Sparse | | 11.896 | 3.67 |
| 5 | Waterbodies | River & Stream | Perennial & Nonperennial | | 10.379 | 3.2 |
| TOTAL | | | | | 324.256 sq. km | 100% |

3.5 SOIL ENVIRONMENT

The objectives of the soil sampling are:-

- To determine the baseline soil characteristics of the study area;
- To determine the impact of proposed activity on soil characteristics and;
- To determine the impact on soil more importantly with agriculture production point of view.

The soil analysis results are given below:-

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Table 3.3: Soil Analysis

| Sr. No. | Parameters | Location | Mine Site | Pomlum | Mawkajem | Dymmiew | Umktieh | Lewmawiong | Setthliew |
|---------|------------------------|----------------------------|--------------------------|--------|----------|---------|---------|------------|-----------|
| | | Units/Analysis Duration | 18/02/2023 to 25/02/2023 | | | | | | |
| 1 | pH | - | 7.65 | 7.21 | 7.19 | 7.43 | 7.25 | 7.12 | 7.29 |
| 2 | Conductivity | µmhos/cm | 371.00 | 368.00 | 364.00 | 412.00 | 363.00 | 397.00 | 427.00 |
| 3 | Sodium (as Na) | mg/kg | 51.72 | 50.23 | 52.82 | 56.81 | 52.72 | 51.86 | 55.74 |
| 4 | Water holding capacity | % | 34.69 | 32.40 | 33.91 | 37.12 | 31.98 | 32.95 | 36.29 |
| 5 | Potassium (as K) | mg/kg | 280.0 | 280.0 | 278.5 | 285.9 | 281.3 | 280.0 | 282.6 |
| 6 | Sand | % | 68.00 | 67.00 | 69.00 | 68.00 | 68.00 | 65.00 | 67.00 |
| 7 | Clay | % | 19.00 | 19.00 | 16.00 | 17.00 | 19.00 | 19.00 | 19.00 |
| 8 | Silt | % | 13.00 | 14.00 | 15.00 | 15.00 | 13.00 | 16.00 | 14.00 |
| 9 | Calcium (as Ca) | mg/kg | 659.32 | 758.30 | 657.21 | 860.5 | 756.49 | 657.93 | 560.5 |
| 10 | Magnesium (as Mg) | mg/kg | 269.85 | 368.60 | 267.24 | 415.92 | 412.28 | 367.35 | 264.83 |
| 11 | SAR | - | 4.98 | 4.72 | 4.61 | 4.87 | 4.56 | 4.67 | 4.72 |
| 12 | Available Phosphorus | Kg/ Hectare | 58.0 | 58.0 | 57.0 | 59.0 | 58.0 | 59.0 | 57.0 |
| 13 | Organic carbon | % | 0.51 | 0.48 | 0.46 | 0.54 | 0.49 | 0.54 | 0.53 |
| 14 | Porosity | % | 43.36 | 40.50 | 42.38 | 42.37 | 42.56 | 41.96 | 42.28 |
| 15 | Bulk Density | kg/cm ³ | 1.43 | 1.40 | 1.45 | 1.32 | 1.29 | 1.39 | 1.41 |
| 16 | Available Nitrogen | Kg/ Hectare | 250 | 310 | 310 | 161 | 149 | 296 | 360 |
| 17 | Total alkalinity | mg/l | 2.1 | 2 | 1.8 | 2.4 | 2.9 | 2 | 2 |
| 18 | Chlorides | mg/l | 11 | 6.8 | 9.7 | 6.8 | 8.67 | 3.8 | 3.2 |
| 19 | Available Potassium | Kg/ Hectare | 260 | 180 | 210 | 193 | 270 | 300 | 337 |
| 20 | Salinity | dS/m | 0.20 | 0.18 | 0.12 | 0.13 | 0.3 | 0.1 | 0.08 |



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3.5.1 OBSERVATION

- The pH of the soil samples ranged from 7.12 to 7.65.
- Soil Conductivity varied from 363 to 427 $\mu\text{mhos/cm}$.
- The phosphorous concentrations are in the range of 57 kg/ha to 59 kg/ha.
- The Nitrogen concentrations are in the range of 149 kg/ha. to 360 kg/ha.

3.6 WATER ENVIRONMENT

The purpose of the study is to:-

1. Assess the water quality characteristics for critical parameters;
2. Evaluate the impacts on agriculture productivity, habitat conditions, recreational resources and aesthetics of the vicinity; and
3. Predict the likely impacts on water quality due to the mining and other related activities.

3.6.1 WATER SAMPLE ANALYSIS

Seven ground water samples were collected as grab samples and were analyzed for various parameter as per the procedures specified in “Standard Methods for the Examination of Water and Wastewater” published by American Public Health Association (APHA). Different physico-chemical parameters of ground water during study period were compared with standard at each monitoring stations and shown in the Table 3.4.

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Table 3.4: Ground Water Analysis

| S.No. | Parameter | Units | Requirement (Desirable Limits). | Permissible Limits in the Absence of Alternate Source. | Mine Site | Pomlum | Mawkajem | Dymmiew | Umktieh | Lewmawiong | Setthliew |
|---|-------------------------------------|------------|---------------------------------|--|-----------|-----------|-----------|-----------|-----------|------------|-----------|
| Organoleptic & Physical Parameters | | | | | | | | | | | |
| 1. | Colour | Hazen Unit | 5 | 15 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 2. | Odour | - | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable |
| 3. | Taste | - | Agreeable | - | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable |
| 4. | Turbidity | NTU | 1 | 5 | <1.0 | <1.0 | <1 | <1 | <1.0 | <1.0 | <1 |
| 5. | pH value | - | 6.5-8.5 | - | 7.54 | 7.16 | 7.35 | 6.98 | 7.48 | 7.18 | 6.93 |
| 6 | Total Dissolve Solid (TDS) | mg/l | 500 | 2000 | 389.2 | 321.0 | 402.0 | 241.9 | 325.0 | 380.0 | 260.0 |
| General Properties | | | | | | | | | | | |
| 7 | Aluminum (as Al) | mg/l | 0.03 | 0.2 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 8 | Total Ammonia | mg/l | 0.5 | No Relaxation | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 9 | Anionic surface Detergents(as MBAS) | mg/l | 0.2 | 1.0 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 10 | Barium (as Ba) | mg/l | 0.7 | No Relaxation | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 11 | Boron (as B) | mg/l | 0.5 | 2.4 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 12 | Calcium(as Ca) | mg/l | 75 | 200 | 56.95 | 56.95 | 54.32 | 61.47 | 65.27 | 56.82 | 52.39 |
| 13 | Chloramines (as Cl2) | mg/l | 4.0 | No Relaxation | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |



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| | | | | | | | | | | | |
|---|--|------|-------|---------------|--------|--------|--------|--------|--------|--------|--------|
| 14 | Chloride (as Cl) | mg/l | 250 | 1000 | 15.73 | 14.62 | 14.69 | 13.95 | 16.26 | 14.39 | 13.82 |
| 15 | Copper (as Cu) | mg/l | 0.05 | 1.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 16 | Fluoride(as F) | mg/l | 1.0 | 1.5 | 0.38 | 0.31 | 0.28 | 0.32 | 0.29 | 0.30 | 0.28 |
| 17 | Free Residual Chlorine | mg/l | 0.2 | 1.0 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 18 | Iron (as Fe) | mg/l | 1.0 | No Relaxation | 0.129 | 0.124 | 0.132 | 0.129 | 0.128 | 0.121 | 0.120 |
| 19 | Magnesium (as mg) | mg/l | 30 | 100 | 3.84 | 3.79 | 4.10 | 4.18 | 3.92 | 4.06 | 3.65 |
| 20 | Manganese (as Mn) | mg/l | 0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 21 | Mineral Oil | mg/l | 0.5 | No Relaxation | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 22 | Nitrate (as NO ₃) | mg/l | 45 | No Relaxation | 0.32 | 0.31 | 0.30 | 0.32 | 0.33 | 0.31 | 0.30 |
| 23 | Selenium (as Se) | mg/l | 0.01 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 24 | Silver (as Ag) | mg/l | 0.1 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Sulphate (as SO ₄) | mg/l | 200 | 400 | 26.75 | 24.65 | 26.82 | 26.83 | 25.81 | 23.92 | 22.87 |
| 26 | Sulphide(as H ₂ S) | mg/l | 0.05 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 27 | Alkalinity(as Ca CO ₃) | mg/l | 200 | 600 | 201.0 | 194.0 | 187.0 | 187.0 | 189.0 | 176.0 | 179.0 |
| 28 | Total Hardness (as CaCO ₃) | mg/l | 200 | 600 | 174.0 | 167.0 | 164.0 | 165.0 | 173.0 | 161.0 | 160.0 |
| 29 | Zinc (as Zn) | mg/l | 5 | 15 | 0.162 | 0.159 | 0.151 | 0.148 | | | |
| Parameters Concerning Toxic Substances | | | | | | | | | | | |
| 30 | Cadmium (as Cd) | mg/l | 0.003 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Cyanide (as CN) | mg/l | 0.05 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Phenol | mg/l | 0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |



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|----------------------------------|------------------------------|--------------|--------|---------------|---------|---------|---------|---------|---------|---------|---------|
| 33 | Lead (as Pb) | mg/l | 0.01 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 34 | Mercury (as Hg) | mg/l | 0.001 | No Relaxation | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 35 | Molybdenum (Mo) | mg/l | 0.07 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 36 | Nickel (as Ni) | mg/l | 0.02 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Poly nuclear Aromatic | mg/l | 0.0001 | No Relaxation | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| 38 | Poly chlorinated biphenyl | mg/l | 0.0005 | No Relaxation | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Microbiological Parameter | | | | | | | | | | | |
| 39 | Escherichia coli | Absent/100ml | | | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| 40 | Coliform Bacteria | Absent/100ml | | | Absent | Absent | Absent | Absent | Absent | Absent | Absent |



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3.6.2 RESULT

3.6.2.1 Ground Water

The analysis results indicate that pH of the groundwater was found to be in range of 6.93 – 7.54. The TDS were found to be in the range of 241.9-402 Mg/l. Other parameters like Calcium, Magnesium, Chlorides, Sulphates and Nitrates were found within the prescribed limits. The physico – chemical analysis for the other parameters were also within the permissible limits as per the standards as per IS: 10500. The water quality is non- potable in nature.

3.7 AIR ENVIRONMENT

The prime objective of the baseline air monitoring was to evaluate the existing air quality of the area. This will also be useful for assessing the conformity to standards of the ambient air quality during the operation of the mine.

The baseline status of the air quality has been assessed through a scientifically designed ambient air quality monitoring network based on the following considerations:-

- Meteorological conditions on synoptic scale;
- Topography of the study area;
- Representatives of regional background air quality for obtaining baseline status; and
- Representatives of likely impact areas.

3.7.1 MICRO-METEOROLOGICAL DATA

An auto weather monitoring station was installed at Mine Site during the study period to record various meteorological parameters on hourly basis to understand the wind pattern, temperature variation and relative humidity variation.



3.7.2 WIND ROSE DIAGRAM

Wind rose is the diagrammatic representation of wind speed in a specified direction with its arms representing sixteen directions. Each arm gives a clear frequency distribution of wind speed in a particular direction for a given period of time. The wind rose diagram for the study period was developed & presented in Figure 3.6.

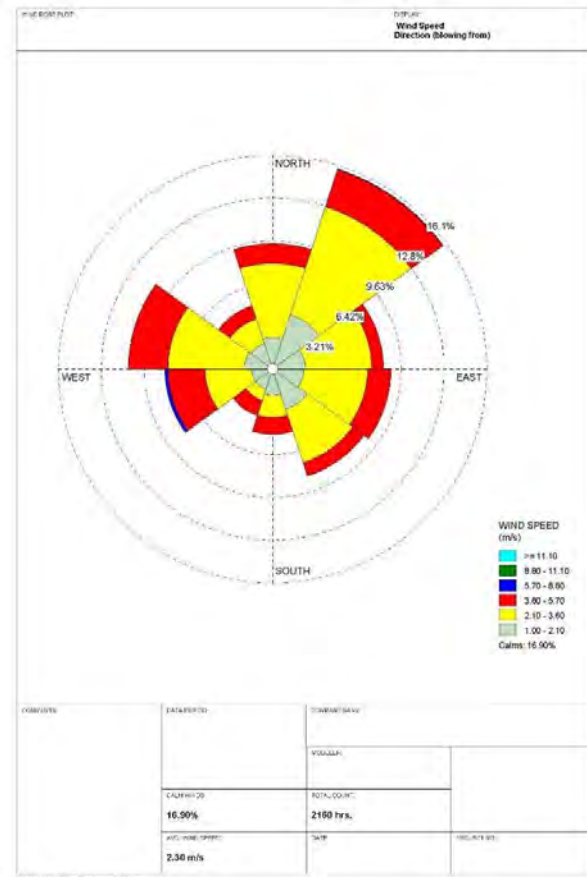


Figure 3.6: Wind Rose Diagram

The Wind rose show that the most predominant wind direction blows from the North-East. This means that the emissions plume will be dispersed mainly in the South-West direction. Calm wind during this period 16.90%

3.7.3 AMBIENT AIR QUALITY DATA

Ambient air quality monitoring stations were selected on the basis of surface influence, demographic influence and meteorological influence. The sites were chosen at eight locations. The ambient air monitoring has been carried out with a frequency of two days in a week at seven locations covering one complete season.

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Table 3.5: Sampling Frequency

| Parameters | Sampling Frequency |
|---------------------------------------|---|
| PM ₁₀ | 24 hourly sample twice a week |
| PM _{2.5} | 24 hourly sample twice a week |
| Sulphur Dioxide (SO ₂) | 8 hourly for 24 hrs sample twice a week |
| Oxides of Nitrogen (NO _x) | 8 hourly for 24 hrs sample twice a week |
| Carbon Monoxide | 8 hourly for 24 hrs sample twice a week |

Table 3.6: Instruments used for Sampling & Analysis

| Pollutants | Instrument | Make | Model No. | Range and Sensitivity |
|------------------------------------|---|-----------------------------------|---------------|--|
| PM ₁₀ | Respirable Dust Sampler (RDS) RDS with thermoelectrically cooled gaseous sampling attachment | M/s ECO TECH Instruments Pvt. Ltd | COMBO-AAS-271 | 2.3 m ³ /hr ± 0.03 m ³ /min |
| PM _{2.5} | | | -- | 1.0 m ³ /hr ± 0.03 m ³ /min |
| SO ₂ NO _x | | | -- | 0 – 3 LPM ± 0.2 LPM |
| CO | CO Analyzer | Testo Analyzer | -- | 1-1999 PPM |
| | | GC – Bruker (Gas Chromatography) | -- | < 1.0 PPM |
| Trace Elements | AAS | Thermo Fisheries | -- | -- |

Table 3.7: Sampling and Analytical Techniques

| S. No. | Parameter | Method |
|--------|-------------------|--|
| 1 | PM ₁₀ | IS-5182 (Part – 23) 2006 |
| 2 | PM _{2.5} | RTI (Research Triangle Institute) (Gravimetric Ana Revision-07 Aug14-2003) |
| 3 | Sulphur Dioxide | IS 5182 (Part – II) 2001, with Improved West & Gaeke Method |
| 4 | Nitrogen Oxide | Modified Jacob – Hochheiser/ Arsenite Method (IS 5182 Part 6) 2011 |
| 5 | Carbon | NDIR Spectroscopy method |



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| | Monoxide | |
| 6 | Trace Elements | APHA-401 and ASTMD 4185-90 |

Table 3.8: Statistical Summary of Concentration Levels of Criteria Pollutants

| S. No | Sampling Location | | Parameters | | | | |
|-----------------------|-------------------|-----------|--|---|---|---|----------------------------|
| | | | PM ₁₀ (µg/m ³) | PM _{2.5} (µg/m ³) | SO ₂ (µg/m ³) | NO _x (µg/m ³) | CO (mg/m ³) |
| 1. | Mine Site | Min | 40.29 | 13.68 | 3.93 | 5.25 | 0.47 |
| | | Max | 57.14 | 20.92 | 6.18 | 8.29 | 0.59 |
| | | Avg. | 44.27 | 16.33 | 5.34 | 6.80 | 0.53 |
| | | 98th% ile | 55.35 | 20.57 | 6.11 | 8.26 | 0.59 |
| 2. | Pomlum | Min | 40.26 | 15.43 | 5.37 | 6.55 | 0.32 |
| | | Max | 54.36 | 22.43 | 7.67 | 8.69 | 0.92 |
| | | Avg. | 45.65 | 17.76 | 6.10 | 7.45 | 0.57 |
| | | 98th% ile | 53.38 | 22.06 | 7.64 | 8.64 | 0.90 |
| 3. | Mawkajem | Min | 32.58 | 13.79 | 4.8 | 6.14 | 0.45 |
| | | Max | 50.75 | 22.4 | 6.5 | 8.86 | 0.55 |
| | | Avg. | 41.31 | 17.29 | 5.63 | 7.45 | 0.51 |
| | | 98th% ile | 50.18 | 22.37 | 6.41 | 8.69 | 0.55 |
| 4. | Dymmiew | Min | 36.02 | 13.76 | 4.33 | 7.09 | 0.46 |
| | | Max | 49.15 | 20.84 | 8.44 | 12.64 | 0.79 |
| | | Avg. | 45.87 | 18.12 | 7.22 | 9.58 | 0.62 |
| | | 98th% ile | 48.92 | 20.40 | 8.43 | 12.64 | 0.78 |
| 5. | Umktieh | Min | 32.69 | 22.61 | 4.24 | 8.43 | 0.47 |
| | | Max | 48.69 | 27.54 | 8.14 | 10.46 | 0.82 |
| | | Avg. | 45.76 | 24.44 | 6.00 | 9.43 | 0.58 |
| | | 98th% ile | 48.58 | 27.17 | 7.72 | 10.46 | 0.81 |
| 6. | Lewmawiong | Min | 35.41 | 14.32 | 5.35 | 8.54 | 0.47 |
| | | Max | 45.02 | 21.38 | 7.89 | 10.98 | 0.85 |
| | | Avg. | 40.98 | 16.62 | 6.89 | 9.95 | 0.62 |
| | | 98th% ile | 44.61 | 21.22 | 7.89 | 10.98 | 0.82 |
| 7. | Sethliew | Min | 40.92 | 16.72 | 5.03 | 8.84 | 0.48 |
| | | Max | 53.4 | 23.84 | 7.54 | 10.9 | 0.92 |
| | | Avg. | 44.97 | 18.79 | 6.18 | 9.80 | 0.70 |
| | | 98th% ile | 51.48 | 23.38 | 7.51 | 10.89 | 0.89 |
| NAAQ STANDARDS | | | 100 | 60 | 80 | 80 | 2 |



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3.7.4 RESULTS

The analysis results for the study period are presented in above monitoring tables. Various statistical parameters like 98th percentile, average, maximum and minimum values have been computed from the observed raw data for all the AAQ monitoring stations. These are compared with the standards prescribed by Central Pollution Control Board (CPCB) for rural and residential zone.

The observation based on the perusal of the results is summarized below:-

PM₁₀:- The maximum value for PM₁₀ observed at Mine site (57.14 µg/m³) and minimum value for PM₁₀ observed at Mawkajem (32.58 µg/m³). The 24 hours applicable limit for Industrial, Residential Rural and Other Areas is 100 µg/m³.

PM_{2.5}:- The maximum value for PM_{2.5} observed at Umktieh (27.54 µg/m³) and minimum value for PM_{2.5} observed at Mine Site (13.68 µg/m³). The 24 hours applicable limit for industrial, Residential Rural and Other Areas is 60 µg/m³.

SO₂:- The maximum value for SO₂ observed at Dymmiew (8.44 µg/m³) and minimum value for SO₂ observed at Mine site (3.93 µg/m³). The 24 hours applicable limit for industrial, Residential Rural and Other Areas is 80 µg/m³.

NO₂:- The maximum value for NO₂ observed at Dymmiew (12.64 µg/m³) and minimum value for NO₂ observed at Mine site (5.25 µg/m³). The 24 hours applicable limit for industrial, Residential Rural and Other Areas is 80 µg/m³.

CO: -The maximum value for CO observed at Setthliew & Pomlum (0.92 Mg/m³) and minimum value for CO observed at Pomlum 0.32 mg/m³. The 8 hours applicable limit for Industrial, Residential Rural and other areas is 2.0 mg/m³.

Conclusion

The results of the monitored data indicate that the ambient air quality of the region in general is in conformity with respect to norms of National Ambient Air Quality standards of CPCB, at all locations monitored.

3.8 NOISE ENVIRONMENT

The main objective of noise monitoring in the study area is to establish the baseline noise level and assess the impact of the total noise expected to be generated during the project operations around the project site.

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Table 3.9: Noise (Sound) Measuring Instrument

| Instrument | Make | Model No. | Instrument Identification | Detection Limit |
|---|-------------|------------------|----------------------------------|-----------------------------|
| Integrated Sound Level Measurement Instrument Standard Accessories. | HTC | SL-1352 | SAL/NOISE/INT/05 | Lo 35-80 dB Hi 80-130 dB |

Table 3.10: Testing Method to be followed

| Particular | Testing Method to be Followed |
|---|--|
| Noise Level Measurement | |
| A Noise Level in dB (A) for continuous 24 hours at 1 hour interval. | Operational Manual of Noise Level Meter, Model No. DT - 805 issued by Mextech. |

3.8.1 AMBIENT NOISE LEVEL DATA

The statistical analysis is done for measured noise level at seven locations. The parameters are analyzed for L_{eq} (day), L_{eq} (night) and L_{eq} (day-night). The statistical analysis results are given in below:-

Table 3.11: Ambient Noise Level Data

| Location | Date of Sampling | Day Time (6.00 AM to 10.0PM) | Night Time (10.00 PM to 6.00 AM) |
|-------------------------------|-------------------------|---|---|
| Mine Site | 08.12.2022 | 56.8 | 35.5 |
| Pomlum | 24.12.2022 | 51.4 | 38.1 |
| Mawkajem | 05.12.2022 | 52.6 | 40.5 |
| Dymmiew | 04.01.2023 | 50.0 | 35.6 |
| Umktieh | 18.01.2023 | 53.6 | 40.3 |
| Lewmawiong | 23.01.2023 | 54.8 | 42.0 |
| Setthliew | 01.02.2023 | 52.5 | 38.5 |
| Standards | | | |
| Category of Area/ Zone | | Day Time | Night Time |
| Industrial Area | | 75 | 70 |
| Commercial Area | | 65 | 55 |
| Residential Area | | 55 | 45 |
| Silence Zone | | 50 | 40 |



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3.8.2 RESULT

A) Day time Noise Levels L_{eq} (day)

The day time L_{eq} (day) noise levels at all locations were observed to be in the range of 50– 56.8 dB(A). The maximum noise level of 56.8 dB (A) was observed at Mine site & the minimum noise level of 50 dB(A) was observed at Dymmiew during the study period. It is observed that the day time noise levels are in accordance to the prescribed limit of 75dB (A) in the study area.

B) Night time Noise Levels L_{eq} (night)

The night time L_{eq} (night) noise levels at all the residential locations was observed to be in range of 35.5-42 dB(A). The maximum noise level of 35.5 dB (A) was observed at Mine site and the minimum noise level of 42 dB (A) at Lewmawiong during the study period. It has been found that the night time noise levels at Mine Site were found to little very high due to vehicular movement, within the prescribed standard of 70 dB(A).

3.9 BIOLOGICAL ENVIRONMENT

3.9.1 INTRODUCTION

The biological environment includes both terrestrial and aquatic ecosystems. A change in the composition and structure of biotic communities are reflected by a change in the distribution pattern, density, diversity, frequency, dominance and abundance of natural species of flora and fauna existing in the ecosystem. Studies on biological aspect of ecosystems are significant under Environmental Impact Assessment for protection of natural flora and fauna from impacted and influenced zones of project. Assessment on the impact of environmental pressure on the biological community structure serves as an inexpensive and efficient early warning system to check the damage to a particular ecosystem. This document reports the Baseline Environmental Data on the Flora and Fauna of the study area of 10 km radial distance around the Project site including submergence and influence zones. Field survey was conducted for baseline study of existing biological resources in three different seasons and all the data has been gathered by direct inventory as well as through reviewing secondary information. Thus, both participatory and consultative approaches were followed under this study.

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Forest and Forest types in Meghalaya: - Meghalaya is a treasure trove of Nature, with its richly varied and dense endemic, exotic and cultivated flora. Nature, in its generous abundance, had bestowed on Meghalaya a unique array of vegetation, ranging from tropical and sub-tropical to temperate or near temperate. This is due to the diverse topography, varied and abundant rainfall and differential climatic and edaphic conditions of the State, within small regions. Biotic factors have also played an important role, at places decisive. The State is basically an agricultural State. It has a total geographical area of 22,429 km². The total estimated forest area of the State is 8,514 km² of which only 722.36 km² are directly under the control of the State Forest Department. The remaining areas are managed by the respective District Councils of Khasi Hills, Jaintia Hills and Garo Hills as per provisions of the Sixth Schedule to the Constitution of India. Except the reserved forest areas and protected forests in and around Shillong (being managed by the department in arrangement with the District Councils), the rest of the forest areas are subjected to the primitive agricultural practice of shifting cultivation or slash and burn method especially in Garo Hills. However, there are few pockets of undisturbed natural forests still in existence, comprising about 1000 km² being protected by the tribal as 'Sacred Groves'. Essentially, they are located in strategic watersheds and still play an important role.

The forests of Meghalaya can be broadly grouped into tropical, subtropical and temperate types. The Indian Institute of Remote Sensing have classified the vegetation of Meghalaya into tropical evergreen, tropical semi-evergreen, tropical moist deciduous, subtropical broad leaved, subtropical pine and temperate forest types, grasslands and savannas. Detailed description of forest is described in following sections:

Tropical forests: These forests occur up to an elevation of 120 m where average annual rainfall ranges between 100 and 250 Cm. They may be evergreen, semi evergreen, and moist deciduous depending on the annual rainfall. Such type of forests occurs along the banks of the River Umngot.

Tropical evergreen forests: These forests usually occur in high rainfall areas as well as near catchment areas. They seldom form continuous belts due to various exogenous factors. But still, they harbour very rich species diversity, where nature is at its extravaganza forming a closed evergreen canopy. The trees exhibit clear zonation with dense and impenetrable herbaceous undergrowth. Small strips and patches of such type of



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communities could be seen along the banks of the river and the streams that discharge into the river in the form of narrow strips.

Tropical semi-evergreen forests: This category of forests occupies the north-eastern and northern slopes of the State, typically up to elevations of 600m, where annual rainfall is 150 to 200 Cm with a comparatively cooler winter. The numbers of species here are fewer than the evergreen zone. There are also a few species in these forests which are deciduous in nature, such as *Careya arborea*, *Dillenia pentagyna* and *Callicarpa arborea*. Again, there is a clear stratification of the trees in these forests.

Tropical moist and dry deciduous forests: This type of forest occurs where annual rainfall is below 150 Cm and at comparatively low elevations. Deciduous forests are much more extensive in their distribution in the State and include a host of economically important trees like *Shorea robusta*, *Tectona grandis*, *Terminalia myriocarpa*, *Sterculia villosa*, *Logerstroemia flos-reginae*, *Logerstroemia parviflora*, *Morus laevigatus*, *Artocarpus chaplasha*, and *Gmelina arborea*.

Grass and Savannas: Grasslands of Meghalaya are also not a climax type but are only the result of removal of original forest cover. The rolling grasslands covering large areas can be seen throughout the Shillong plateau, around Riango, Ranikor, Weiloi, Mawphlang, Mawsynram, Cherrapunji, Shillong, Jowai, Jarain, and Sutnga in Khasi Hills and Jaintia Hills districts and major parts of West Garo Hills district.

Temperate Forests: 5.10 The temperate forests occupy the higher elevations of about 1000 m, mostly along the southern slope of Khasi Hills and Jaintia Hills. The rainfall here is very high (200-500 Cm) with severe winter during November to March. Ground frost is also common during December to January.

According to the State of Forest Report (FSI 2001), the actual forest cover of the state is 15,584 sq. km. This accounts for around 69.5% of the state's geographic area. Per capita forest area in the state is 0.64 hectares compared to the national average of 0.11 hectares. However, the total recorded forest area is 9,496 sq. km. The area of reserved and protected forests under the control of the state government is only 1,124 sq. km. The Unclassed Forests, managed by Autonomous District Councils, village durbars and other traditional institutions, and private owners cover an area of 8,372 sq. km. During 1985-87, 73.41% (16,466 sq. km) of the total geographical area of the state was under forest cover. It decreased to 69.75% (15,645 sq. km) by the year 1987-89 and then increased to 69.48% (15584 sq. km) in 1999-2001.



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3.9.2 OBJECTIVES OF THE STUDY

The objectives of the present study were as follows:-

- To assess the flora and fauna present in the core site of the proposed project and in around area buffer region (10 Km radius range),
- To document cultivated, planted and naturally occurring species in the core site,
- To document Rare, Endangered, Threatened species in the core area and in the buffer zone,
- Assessment of species protected by specific legislation (Rare, endangered, critically endangered, endemic and vulnerable)
- To identify designated locates, habitats and features of ecological significance

3.9.2.1 Activities undertaken during the study

a) Flora survey

- Fauna survey Tree, shrub, herb, climber and grass species identification and enumeration
- Diversity of species under plantations
- Analysis of Rare-Endangered-Threatened flora

b) Fauna survey

- Documentation of Avian, Reptilian, Insect, Amphibian, Mammal and other faunal diversity
- Observation by direct and indirect evidences (Direct evidence-Sighting and hearing, indirect evidence-Pug marks, nests and other sings)
- Analysis of Scheduled species
- Study Habit/microhabitat for the faunal elements in the project site and surrounding areas within 10 km range from the site.
- Records of the forest department and discussion with forest officials.
- The presence of wildlife was also confirmed from the local inhabitants depending on the animal's sightings and the frequency of their visits in the project area.
- In addition review of secondary data was another source of information for studying the fauna of the area.

c. Habitat/microhabitat diversity in the core sites and Buffer area

This survey records the flora and fauna evident on the day of the site visit and field survey. It does record any flora and fauna that may appear at other times of the year, and



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such, were not evident at the time of visit. The report represents ecological status of the area evident during the particular period of the study.

3.9.3 STUDY AREA

The state of Meghalaya is known for its diverse, extensive and luxuriant forests. The rich natural vegetation of the state ranges from Sub-tropical to Tropical owing to its diverse topography and varied climatic and edaphic conditions. Availability of fertile soil and its spatial variability in structure and texture provide rich substratum for growth and development of a wide range of vegetation. Further, luxuriant growth of wide range of flora is also attributed to differences in altitude and climatic conditions.



Figure: 3.7 View of the study area

3.9.4 OBSERVATION

Forest type in Submergence Area:

The forests that occur in the area of submergence are typical tropical riverside forests dominated by different species of *Ficus*, *Shorea robusta*, *Tectona grandis*, *Terminalia myriocarpa*, *Sterculia villosa*, *Logerstroemia flos-reginae*, *Logerstroemia parviflora*, *Morus laevigatus*, *Artocarpus chaplasha*, *Gmelina arborea*, *Schima wallichii*, *Artocarpus*



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gameziana, Tetrameles nudiflora, Lannea coromandelica, Salmalia malabarica Erythrina stricta, Premna milliflora, Vitex peduncularis, Albizia lebbeck, Terminalia bellirica, Anthocephalus cadamba and others.

The catchment area towards the Jaintia Hills was represented mainly by private or community croplands. Potato, Cabbage, Cauliflower, Carrot, Radish, Tomato, Chilies, Paddy, Millets, Pulses, Jute, Mesta, Ginger, Turmeric, Black Pepper, Sugarcane are the main crops grown during the rainy season. Areca nut, Pineapple and Betel wines are also grown in a limited area. The Eastern slopes of the East Khasi Hills beyond the level of submergence have been denuded and reclaimed for cultivation of Potato, Cabbage, Cauliflower, Carrot, Radish, Tomato, Chilies, Paddy, Millets, Pulses, Jute, Mesta and Ginger. Black Pepper, Areca nuts and Pineapple are grown in a few localities. In upper part of the hills large areas are also under the cultivation of broom grass (*Thysanolaena maxima*) on the plateau regions.

The catchment area of the Umngot River supports all the different types of vegetation types described earlier. There are different types of forests, grasslands and croplands. Based on the ownership of the land, the forests are classified as the reserve forests, unclassified community forests and sacred grooves. The sacred groves of Meghalaya are the best protected pieces of natural vegetation and have been preserved since time immemorial. Therefore, these are treasure trove of unique flora. However, there no sacred groove in the submergence area. A protective hedge of *Castanopsis kurzii* trees, which do not allow the growth of the Khasi pine within the enclosed area, surrounds these groves. Inside the groves however, the soil is richly laden with humus, accumulated over the centuries and which supports a variety of plant life found nowhere else. As indicated, there are unclassified dense (private forests) and open forests in the catchment and reservoir areas. Land use and Land cover of the catchment and submergence area. Out of the total forest area, only 4% is a reserve forest and the rest are treated as unclassified community forests.

Economically Important Species (Viz. Medicinal, Timber, Fuel Wood etc. Sacred groves): Forest-Groves are known by various names as "Ki Law Kyantang" (sacred forest); "Ki Law Adong" (prohibited forest); "Ki Law Shnong" (village forest) and "Ki Law Kynti" (private forest). These sacred groves are basically nature's own museum, as they have been preserved since time immemorial, and are hence a treasure trove of unique flora. A protective hedge of *Castanopsis kurzii* trees, which do not allow the



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growth of the Khasi pine within the enclosed area, surrounds these groves. Inside the groves however, the soil is richly laden with humus, accumulated over the centuries and which supports a variety of plant life found nowhere else. The trees in every grove are loaded with epiphytic growth of pipers, ferns, orchids etc. The size of the sacred groves varies from as small as an acre to hundreds of acres. There is at least one sacred grove for every two villages on an average. Some of the important tree species, which yield valuable timber for trade, are Khasi Pine, Sal, Teak, Bamboos. In Meghalaya forests the rubber-yielding plant of *Ficus elastica* belonging to the family of Moraceae is common. Lac and Gum are obtained from forests in the area. Forests offer tremendous scope for sericulture or silk worm rearing industry.

Ornamental Plants: The forests of study area are treasure house of valuable products such a timber, fuel wood, fodder, resin, tannin, gums, shellac, fiber, latex, essential oils, fats, edible fruits, honey and a large number of medicinal plants. Study area is well known for bay leaves and cinnamon. *Morus alba*, *Quercus semiserrata* and a number of other tree species play a vital role in the economy of the State, being the host plants for rearing of silk worms for sericulture. **The common ornamental trees are:** *Cassia fistula*, *Cassia nodosa*, *Jacaranda acutifolia*, *Magnolia griffithii*, *Lagerstroemia indica*, *Callistemon viminalis*, *Rhododendron spp.* The other seasonal ornamental plants are *Dahlia*, *Canna*, *Gladiolus*, *Hydrangium*, *Begonia*, *Tropaeolum*, *Aster*, *Polargonium*, *Antirrhinum*, *Crinum*, *Celosia*, *Kniphofia*, *Impatiens*, *Chrysanthemum*, *Petunias*, *Pansy*, *Calendula*, *Sweet peas* and *Salvia*. Many climbers like *Bougainvillea*, *Rosa*, *Jasminum*, etc. are quite common. Orchids like *Phaius*, *Paphiopedilum* and *Cymbidium spp.* are also cultivated. Other ornamentals grown in gardens are *Hibiscus*, *Hydrangea*, *Gardenia*, *Poinsettia*, *Dahlia*, *Canna*, *Gladiolus*, *Begonia*, *Tropaeolum*, *Aster*, *Polargonium*, *Antirrhinum*, *Crinum*, *Celosia*, *Holley hock*, *Kniphofia*, *Impatiens*, *Chrysanthemum*, *Petunia*, *Pansy*, *Calendula*, *Sweet Pea*, *Salvia*, *Roses*, *Bougainvillea*, *Jasminum* etc. A few Orchids like Phais, *Dendrobium* and *Cymbidium* varieties are also cultivated.

Ornamental Plants: The forests of study area are treasure house of valuable products such a timber, fuel wood, fodder, resin, tannin, gums, shellac, fiber, latex, essential oils, fats, edible fruits, honey and a large number of medicinal plants. Study area is well known for bay leaves and cinnamon. *Morus alba*, *Quercus semiserrata* and a number of other tree species play a vital role in the economy of the State, being the host plants for rearing of silk worms for sericulture. The common ornamental trees are: *Cassia fistula*,



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Cassia nodosa, Jacaranda acutifolia, Magnolia griffithii, Lagerstroemia indica, Callistemon viminalis, Rhododendron spp. The other seasonal ornamental plants are Dahlia, Canna, Gladiolus, Hydrangium, Begonia, Tropaeolum, Aster, Polargonium, Antirrhinum, Crinum, Celosia, Kniphofia, Impatiens, Chrysanthemum, Petunias, Pansy, Calendula, Sweet peas and Salvia. Many climbers like Bougainvillea, Rosa, Jasminum, etc. are quite common. Orchids like Phaius, Paphiopedilum and Cymbidium spp. are also cultivated. Other ornamentals grown in gardens are Hibiscus, Hydrangea, Gardenia, Poinsettia, Dahlia, Canna, Gladiolus, Begonia, Tropaeolum, Aster, Poalrgonium, Antirrhinum, Crinum, Celosia, Holley hock, Kniphofia, Impatiens, Chrysanthemum, Petunia, Pansy, Calendula, Sweet Pea, Salvia, Roses, Bougainvillea, Jasminum etc. A few Orchids like Phais, Dendrobium and Cymbidium varieties are also cultivated.

Agriculture: The major crop plants of study area are Paddy, Maize, Millets, Pulses, Potato, Jute and Mesta, Ginger, Turmeric, Black Pepper, Sugar Cane, Oil Seeds. Both Areca nut and Betel. The catchment area towards the Jaintia Hills was represented mainly by private or community croplands. Potato, Cabbage, Cauliflower, Carrot, Radish, Tomato, Chilies, Paddy, Millets, Pulses, Jute, Mesta, Ginger, Turmeric, Black Pepper, Sugarcane are the main crop grown during the rainy season. Areca nut, Pineapple and Betel wines are also grown in a limited area. The Eastern slopes of the East Khasi Hills beyond the level of submergence have been denuded and reclaimed for cultivation of Potato, Cabbage, Cauliflower, Carrot, Radish, Tomato, Chilies, Paddy, Millets, Pulses, Broom grass is cultivated mainly in the plateau. Jute, Mesta and Ginger, Black Pepper, Areca nuts and Pineapple are grown in a few localities. Horticulture is not the main stay of the locals. Orchids from natural sources are collected and sold in Shillong.

Medicinal plants: Different parts of many plants growing in study have been put to medicinal use. Among the important and recognized medicinal plants found and cultivated in the study area are Ipecac, Rauwolfia serpentina, Cinchona, Abromine, Chaulmoogra oil, Croton oil, Eucalyptus, Castor oil, Chiretta, *Solanum khasianum, Casearia vareca, Zanthoxylum armatum, Hedyotis scandens, Paederia foetida, Salix alba, Anacardium occidentale, Cinnamomum and Taxus baccata.* A list of trees including the shrubs, herbs and climber is given in Table 3.12.

Table 3.12: List of Flora in Project Area (Buffer zone)

| S. No. | Plant Species | Family | Local Name |
|--------|---------------|--------|------------|
| Tree | | | |

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|-----|-----------------------------------|----------------|-----------------|
| 1. | <i>Aglaiia perviridis</i> | Meliaceae | - |
| 2. | <i>Albizia procera</i> | Mimosaceae | Dieng Sohriew |
| 3. | <i>Altsonia scholaris</i> | Apocynaceae | - |
| 4. | <i>Artocarpus lacucha</i> | Moraceae | Dieng Sohryrtet |
| 5. | <i>Aphanomixis polystachya</i> | Meliaceae | Dieng-soh-sying |
| 6. | <i>Bauhinia purpurea</i> | Caesalpinaceae | Me-gong |
| 7. | <i>Beilschme roxburghiana</i> | Laraceae | - |
| 8. | <i>Beilschmiedia roxburghiana</i> | Lauraceae | - |
| 9. | <i>Bombax ceiba</i> | Bombacaceae | Dieng ruin |
| 10. | <i>Callicarpa arborea</i> | Verbenaceae | Dieng-lakhoit |
| 11. | <i>Camellia caudata</i> | Theaceae | |
| 12. | <i>Caryota urens</i> | Arecaceae | Dieng Lakhar |
| 13. | <i>Casearia vareca</i> | Flacourtiaceae | - |
| 14. | <i>Castanopsis indica</i> | Fagaceae | Dieng sohot |
| 15. | <i>Castanopsis purpurella</i> | Fagaceae | - |
| 16. | <i>Castanopsis tribuloides</i> | Fagaceae | - |
| 17. | <i>Cinnamomum granduliflerum</i> | Lauraceae | - |
| 18. | <i>Cinnamomum tamala</i> | Lauraceae | Dieng Latyrpad |
| 19. | <i>Citrus latipes</i> | Rutaceae | Dieng sohkyphor |
| 20. | <i>Coffea khasiana</i> | Rubiaceae | - |
| 21. | <i>Desmos longiflorus</i> | Schisandraceae | - |
| 22. | <i>Diospyros kaki</i> | Ebenaceae | Dieng-iong |
| 23. | <i>Dysoxylum gobara</i> | Meliaceae | Sla-luchai |
| 24. | <i>Engelhardtia spicata</i> | Juglandaceae | Gandmowa |
| 25. | <i>Erythrina stricta</i> | Papilionaceae | - |
| 26. | <i>Eurya acuminata</i> | Theaceae | Dieng shit |
| 27. | <i>Eurya cerasifolia</i> | Theaceae | - |
| 28. | <i>F. oligodon</i> | Moraceae | - |
| 29. | <i>Ficus geniculate</i> | Moraceae | Phrap-agar |
| 30. | <i>Ficus hirta</i> | Moraceae | Dieng jri |
| 31. | <i>Ficus nerifolia</i> | Moraceae | Dieng jri |
| 32. | <i>Garcinia xanthochymus</i> | Cluciaceae | Jharambi |
| 33. | <i>Glochidion hirsutum</i> | Euphorbiaceae | - |
| 34. | <i>Gynocadia odorata</i> | Flacourtiaceae | - |
| 35. | <i>Homalium schlichii</i> | Flacourtiaceae | - |



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|-----|-----------------------------------|----------------|------------------|
| 36. | <i>Hydnocarpus kurzi</i> | Flacourtiaceae | - |
| 37. | <i>Itea macrophylla</i> | Itaceae | |
| 38. | <i>L. khasyana</i> | Lauraceae | - |
| 39. | <i>Lagerstroemia hirsute</i> | Lythraceae | Taman |
| 40. | <i>Lannea coromandelica</i> | Anacardiaceae | Jhingran |
| 41. | <i>Lindera latifolia</i> | Lauraceae | - |
| 42. | <i>Litsea citrate</i> | Lauraceae | |
| 43. | <i>Lithocarpus elagans</i> | Fagaceae | - |
| 44. | <i>Litsea lancifolia</i> | Lauraceae | - |
| 45. | <i>Macaranga denticulate</i> | Euphorbiaceae | Dieng Lakhar |
| 46. | <i>Michelia glabra</i> | Magnoliaceae | - |
| 47. | <i>Miliusa globose</i> | Anonaceae | - |
| 48. | <i>Myrica esculanta</i> | Myricaceae | Dieng sohpie |
| 49. | <i>Oroxylum indicum</i> | Bignoniaceae | Pharri |
| 50. | <i>Parkia roxburghii</i> | Mimosaceae | Dieng jariat |
| 51. | <i>Persea odoratissima</i> | Lauraceae | Kaula |
| 52. | <i>Picresema sp.</i> | Simaroubiaceae | - |
| 53. | <i>Pithecellobium monadelphum</i> | Mimosaceae | - |
| 54. | <i>Pinus khasiana</i> | Pinaceae | Dieng kseh |
| 55. | <i>Podocarpus nerrifolia</i> | Podocarpaceae | - |
| 56. | <i>Pyrularia edulis</i> | Santalaceae | - |
| 57. | <i>Quercus griffithii</i> | Fagaceae | - |
| 58. | <i>Rhus acuminata</i> | Anacardiaceae | Dieng sohma |
| 59. | <i>Rhus javanica</i> | Anacardiaceae | - |
| 60. | <i>Samanea saman</i> | Mimosaceae | -- |
| 61. | <i>Sapindus rarak</i> | Sapindaceae | - |
| 62. | <i>Schefflera bengalensis</i> | Araliaceae | - |
| 63. | <i>Schefflera hypoleucea</i> | Araliaceae | - |
| 64. | <i>Schima wallichii</i> | Theaceae | Dieng ngan |
| 65. | <i>Schima wallichii</i> | Theaceae | Dieng ngan |
| 66. | <i>Stereospermum chelonoides</i> | Bignoniaceae | Padal |
| 67. | <i>Styrax serrulatum</i> | Styraceae | - |
| 68. | <i>Saurauia punduana</i> | Actinidiaceae | - |
| 69. | <i>Syzygium cuminii</i> | Myrtaceae | Dieng Jamun |
| 70. | <i>Syzygium tetragomum</i> | Myrtaceae | Dieng-soh-sarlei |



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|---------------|------------------------------------|-----------------|---|
| 71. | <i>Tetradium fraxinifolium</i> | Rutaceae | - |
| 72. | <i>Trema aboimensis</i> | Ulmaceae | - |
| 73. | <i>Vaccinium donianum</i> | Ericaceae | - |
| 74. | <i>Villebrunea integrifolia</i> | Urticaceae | - |
| Shrubs | | | |
| 1. | <i>Aeschynanthus hookeri</i> | Gesneriaceae | - |
| 2. | <i>Andrachne cordifolia</i> | Euphorbiaceae | - |
| 3. | <i>Aralia thomsonii</i> | Araliaceae | |
| 4. | <i>Artabotrys caudatus</i> | Annonaceae | - |
| 5. | <i>Aspidopterys roxburghiana</i> | Malpighiaceae | - |
| 6. | <i>B. platyphylla</i> | Urticaceae | - |
| 7. | <i>Bambusa tulda</i> | Poaceae | - |
| 8. | <i>Boehmeria macrophylla</i> | Urticaceae | - |
| 9. | <i>Boehmeria sidaefolia</i> | Urticaceae | |
| 10. | <i>Breynia retusa</i> | Euphobiaceae | |
| 11. | <i>Calamus floribundus</i> | Arecaceae | - |
| 12. | <i>Cassia floribunda</i> | Fabaceae | |
| 13. | <i>Chromolaena odoratum</i> | Asteraceae | - |
| 14. | <i>Clerodendrum colebrookianum</i> | Verbenaceae | - |
| 15. | <i>Corylopsis himalayana</i> | Hamamelidaceae | |
| 16. | <i>Desmodium triquetrum</i> | Papilionaceae | - |
| 17. | <i>Embelia subcoriaceae</i> | Myrsinaceae | |
| 18. | <i>Embelia vestita</i> | Myrsinaceae | |
| 19. | <i>Erythroxylum kunthianum</i> | Erythroxylaceae | |
| 20. | <i>Euonymus lowsonii</i> | Celastraceae | |
| 21. | <i>Eupatorium adenophorum</i> | Asteraceae | |
| 22. | <i>F. lanceolata</i> | Moraceae | - |
| 23. | <i>Ficus clavate</i> | Moraceae | |
| 24. | <i>Ficus scandens</i> | Moraceae | - |
| 25. | <i>Indigofera heterantha</i> | Papilionaceae | - |
| 26. | <i>Isodon ternifolius</i> | Lamiaceae | - |
| 27. | <i>Ixora acuminata</i> | Rubiaceae | - |
| 28. | <i>Jasminium dispernum</i> | Oleaceae | |
| 29. | <i>L. crispa</i> | Leeaceae | - |



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|-----|-----------------------------------|--------------|---|
| 30. | <i>Lasianthus lucidus</i> | Rubiaceae | - |
| 31. | <i>Lantana camara</i> | Verbeniaceae | - |
| 32. | <i>Lasianthus sikkimensis</i> | Rubiaceae | - |
| 33. | <i>Leea aequata</i> | Leeaceae | - |
| 34. | <i>Liculia pinceana</i> | Rubiaceae | - |
| 35. | <i>Loranthus odoratus</i> | Loranthaceae | - |
| 36. | <i>Loxostigma griffithii</i> | Gesneriaceae | - |
| 37. | <i>Measa indica</i> | Myrsinaceae | |
| 38. | <i>Micromelum integerrimum</i> | Rutaceae | - |
| 39. | <i>Mimosa rubecaulis</i> | Mimosaceae | - |
| 40. | <i>Mussaenda roxburghii</i> | Rubiaceae | - |
| 41. | <i>Melastoma nepalensis</i> | Myricaceae | - |
| 42. | <i>Osbeckia nepalensis</i> | Lythraceae | - |
| 43. | <i>Oxympora paniculata</i> | Lythraceae | - |
| 44. | <i>Pentapanax fragrans</i> | Araliaceae | - |
| 45. | <i>Phlogacanthus thyrsoflorus</i> | Acanthaceae | - |
| 46. | <i>Piper pedicellatum</i> | Piperaceae | - |
| 47. | <i>Plectranthus striatus</i> | Lamiaceae | |
| 48. | <i>Polygonum molle</i> | Polygonaceae | |
| 49. | <i>Prinsepia utilis</i> | Rosaceae | |
| 50. | <i>Psychortia curviflora</i> | Rubiaceae | |
| 51. | <i>Psychortia erratica</i> | Rubiaceae | |
| 52. | <i>Psychotria denticulata</i> | Rubiaceae | - |
| 53. | <i>R. ellipticus</i> | Rosaceae | - |
| 54. | <i>R. moluccanus</i> | Rosaceae | - |
| 55. | <i>R. paniculatus</i> | Rosaceae | - |
| 56. | <i>R. rosaefolius</i> | Rosaceae | - |
| 57. | <i>Rhynchotecom vestitum</i> | Gesneriaceae | |
| 58. | <i>Rubus acuminatus</i> | Rosaceae | - |
| 59. | <i>Rubus assamensis</i> | Rosaceae | |
| 60. | <i>Rubus ellipticus</i> | Rosaceae | |
| 61. | <i>Rubus khasiana</i> | Rosaceae | |
| 62. | <i>S. surettense</i> | Solanaceae | - |
| 63. | <i>Senecio cappa</i> | Myricaceae | |
| 64. | <i>Shutaria vestida</i> | Rubiaceae | |



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|--------------|----------------------------------|-----------------|---|
| 65. | <i>Solanum aculeatissimum</i> | Solanaceae | |
| 66. | <i>Solanum ferox</i> | Solanaceae | - |
| 67. | <i>Strobilanthes auriculata</i> | Acanthaceae | - |
| 68. | <i>Trevesia palmata</i> | Araliaceae | - |
| 69. | <i>Viburnum foetidum</i> | Caprifoliaceae | |
| 70. | <i>Viscum articulatum</i> | Loranthaceae | - |
| Herbs | | | |
| 1. | <i>Sida cordata</i> | Malvaceae | - |
| 2. | <i>Borreria sp.</i> | Rubiaceae | - |
| 3. | <i>Cyperus flavidus</i> | Cyperaceae | - |
| 4. | <i>Impatiens khasiana</i> | Balsaminaceae | - |
| 5. | <i>Oxalis corniculata</i> | Oxalidaceae | - |
| 6. | <i>Trigonella foenum-graecum</i> | Papilionaceae | - |
| 7. | <i>Melilotus indica</i> | Papilionaceae | |
| 8. | <i>Desmodium triquetrum</i> | Papilionaceae | |
| 9. | <i>Drymaria cordata</i> | Caryophyllaceae | |
| 10. | <i>Hedyotis vestita</i> | Rubiaceae | - |
| 11. | <i>H. scandens</i> | Rubiaceae | - |
| 12. | <i>Ageratum conyzoides</i> | Asteraceae | - |
| 13. | <i>Blumea chinensis</i> | Asteraceae | - |
| 14. | <i>Crepis japonica</i> | Asteraceae | - |
| 15. | <i>Inula cappa</i> | Asteraceae | - |
| 16. | <i>Mikania macrantha</i> | Asteraceae | - |
| 17. | <i>Senecio araneosus</i> | Asteraceae | - |
| 18. | <i>Lophatherum gracile</i> | Poaceae | - |
| 19. | <i>Isachne himalaica</i> | Poaceae | - |
| 20. | <i>Selaginella semicordata</i> | Selaginallaceae | - |
| 21. | <i>Hedychium ellepticum</i> | Zingiberaceae | - |
| 22. | <i>Globba clarkia</i> | Zingiberaceae | - |
| 23. | <i>Begonia palmata</i> | Begoniaceae | - |
| 24. | <i>Impatiens khasiana</i> | Balsaminaceae | - |
| 25. | <i>Impatiens banthamii</i> | Balsaminaceae | - |
| 26. | <i>Commelina paludosca</i> | Commelinaceae | - |
| 27. | <i>Panicum brevifolium</i> | Poaceae | - |
| 28. | <i>Murdannia gigantean</i> | Commelinaceae | - |



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|-----------------|------------------------------------|------------------|---|
| 29. | <i>Aeginetia indica</i> | Orobanchaceae | - |
| 30. | <i>Carex filicina</i> | Cyperaceae | - |
| 31. | <i>Crassocephalum crepidioides</i> | Asteraceae | - |
| 32. | <i>Achyrospermum wallichianum</i> | Lamiaceae | - |
| 33. | <i>Elatostema dissectum</i> | Urticaceae | - |
| 34. | <i>Elsholtzia blanda</i> | Lamiaceae | - |
| 35. | <i>Arisaema tortuosum</i> | Araceae | - |
| 36. | <i>Dianella ensata</i> | Liliaceae | - |
| 37. | <i>Cyanotis vaga</i> | Commelinaceae | - |
| 38. | <i>Balanophora dioica</i> | Balanophoraceae | - |
| 39. | <i>Murdannia nudiflora</i> | Commelinaceae | - |
| 40. | <i>Sonerila khasiana</i> | Melastomaceae | - |
| Climbers | | | |
| 1. | <i>Cocculus macrocarpus</i> | Menispermaceae | - |
| 2. | <i>Stephania glabra</i> | Menispermaceae | - |
| 3. | <i>Toddalia asiatica</i> | Rutaceae | - |
| 4. | <i>Celastrus monosperma</i> | Celastraceae | - |
| 5. | <i>Cayratia mollissima</i> | Vitaceae | - |
| 6. | <i>Cissus adnate</i> | Vitaceae | - |
| 7. | <i>Tetrastigma discolor</i> | Vitaceae | - |
| 8. | <i>Mucuna monosperma</i> | Papilionaceae | - |
| 9. | <i>Entada phaseoloides</i> | Mimosaceae | - |
| 10. | <i>Hedera nepalensis</i> | Araliaceae | - |
| 11. | <i>Jasminum dispernum</i> | Oleaceae | - |
| 12. | <i>Ichnocarpus frutescens</i> | Apocynaceae | - |
| 13. | <i>Marsdenia tinctoria</i> | Asclepiadaceae | - |
| 14. | <i>Porana paniculata</i> | Convolvulaceae | - |
| 15. | <i>Thunbergia grandiflora</i> | Acanthaceae | - |
| 16. | <i>Aristolochia roxburghiana</i> | Aristolochiaceae | - |
| 17. | <i>Dioscorea bulbifera</i> | Dioscoreaceae | - |
| 18. | <i>Smilax aspericaulis</i> | Smilacaceae | - |
| 19. | <i>Rhaphidophora decursiva</i> | Araceae | - |

*As per the secondary source

Table 3.13: List of Orchids reported in West Jaintia Hills

| Name of plant species | Family | Status as per IUCN/BSI |
|--------------------------------------|------------------|---------------------------------------|
| <i>Ceropegia angustifolia</i> | Asclepiadaceae | Vulnerable NE Hilly region, Khasi |
| <i>Fimbristylis stolonifera</i> | Cyperaceae | Rare in abandoned jhum of Khasi hills |
| <i>Elaeocarpus prunifolius</i> | Elaeocarpaceae | Rare |
| <i>Paphiopedilum venustum</i> | Orchidaceae | Vulnerable |
| <i>Vanda coerulea</i> | Orchidaceae | Rare |
| <i>Cleyera japonica</i> | Theaceae | Rare |
| <i>Metathelypteris decipiens</i> | Thelypteridaceae | Rare / Endemic |
| <i>Coryopteris didymochlaenoides</i> | Thelypteridaceae | Rare / Endemic Fern |



Oxalis Species



Microphylla Species



Fern Species (Asplenium)



Lygodium Species



Pseudognaphalium



Uncaria Species



Polygonum Species



Fern Species



Cynotis Species



Selaginella Species.

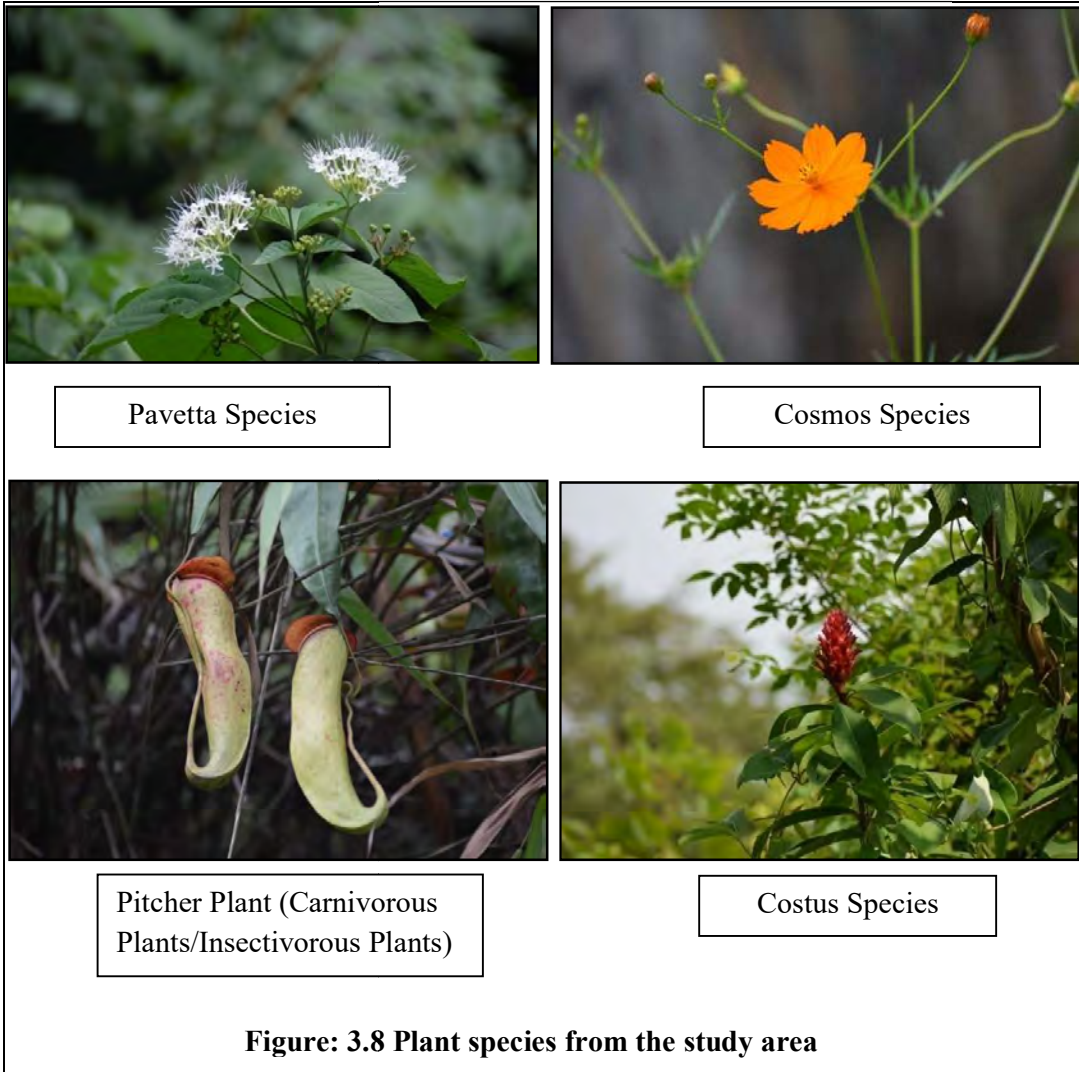


Figure: 3.8 Plant species from the study area

Faunal Diversity (Meghalaya State):

More than 110 mammal species are reported from the Meghalaya Forests, but none is endemic to the state. Some of the species of conservation importance include tiger (*Panthera tigris*), clouded leopard (*Pardofelis nebulosa*), Asian elephant (*Elephas maximus*), wild dog (*Cuon alpinus*), Malayan sun bear (*Ursus malayanus*), sloth bear (*Melursus ursinus*), large Indian civet (*Viverra zibetha*), Chinese pangolin (*Manis pentadactyla*), Indian pangolin (*Manis crassicaudata*), Assamese macaque (*Macaca assamensis*), bear macaque (*Macaca arctoides*), and capped leaf monkey (*Semnopithecus pileatus*). The tiger, clouded leopard, Asian elephant, Assamese macaque, bear macaque, capped leaf monkey, wild dog, sloth bear, and smooth-coated otter are threatened species (IUCN 2000). There are about 2,000 elephants in the Garo Hills and 500 in Jaintia Hills. The wild Buffaloes are also found in the forests of



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Meghalaya. Frogs and toads represent amphibians. Three types of reptiles - lizards, tortoises and snakes, are reported from the state. Several species of fishes and crabs are also found.

Faunal survey was carried out for the species of Mammals, Birds, Herpetofauna and Insects and the study of mammals and birds were studied by placing systematic transects at different sampling locations in the study area. This exploration of the species was carried out with respect to the habitat types and altitudes where they occurred. A study and survey of Birds (resident, migratory), land animals including mammals, reptiles and insects and aquatic flora and fauna including fish species was undertaken during the study period by a team of experienced biologists. Fauna of Meghalaya (Volume I and II), published by the Zoological Society of India, Meghalaya Flora and Fauna by the Directorate of information and Public relations, Government of Meghalaya and published Scientific reports have been used as references. As far as the larger vertebrates including Carnivores and reptiles are concerned, the data is based mainly on secondary sources corroborated by local residents. Birds have been watched using binoculars, photographed for identification. But the list of birds is based both on primary and secondary sources. Butterflies are based mainly on primary observations.

Mammals

All the sampling for mammalian fauna was carried out in the morning and evening time by using 2-3 km long transects and animal trails. The focus of the sampling was towards the direct sighting of animals but indirect signs like scats, pellets, pugmarks, scraps, vocalizations, horns etc. were also recorded during the survey walk and referred for the presence of animals. The indirect evidences and information of the animal presence has been also collected through the interviews of local people and available literature. A list of mammals reported from the catchment area is given in Table 3.14 the list is mainly based on secondary sources.

Table 3.14: List of Mammalian Species

| S. No. | Scientific Name | Common Name | Family | IWPA, 1972 |
|--------|--------------------------|---------------|-----------------|-----------------|
| 1. | <i>Macaca arctoides</i> | Bear macaque | Cercopithecidae | Sch II (Part I) |
| 2. | <i>Macaca assamensis</i> | Assam macaque | Cercopithecidae | Sch II (Part I) |
| 3. | <i>Felis chaus</i> | Jungle Cat | Felidae | Sch II (Part I) |
| 4. | <i>Canis aureus</i> | Jackal | Canidae | Sch II (Part I) |



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| 5. | <i>Viverricula indica</i> | Small Indian Civet | Viverridae | Sch II (Part I) |
| 6. | <i>Paguma larvata</i> | Masked Palm Civet | Viverridae | Sch II (Part I) |
| 7. | <i>Antherurus macrourus</i> | Bush-tailed porcupine | Hystriidae | Sch II (Part I) |
| 8. | <i>Suncus murinus</i> | House Shrew | Soricidae | Least Concern |
| 9. | <i>Suncus fellowesgordoni</i> | Pigmy Shrew | Soricidae | Least Concern |
| 10. | <i>Anourosorex squamipes</i> | Chinese Mole Shrew | Soricidae | Least Concern |
| 11. | <i>Herpestes urva</i> | Crab Eating mongoose | Herpestidae | Sch II (Part I) |
| 12. | <i>Herpestes edwardsii</i> | Indian Grey Mongoose | Herpestidae | Sch II (Part I) |
| 13. | <i>Muntiacus muntjak</i> | Barking deer | Cervidae | Sch III |
| 14. | <i>Rusa unicolor</i> | Sambar | Cervidae | Sch III |
| 15. | <i>Dremomys lokriah</i> | Long-nosed Squirrel | Sciuridae | Sch II (Part I) |
| 16. | <i>Ratufa bicolor</i> | Him. Giant squirrel | Sciuridae | Sch II (Part I) |
| 17. | <i>Petaurista</i> | Red Giant Flying Squirrel | Sciuridae | Sch II (Part I) |
| 18. | <i>Callosciurus pygerythrus</i> | Hoary Bellied Squirrel | Sciuridae | Sch II (Part I) |
| 19. | <i>Parascaptor leucura</i> | Indian Mole | Talpidae | Sch IV |
| 20. | <i>Rattus niviventer</i> | House Rat | Muridae | Sch IV |
| 21. | <i>Chiropodomys gliroides</i> | Pencil-tailed Tree Mouse | Muridae | Sch V |
| 22. | <i>Berylmys bowersi</i> | White-toothed Rat | Murinae | Sch V |
| 23. | <i>Berylmys mackenziei</i> | Keneth's Rat | Murinae | Sch V |
| 24. | <i>Leopoldamys edwardsi</i> | Long-tailed giant Mouse | Murinae | Sch V |
| 25. | <i>Rhizomys pruinosus</i> | Hoary Bamboo rat | Spalacidae | Sch-V |
| 26. | <i>Cannomys badius</i> | Lesser Bamboo Rat | Spalacidae | Sch-V |
| 27. | <i>Rhinolophus pusillus</i> | Least Horseshoe bat | Rhinolophidae | Sch IV |

Table 3.15: List of Reptilian fauna recorded from the study area

| S.No. | Common name | Latin name | Distribution | Status ZSI /IUCN | IWPA, 1972 Schedule |
|-------|-------------|---------------------------------|--------------|------------------|---------------------|
| 1. | Lizard | <i>Cyrtodactylus khasiensis</i> | Widespread | Common | II (Part II) |
| 2. | Lizards | <i>Cosymbotus platyurus</i> | Widespread | Common | II (Part II) |
| 3. | Lizards | <i>Calotes emma</i> | Widespread | Common | II (Part II) |



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| 4. | Lizards | <i>Calotes jerdoni</i> | Widespread | Common | II (Part II) |
| 5. | Lizards | <i>Calotes versicolor</i> | Widespread | Common | II (Part II) |
| 6. | Lizards | <i>Gecko</i> | Widespread | Common | II (Part II) |
| 7. | House Gecko | <i>Hemidactylus brooki</i> | Widespread | Common | II (Part II) |
| 8. | Rat snake | <i>Ptyas korros</i> | Very common | Common | II (Part I) |
| 9. | Black Krait | <i>Bungarus niger</i> | Common | Scarce | II (Part II) |
| 10. | Banded Krait | <i>Bungarus fasciatus</i> | Common | Scarce | II (Part II) |
| 11. | Indian Cobra | <i>Naja</i> | Scarce | Threatened | II (Part II) |
| 12. | Pit Viper | <i>Trimeresurus albolabris</i> | Common | common | II (Part II) |

Avifauna

Bird survey was conducted on the same transects and trails marked for mammal's survey. The whole sampling was carried out in fixed width trails of 2-3 km wherever the terrain permits and point counts were carried out at a fixed distance at more or less at regular intervals. A prismatic field binocular (10X50) was used for the bird watching during transect walk mostly during morning and evening hours at nearby habitations as well as near to water bodies in the study area. An on-spot identification of birds has been carried out with the help of pictorial guides/literature published by Grimmett et al. (2011). A list of local, resident, migrant and vagrant birds of the catchment area of the Umngot River is given in Table 3.16. The list shows none of species belong to the Schedule I category of the IWPA, 1972.

Table 3.16: List of avifauna recorded from the study area

| S. No. | Common name | Scientific Name | Order | Residential status | IWPA, 1972 Schedule |
|--------|------------------------|----------------------------|---------------|--------------------|---------------------|
| 1. | Assam Bamboo Partridge | <i>Bambusicola fytchii</i> | Galiformes | Local migrant | IV |
| 2. | Assam Black Partridge | <i>Francolinus</i> | Galiformes | Local migrant | IV |
| 3. | Black winged kite | <i>Elanus caeruleus</i> | Falconiformes | Local migrant | IV |
| 4. | Brahmy Kite | <i>Heliaster indus</i> | Falconiformes | Local migrant | IV |
| 5. | Cattle Egret | <i>Bubulcus ibis</i> | Ciconiformes | Local migrant | IV |
| 6. | Common Pochard | <i>Aythya ferina</i> | Ciconiformes | Local migrant | IV |
| 7. | Common Teal | <i>Anas crecca</i> | Ciconiformes | Local migrant | IV |
| 8. | Coot | <i>Fulica atra</i> | Gruciformes | Resident | IV |



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|-----|------------------------|-------------------------------------|------------------|---------------|----|
| 9. | Eastern Grey Goose | <i>Anser</i> | Ciconiformes | Migratory | IV |
| 10. | Eastern Grey Heron | <i>Ardea cinerea</i> | Ciconiformes | Local migrant | IV |
| 11. | Eastern Purple Heron | <i>Ardea purpurea</i> | Ciconiformes | Local migrant | IV |
| 12. | Eastern Steppe Eagle | <i>Aquila rapax</i> | Falconiformes | Local migrant | IV |
| 13. | Goshawk | <i>Accipiter gentiles</i> | Falconiformes | Local migrant | IV |
| 14. | Great egret | <i>Ardea alba</i> | Ciconiformes | Local migrant | IV |
| 15. | Indian Black Vulture | <i>Sarcogyps calvus</i> | Falconiformes | Local migrant | IV |
| 16. | Indian Moorhen | <i>Gallinula chloropus</i> | Gruciformes | Local migrant | IV |
| 17. | Indian Red jungle Fowl | <i>Gallua gallus murgha</i> | Galiformes | Resident | IV |
| 18. | Indian Shikra | <i>Accipiter badius</i> | Falconiformes | Local migrant | IV |
| 19. | Khalij Pheasant | <i>Polyplectron bicalcaratum</i> | Galiformes | Local migrant | IV |
| 20. | Large cormorant | <i>Phalacrocorax carbo sinensis</i> | Felicaniformis | Local migrant | IV |
| 21. | Large Indian Kite | <i>Milvus migrans</i> | Falconiformes | Local migrant | IV |
| 22. | Lesser whistling Teal | <i>Anas javanica</i> | Ciconiformes | Local migrant | IV |
| 23. | Little Bustard Quail | <i>Turnix sylvatica</i> | Gruciformes | Local migrant | IV |
| 24. | Little cormorant | <i>Phalacrocorax niger</i> | Felicaniformis | Local migrant | IV |
| 25. | Little grebe | <i>Podiceps rufficollis</i> | Podicipediformis | Migratory | IV |
| 26. | Little green Heron | <i>Ardea striatus</i> | Ciconiformes | Local migrant | IV |
| 27. | Night Heron | <i>Nycticorax nycticorax</i> | Ciconiformes | Local migrant | IV |
| 28. | Paintail | <i>Anas acuta</i> | Ciconiformes | Local migrant | IV |
| 29. | Pariah kite | <i>Milvus migrans</i> | Falconiformes | Vagrant | IV |
| 30. | Peacock Pheasant | <i>Polyplectron bicalcaratum</i> | Galiformes | Vulnerable | IV |
| 31. | Smaller / median Egret | <i>Egretta intermedia</i> | Ciconiformes | Local migrant | IV |
| 32. | Pheasant tailed Jacana | <i>Hydrophasianus chirurgus</i> | Gruciformes | Resident | IV |
| 33. | Red Wattled Lapwing | <i>Vanellus indicus</i> | Gruciformes | Resident | IV |
| 34. | Eastern golden Plover | <i>Pluvialis dominica</i> | Gruciformes | Resident | IV |
| 35. | Eastern Little Ringed | <i>Charadrius dubius</i> | Gruciformes | Resident | IV |



| | | | | | |
|-----|-------------------------------------|------------------------------------|-------------------|---------------|----|
| | Plover | <i>curonicus</i> | | | |
| 36. | Spotted Sandpiper | <i>Tringa glareola</i> | Gruciformes | Resident | IV |
| 37. | Common sandpiper | <i>Tringa hypoleucos</i> | Gruciformes | Resident | IV |
| 38. | Fantail Snipe | <i>Gallinago gallinago</i> | Gruciformes | Local migrant | IV |
| 39. | Woodcock | <i>Scolopax rusticola</i> | Gruciformes | Resident | IV |
| 40. | Painted snipe | <i>Rostratula benghalensis</i> | Gruciformes | Local migrant | IV |
| 41. | Indian River Tern | <i>Sterna aurantia</i> | Gruciformes | Local migrant | IV |
| 42. | Wedge tailed Pigeon | <i>Treron spenura</i> | Columbiforme s | Resident | IV |
| 43. | Bengal green Pigeon | <i>Treron phoenicoptera</i> | Columbiforme s | Resident | IV |
| 44. | Indian Blue rock Pigeon | <i>Columba livia</i> | Columbiforme s | Resident | IV |
| 45. | Indian Ring Dove | <i>Streptopelia decaocto</i> | Columbiforme s | Resident | IV |
| 46. | Indian spotted dove | <i>Streptopelia chinensis</i> | Columbiforme s | Resident | IV |
| 47. | Northern Ring nosed Parakeet | <i>Psittacula krameri</i> | Psittaciformes | Resident | IV |
| 48. | Northern blossom headed Parakeet | <i>Psittacula cyanocephala</i> | Psittaciformes | Resident | IV |
| 49. | Indian Lorikeet | <i>Loriculus vernalis</i> | Psittaciformes | Resident | IV |
| 50. | Red winged crested Cuckoo | <i>Clamator coromandus</i> | Cuculiformes | Local migrant | IV |
| 51. | Common Hawk Cuckoo | <i>Cuculus varius</i> | Cuculiformes | Local migrant | IV |
| 52. | Indian Cuckoo | <i>Cuculus micropterus</i> | Cuculiformes | Local migrant | IV |
| 53. | Khasi Hills Cuckoo | <i>Cuculus canorus</i> | Cuculiformes | Resident | IV |
| 54. | Indian Koel | <i>Eudynamis scelopacea</i> | Cuculiformes | Local migrant | IV |
| 55. | Grass Owl | <i>Tyto capensis</i> | Strigiformes | Local migrant | IV |
| 56. | Indian great horned Owl | <i>Bubo bengalensis</i> | Strigiformes | Local migrant | IV |
| 57. | Northern Spotted Owl | <i>Athene brama</i> | Strigiformes | Local migrant | IV |



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|-----|-----------------------------------|-----------------------------------|--------------|---------------|----|
| | | <i>indica</i> | | | |
| 58. | Eastern Palm Swift | <i>Cypsiurus parvus</i> | Apordiformes | Local migrant | IV |
| 59. | Indian Pied Kingfisher | <i>Ceryle rudis</i> | Coraciformes | Local migrant | IV |
| 60. | Great Blue Kingfisher | <i>Alcedo hercules</i> | Coraciformes | Local migrant | IV |
| 61. | Assam Blue - eared Kingfisher | <i>Alcedo meninting</i> | Coraciformes | Local migrant | IV |
| 62. | Eastern White breasted Kingfisher | <i>Halcyon smyrnensis</i> | Coraciformes | Local migrant | IV |
| 63. | Burmese Roller | <i>Coracias bengalensis</i> | Coraciformes | Local migrant | IV |
| 64. | Assam Great Barbet | <i>Megalaima virens</i> | Piciformes | Local migrant | IV |
| 65. | Blue throated Barbet | <i>Megalaima asiatica</i> | Piciformes | Local migrant | IV |
| 66. | Eastern Rufus Woodpecker | <i>Micropternus brachyurus</i> | Piciformes | Local migrant | IV |
| 67. | Black necked green Woodpecker | <i>Picus canus</i> | Piciformes | Local migrant | IV |
| 68. | Pole headed Woodpecker | <i>Gecinulus grantia</i> | Piciformes | Local migrant | IV |
| 69. | Assam Great | <i>Mulleripicus pulverulentus</i> | Piciformes | Resident | IV |
| 70. | Slaty Woodpecker | | | | |
| 71. | Green breasted Pitta | <i>Pitta sordida</i> | Piciformes | Resident | IV |
| 72. | Black necked Oriole | <i>Oriolus xanthornus</i> | Piciformes | Resident | IV |
| 73. | North Indian Black Drongo | <i>Dicrurus adsimillus</i> | Piciformes | Local migrant | IV |
| 74. | Assam Grey Drongo | <i>Dicrus leucophaeus</i> | Piciformes | Resident | IV |
| 75. | Grey headed Myna | <i>Sturnus malabaricus</i> | Piciformes | Resident | IV |
| 76. | Indian Pied Myna | <i>Sturnus contra</i> | Piciformes | Resident | IV |
| 77. | Hill Myna | <i>Gracula religiosa</i> | Piciformes | Resident | IV |
| 78. | Indian House Crow | <i>Corvus splendens</i> | Piciformes | Resident | V |
| 79. | Eastern Jungle Crow | <i>Corvus macrorhynchos</i> | Piciformes | Resident | IV |
| 80. | Indian wood Shrike | <i>Tephrodornis pondicerianus</i> | Piciformes | Local migrant | IV |
| 81. | Small Grey | <i>Coracina</i> | Piciformes | Local migrant | IV |



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| 82. | Cuckoo Shrike | <i>melaschistos</i> | | | |
| 83. | Finch billed Bulbul | <i>Spizixos canifrons</i> | Piciformes | Resident | IV |
| 84. | Black headed Bulbul | <i>Pycnonotus atriceps</i> | Piciformes | Resident | IV |
| 85. | Striated green Bulbul | <i>Pycnonotus striatus</i> | Piciformes | Resident | IV |
| 86. | White throated Bulbul | <i>Criniger flaveolus</i> | Piciformes | Resident | IV |
| 87. | Assam brown Babbler | <i>Pellorneum albiventre</i> | Piciformes | Resident | IV |
| 88. | Long tailed Wren Babbler | <i>Spelaeornis longicaudatus</i> | Piciformes | Local migrant | IV |
| 89. | Red headed Babbler | <i>Stachrys chrysaee</i> | Piciformes | Local migrant | IV |
| 90. | Yellow breasted Babbler | <i>Macronous gularis</i> | Piciformes | Local migrant | IV |
| 91. | Red capped Babbler | <i>Tamalia pileata</i> | Piciformes | Local migrant | IV |
| 92. | Assam orange Parrot bill | <i>Paradoxornis nipalensis</i> | Piciformes | Local migrant | IV |
| 93. | Assam red headed Parrot bill | <i>Paradoxornis ruficeps</i> | Piciformes | Local migrant | IV |

Butterfly/ Moth

The butterflies are beautiful day flying insects of order Lepidoptera which make excellent subject for natural history observation as they can be reared at home and can be easily observed for various stages of the development of organisms. Earlier butterflies classified into smaller families and India alone had 9 families. However, many of the older families are now merged into the family Nymphalidae and finally only 5 families maintaining across the world and all of which are represented in India. During the primary surveys for three seasons, a total of 14 species of butterfly were encountered from the study area. Blue Pansy, Common Marmon, Indian Cabbage White, Plain Tiger, Long-tailed Blue and Common Emigrant are most frequent species recorded from study area. No moth species has been recorded in primary survey (Table 3.17).

Table 3.17: List of Butterfly fauna recorded/compiled from the study area

| S. No. | Scientific name | Family | Common Name | Status as per IWPA, 1972 |
|--------|---------------------------|--------------|--------------|--------------------------|
| 1 | <i>Priniceps polyctor</i> | Papilionidae | Blue Peacock | - |



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| 2 | <i>Priceps Helenus</i> | Papilionidae | Red Helen | - |
| 3 | <i>Princeps castor</i> | Papilionidae | Common Ravan | - |
| 4 | <i>Graphium sarpedon</i> | Papilionidae | Common Bluebottle | - |
| 5 | <i>Graphium</i> | Papilionidae | Tailed Jay | - |
| 6 | <i>Eurema hecabe</i> | Pieridae | Common Grass Yellow | - |
| 7 | <i>Eurema blanda</i> | Pieridae | Three Spot Grass Yellow | - |
| 8 | <i>Catopsilia Pomona</i> | Pieridae | Common Emigrant | - |
| 9 | <i>Catopsilia pyranthe</i> | Pieridae | Mottled Emigrant | - |
| 10 | <i>Hebomoia glaucippe</i> | Pieridae | Great Orange Tip | |
| 11 | <i>Appias libythea</i> | Pieridae | Striped Albatross | IV |
| 12 | <i>Appias lycida</i> | Pieridae | Chocolate Albatross | II |
| 13 | <i>Cepora nadina</i> | Pieridae | Lesser Gull | II |
| 14 | <i>Pieris canidia</i> | Pieridae | Indian Cabbage White | - |
| 15 | <i>Delias spasithoe</i> | Pieridae | Red-Base Jezebel | - |
| 16 | <i>Jamides celeno</i> | Lycaenidae | Common Cerulean | II |
| 17 | <i>Zizeeria karsandra</i> | Lycaenidae | Dark Grass Blue | - |
| 18 | <i>Pseudozizeeria maha</i> | Lycaenidae | Pale Grass Blue | - |
| 19 | <i>Zizina Otis</i> | Lycaenidae | Lesser Grass Blue | - |
| 20 | <i>Chilades lajus</i> | Lycaenidae | Lime Blue | - |
| 21 | <i>Zemeros flegyas</i> | Lycaenidae | Punchinello | - |
| 22 | <i>Neptis soma</i> | Nymphalidae | Sullied Sailer | II |
| 23 | <i>Neptis hylas</i> | Nymphalidae | Common Sailer | - |
| 24 | <i>Euploea aglae</i> | Nymphalidae | Common Crow | - |
| 25 | <i>Mycalesis mineus</i> | Nymphalidae | Dark-Brand Bushbrown | - |
| 26 | <i>Ypthima huebner</i> | Nymphalidae | Common Fourring | - |
| 27 | <i>Pelopidas mathias</i> | Hesperiidae | Small Branded Swift | - |
| 28 | <i>Junonia almana</i> | Nymphalidae | Peacock Pansy | - |

*As per the secondary source

Aquatic Ecology:-

An in-depth aquatic ecological study was carried out in the project area for three seasons as per the ToR provided by MoEF. Primary data on various components of aquatic biodiversity were collected through intensive field survey of the study area, aquatic sampling and consultation with local communities. Review of secondary data



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was also made for confirming the primary data. Secondary data review has been carried out by using published research papers/literatures.

Sampling Rationale for Aquatic Biodiversity: In order to understand aquatic ecosystem of river line running in project area, biological components which constitute the structure of an ecosystem, the major communities found in the stream; the bottom dwelling benthos were sampled. Since the benthic diatoms (a group of algae with silica walls) are abundant in the mountain streams, they were opted to represent the auto-trophs. In case of the hetero-trophs, the benthic macro-invertebrates with high indicator value were considered suitable. Fish is also an important part of the aquatic ecosystem for the same functions. It is a cheap source of high-quality animal protein and hence as nutritional food for the mountain communities and therefore is an integral part of their daily life. A qualitative study of these indicator groups provides the knowledge of aquatic flora and fauna while quantitative studies help to understand the community features such as taxonomic composition of species, abundances and assemblages which vary with the physical and chemical attributes of the ecosystem. The sampling was carried out during winter, summer and Monsoon seasons as per ToR provided by the MoEF. A total of 4 biological parameters were studied which are as follows:

Sampling for Plankton Communities (Phytoplankton and Zooplankton): Plankton is sampled by sieving 100 liters of water through plankton net mesh size (25 μ). The sieved sample is preserved in 4% formalin for microscopic study. Density is computed by performing counts in S-R Cell according to Welch (1948). Identifications are performed with the help of standard keys (Edmondson 1959; Prasad & Mishra 1992, Krammer and Lange-Bertalot 1999; 2004; Lange Bertalot 2001, Jaiswal & Tiwari 2003).

Zoobenthos (Benthic Invertebrates): The macro-invertebrate fauna is sampled by carefully lifting small boulders, cobbles and pebbles from the marked area (1 ft²) and washing in a bucket full of water by dipping number of times to dislodge the attached fauna. Soft substratum in the form of clay and silt is sampled with Ekman dredge. The sediments are sieved to obtain the fauna. Samples are preserved in 5% formalin for laboratory analysis. Macro-invertebrate samples are identified to family and class level with the help of standard keys (Edmondson 1959; Edington & Hildrew 1995).

Nekton (Fish): Fish samples are collected by experimental fishing through cast net and gill net and local markets/shops. The samples are preserved in 10% formalin for species



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identification with the help of standard keys (Day 1958; Talwar & Jhingran 1991; Jayaram 2002). Fish samples are used for determining the food habits and the environmental resource base.

Table 3.18: Distribution of Phytoplankton taxa in pond and river habitats

| S. No. | Taxa |
|--------------------------------|--------------------------------|
| Cyanophyceae- Blue green algae | |
| 1 | <i>Oscillatoria sp.</i> |
| 2 | <i>Microcystis sp.</i> |
| 3 | <i>Leptolyngbya sp.</i> |
| 4 | <i>Anacystis sp.</i> |
| 5 | <i>Microcystis sp.</i> |
| 6 | <i>Anabaena spiroides</i> |
| Cholorophyceae- Green Algae | |
| 7 | <i>Ankistrodesmus falcatus</i> |
| 8 | <i>Closterium acutum</i> |
| 9 | <i>Cosmarium spp</i> |
| 10 | <i>Characium sp</i> |
| 11 | <i>Hyalotheca sp</i> |
| 12 | <i>Oedogonium sp.</i> |
| 13 | <i>Scenedesmus dimorphus</i> |
| 14 | <i>Cladophora sp.</i> |
| 15 | <i>Ulothrix sp.</i> |
| 16 | <i>Zygnema sp.</i> |
| 17 | <i>Spirogyra sp.</i> |
| 18 | <i>Chlorella sp.</i> |
| Euglenophyceae /Flagillates | |
| 19 | <i>Euglena vedinas</i> |
| 20 | <i>Chlamydomonas sp</i> |
| Bacillariophyceae-Diatoms | |
| 21 | <i>Achnantheidium spp</i> |
| 22 | <i>Navicula spp</i> |
| 23 | <i>Synedra spp</i> |
| 24 | <i>Fragillaria spp</i> |
| 25 | <i>Nitzeschia spp</i> |



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| 26 | <i>Cymbella spp</i> |
| 27 | <i>Gomphonema spp</i> |
| 28 | <i>Hantzschia amphioxys</i> |
| 29 | <i>Craticula sp</i> |
| 30 | <i>Denticula kutzing</i> |
| 31 | <i>Diatoma vulgare</i> |
| *As per the secondary source | |

Zooplankton

Rotifers and cladocera larvae were chief component of zooplanktonic communities that serves as fish food. The taxa observed at different sites of Umngot river were *Rotaria sp*, *Brachionus spp*, *Fillinia sp.*, *Keratella sp.* (Rotifers) and *Bosmina sp.* (Cladocera). In case of zooplankton, a total 25 taxa were observed in all the three stations. Out of these 25 taxa, 5 taxa belong to class Protozoa, 9 belong to class Rotifera, 3 belongs to Copepoda, 6 belongs to Cladocerans and 2 from. Ostracos. Rotifera was most abundant group. Distribution of zooplanktons in Umngot river at different location is presented in table 3.19.

Table 3.19: Distribution of Zooplankton taxa in pond and river habitats

| S. No. | Taxa |
|----------|----------------------------------|
| Protozoa | |
| 1 | <i>Arcella discoida</i> |
| 2 | <i>Ceratium sp.</i> |
| 3 | <i>Paramecium sp.</i> |
| 4 | <i>Vorticella sp.</i> |
| 5 | <i>Didinium sp</i> |
| Rotifera | |
| 6 | <i>Asplanchnopus brightwelli</i> |
| 7 | <i>Brachionus sp.</i> |
| 8 | <i>B. rubens, B. bidens</i> |
| 9 | <i>B. caudatus</i> |
| 10 | <i>Filinia longiseta</i> |
| 11 | <i>Keratella tropica</i> |
| 12 | <i>Monostylla bulla</i> |
| 13 | <i>Trichocera longiseta</i> |
| 14 | <i>Rotaria sp</i> |



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|-----------|----------------------|
| Copepoda | |
| 15 | Cyclops leuckarti |
| 16 | Diaptomus sp. |
| 17 | Mesocyclops hyalinus |
| Cladocera | |
| 18 | Daphnia corinata |
| 19 | Daphnia pulex |
| 20 | Daphnia circinate |
| 21 | Moina branchiate |
| 22 | Alona macrocopa |
| 23 | Bosmina loniotris |
| Ostracods | |
| 24 | Heterocypris sp |
| 25 | Cypris sp |

**As per the secondary source*

Macro-Invertebrates

In riverine ecology and wetland ecosystem, benthic invertebrate fauna provides a crucial link between the primary producers (aquatic plants and algae) and the higher consumers (fish, birds, amphibians). As a food for higher consumers, they are particularly important as a source of protein. Birds require high protein levels during breeding and moulting, and duckling survival has been shown to increase with invertebrate abundance (Scheffer, 1998). Macro invertebrates are widely used as indicators of short- and long-term environmental changes in both lentic and lotic systems. They provide both a facility for examining temporal changes and integrating the effects of prolonged exposure to intermittent discharges or variable concentrations of pollutants (Hellowell, 1986). Thus, it is promising to characterize the changes occurring in these macro invertebrate communities to assess target ecosystems exposed to environmental disturbance. Macro-invertebrate's fauna comprises of 16 species belonging to order Ephemeroptera, Diptera, Odonata and Hemiptera (Table 3.20). The lower density and diversity of macro-invertebrates can be attributed to the high-water velocity and lesser number of riffle-pool habitats. Species richness, density and species composition of macro- invertebrates are largely used as indicators of the water quality. Though, low richness and density of macro-invertebrate in Umngot River is due to washing out due to monsoonal rains and its naturally happening.



Table 3.20: Macroinvertebrate fauna in the Study Area

| S. No. | Species |
|---------------|--|
| Ephemeroptera | |
| 1 | Ephemera nadinac |
| 2 | Ephemera sp |
| 3 | Ephemerella indica |
| 4 | Baetis simplex |
| 5 | Baetis festivus |
| 6 | Caenis latipennis |
| 7 | Epeorus gilliesi |
| 8 | Cinygmula sp. |
| 9 | Orthetrum sp |
| 10 | Chironomus sp |
| Odonata | |
| 11 | Orthetrum sp |
| Diptera | |
| 12 | Chironomus sp |
| 13 | Simulium sp |
| Hemiptera | |
| 14 | Aphids, Bugs, Necton & misquotes larvae: |
| | Anisops sp, Gyrimus sp |
| Molluscan | |
| 15 | Indian river Crab, keakura |
| 16 | Shrimps |

**As per the secondary source*

Nektons (Fish community)

A total of 16 fish species from 7 families were reported from Umngot River from all primary as well as secondary sources. Considering the number of fishes in Umngot River and adjacent area, it can be concluded that the area is not rich ichthyofaunal diversity. The low fish diversity in this area can be attributed to the nature of river and land use/ land cover in the catchment and habitat structure including river morphology.



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It is observed that 50% of the fish species collected belonged to the family Cyprinidae. This perhaps may be due to the fact that fishes which are highly adaptable in the hill streams belong to the family Cyprinidae more than any other family. Genus like Garra, Psilorhynchus, Labeo, Cyprinus are inhabitants of hill streams. During the primary survey a total of 6 species were observed from the influence area of proposed project. List of fish species reported/ observed in the study area are listed in Table 3.21.

Table 3.21: Fish Species Composition in Study Area (Umngot River)

| S. No. | Family | Fish Species | Local Name (Khasi) | IUCN status |
|--------|-----------------|---------------------------|-----------------------|-------------|
| 1. | Bagridae | <i>Mystus cavasius</i> | Kha Kot / Kha Tyngkra | LC |
| 2. | Balitoridae | <i>Balitora brucei</i> | | VU |
| 3. | Belonidae | <i>Xenentodon cancila</i> | Chowkli | VU |
| 4. | Chacidae | <i>Chaca chaca</i> | Gajeb-bakau | NT |
| 5. | Chandidae | <i>Chanda nama</i> | Kha Snad | |
| 6. | Cyprinidae | <i>Chela laubuca</i> | | LC |
| 7. | Cyprinidae | <i>Cirrhinus reba</i> | Kha mirka | LC |
| 8. | Cyprinidae | <i>Garra gotyla</i> | Doh Jei | VU |
| 9. | Cyprinidae | <i>Garra lamta</i> | Doh Jei | LC |
| 10. | Cyprinidae | <i>Labeo boga</i> | Kha bah | LC |
| 11. | Cyprinidae | <i>Labeo calbasu</i> | Kha long | LC |
| 12. | Cyprinidae | <i>Labeo gonius</i> | Kha ski | LC |
| 13. | Cyprinidae | <i>Labeo pangusia</i> | Kha baw | NT |
| 14. | Cyprinidae | <i>Puntius chola</i> | Shalynni | LC |
| 15. | Mastacembelidae | <i>Macrognathus aral</i> | Kha Baien | LC |
| 16. | Siluridae | <i>O. pabo</i> | Kha Babia | VU |

*As per the secondary source



Littorina sp.



Calotes versicolor



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Cropping and Irrigation Practices in the Study Area

As per Agro-Climate Zone (NARP), the district has been categorized as Sub-Tropical Hill Zone (NEH-5) and is covered under Eastern Himalayan Region (II) as per agro-climate zone (Planning Commission). Major crops grown are Rice, Maize, Pea, Cow pea, Soya bean, sesamum and Mustard. Fruits grown in the area are Khasi Mandrin, Assam Lemon, Pine Apple, Banana and Papaya. The prominent vegetables grown are Potato, Sweet potato, Tapicoa, Cabbage, Cucumber, Carrot, Onion and Pumpkin. Some spices crop like Ginger, Turmeric and Chilies are also grown. Irrigation has so far played only a minimal role in the agricultural development of the district. The topography of the district makes alignment and construction of channels difficult and costly. Even where the lay of the land is favorable, irrigation is confined only to areas bordering major rivers and streams. The cultivators, therefore, have to depend on rainfalls to irrigate their land which seldom fail them. The study area covering Mawkynrew and Mawryngkneng blocks is a mountainous terrain with Quartzite (Shillong group) forms the main aquifer of the area, development of tube well is not lucrative for practicing irrigation. The people have to depend upon rainfed crops.

3.9.5 CONCLUSION

During the biodiversity assessment and concern with local stakeholder revealed that the project study area does not fall in migration route of migratory Birds. The study area does not form part of any National park, Wild life Sanctuary, and ecological sensitive area. On the other hand none of significant fauna present in core zone project area and no habitation of significant wild life in core zone of project.

All the floral and faunal species reported from the core zone are common and widely distributed in the buffer zone also. So, it can be stated that the proposed project and associated activities are unlikely to influence any floral and faunal components significantly provided that the suggestions / recommendations in this report are implemented. Strict implementations of EMP / mitigation measures are required to ensure that the biodiversity of the study area should not be impacted negatively.

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3.10 SOCIO-ECONOMIC ENVIRONMENT

3.10.1 INTRODUCTION

The socio economic baseline data of the study area is discussed in this section. The other objectives are as follows:

- To study the socio-economic aspects of the project study area
- To know the perceptions of people living in the study area
- To suggest mitigation measures for the proposed project

STUDY AREA

The proposed project “BOULDER STONE MINE” location is Village- is SyllaiMadan, Laitkynsew, Sub Division- Pynursla, District- East Khasi Hills, Meghalaya.

Meghalaya

Tribal people make up the majority of Meghalaya's population. The Khasis are the largest group, followed by the Garos then the Jaintias (Jayantiya). These were among those known to the British as "hill tribes." Other groups include the Assamese, Bengali, Hajongs, the Biates, the Koches and related Rajbongshis, the Boros, Dimasa, Kuki, Lakhar, Tiwa (Lalung), Karbi, Rabha and Nepali.

Meghalaya recorded the highest decennial population growth of 27.82% among all the seven north-eastern states, as per the provisional report of census 2011. The population of Meghalaya as of 2011 has been estimated at 2,964,007 of which females constitute 1,492,668 and males 1,471,339. As per the census of India 2011, the sex ratio in the state was 986 females per 1,000 males which was far higher than the national average of 940. The urban female sex ratio of 985 was higher than the rural sex ratio of 972.

The study area is of 10.0 km from the project location. The list of villages falling in the study area is 42 villages/urban area, the segregation is present in Table 3.22 (a & b) into the following manner:

- 3 villages/urban are falling are from 0.0 km to 2.0 km radius boundary.
- 08 villages/urban are falling are from 2.0 km to 5.0 km radius boundary.



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iii. 31 villages/urban are falling are from 5.0 km to 10.0 km radius boundary. The villages in the 10.0 km of the study area from the project site are given in Table 3.22.

Table 3.22: List of Villages in the study area

| Sl. No | 0 to 2 km | Sl. No. | 2 to 5 km | Sl. No | 5 to 10 km |
|--------|------------|---------|---------------------|--------|------------------------|
| 1 | Mawkajem | 1 | Madanfootball | 1 | Mawmuthoh |
| 2 | Pomlum | 2 | Laitmawlong-Wahpein | 2 | Madanlyngdoh |
| 3 | Laitkynsew | 3 | Laitmawroh | 3 | Mawsawa |
| | | 4 | Umthli | 4 | Rngi (Mylliem) |
| | | 5 | Umkseh | 5 | KyndongLaitmawbah |
| | | | | 6 | MawngapMawsmai |
| | | | | 7 | Pomkaniew |
| | | | | 8 | Mawjrong |
| | | | | 9 | Diengkynthong |
| | | | | 10 | Laitkynsew (Laitkroh) |
| | | | | 11 | Lummawkong |
| | | | | 12 | Mawkdok |
| | | | | 13 | Umdiengpoh |
| | | | | 14 | Mawrah |
| | | | | 15 | Rangtmah |
| | | | | 16 | Dewlieh |
| | | | | 17 | Rikyrshang |
| | | | | 18 | Mawthawtieng |
| | | | | 19 | Phong |
| | | | | 20 | Massar |
| | | | | 21 | Wahkhen |
| | | | | 22 | Nongblai |
| | | | | 23 | Wahlyngkhat |
| | | | | 24 | Laitlyting |
| | | | | 25 | Langsiew |
| | | | | 26 | Pyngkya |
| | | | | 27 | Mawpynieng |
| | | | | 28 | Rasong |
| | | | | 29 | Laitlum |
| | | | | 30 | Mawslang |
| | | | | 31 | Wahtyngngai-Ummmluh |



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3.10.1.1 Population

In the study area, there are 4037 households of which 5.05% household's falls in 0 to 2 km, 16.62% household's in 2 to 5 km and 78.33% household's in 5 to 10 km respectively. The total population falling in the project area is 20767 of which 4.82% resides within 0 to 2 km, 17.63% are in 2 to 5 km and 77.55% in 5 to 10 km. The total male population consists of 49.23% and female population accounts to be 50.77% of the total population. The sex ratio of the 10.0 km study area is 1031 females over thousand males. There are approx 4 to 5 members in a family. The 0-6 population comprises of 21.12% of the total population of the study area. The sex ratio of 0-6 population is 973 females over thousand males. Table 3.23 shows the population, household data of the villages falling within 10.0 km from the study area. Figure 3.9 and Figure 3.10 shows the sex ratio of total population and 0-6 population within the study area.

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Table 3.23:Population &Literate

| K.M. | No_H H | TOT_P | TOT_M | TOT_F | P_06 | M_06 | F_06 | P_S C | M_S C | F_S C | P_S T | M_S T | F_S T | P_LIT | M_L IT | F_LI T | P_IL L | M_I LL | F_I LL |
|--------------|-------------|--------------|--------------|--------------|-------------|-------------|-------------|----------|----------|----------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|-----------|
| 0 to 2 | 204 | 1001 | 509 | 492 | 215 | 117 | 98 | 1 | 1 | 0 | 986 | 495 | 491 | 715 | 359 | 356 | 286 | 150 | 1 |
| 2 to 5 | 671 | 3661 | 1809 | 1852 | 778 | 379 | 399 | 0 | 0 | 0 | 3651 | 1803 | 1848 | 2432 | 1180 | 1252 | 1229 | 629 | 6 |
| 5 to 10 | 3162 | 16105 | 7906 | 8199 | 3394 | 1727 | 1667 | 1 | 1 | 0 | 16042 | 7867 | 8175 | 9837 | 4641 | 5196 | 6268 | 3265 | 30 |
| Total | 4037 | 20767 | 10224 | 10543 | 4387 | 2223 | 2164 | 2 | 2 | 0 | 20679 | 10165 | 10514 | 12984 | 6180 | 6804 | 7783 | 4044 | 37 |

*HH- Household; Pop- Population

*Source: Census of India, District Handbook 2011

Table 3.24:Total & Main Work Participation

| K.M. | TOT_WORK_P | TOT_WORK_M | TOT_WORK_F | MAIN_WORK_P | MAIN_WORK_M | MAIN_WORK_F | MAI_N_CL_P | MAI_N_CL_M | MAI_N_CL_F | MAI_N_AL_P | MAI_N_AL_M | MAI_N_AL_F | MAI_N_HH_P | MAIN_HH_M | MAIN_HH_F | MAIN_OT_P | MAIN_OT_M | MAIN_OT_F |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|-----------|-------------|-------------|-----------|
| 0 to 2 | 403 | 254 | 149 | 363 | 229 | 134 | 11 | 10 | 1 | 225 | 138 | 87 | 7 | 7 | 0 | 120 | 74 | 40 |
| 2 to 5 | 1750 | 937 | 813 | 1645 | 894 | 751 | 948 | 507 | 441 | 289 | 167 | 122 | 17 | 3 | 14 | 391 | 217 | 17 |
| 5 to 10 | 7570 | 4073 | 3497 | 6900 | 3819 | 3081 | 3236 | 1640 | 1596 | 1846 | 1114 | 732 | 170 | 115 | 55 | 1648 | 950 | 69 |
| Total | 9723 | 5264 | 4459 | 8908 | 4942 | 3966 | 4195 | 2157 | 2038 | 2360 | 1419 | 941 | 194 | 125 | 69 | 2159 | 1241 | 91 |

*Source: Census of India, District Handbook 2011



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Table 3.25: Marginal& Non Work Participation

| K.M. | MAR GWO RK_P | MAR GWO RK_M | MA RG WO RK_ F | MAR G_C L_P | MA RG_ CL_ M | MAR G_C L_F | MAR G_A L_P | MAR G_A L_M | MAR G_A L_F | MA RG_ HH_ P | MA RG_ HH_ M | MA RG_ HH_ F | MA RG_ OT_ P | MAR G_OT _M | MAR G_O T_F | NON_ WOR K_P | NON_ WOR K_M | NON_ ORK_ _ |
|--------------|--------------------|--------------------|----------------------------|-------------------|-----------------------|-------------------|-------------------|-------------------|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------|-------------------|--------------------|--------------------|-------------------|
| 0 to 2 | 40 | 25 | 15 | 0 | 0 | 0 | 12 | 9 | 3 | 0 | 0 | 0 | 28 | 16 | 12 | 598 | 255 | 343 |
| 2 to 5 | 105 | 43 | 62 | 54 | 17 | 37 | 25 | 18 | 7 | 0 | 0 | 0 | 26 | 8 | 18 | 1911 | 872 | 1035 |
| 5 to 10 | 670 | 254 | 416 | 248 | 96 | 152 | 332 | 113 | 219 | 4 | 4 | 0 | 86 | 41 | 45 | 8535 | 3833 | 4702 |
| Total | 815 | 322 | 493 | 302 | 113 | 189 | 369 | 140 | 229 | 4 | 4 | 0 | 140 | 65 | 75 | 11044 | 4960 | 6084 |

*Source: Census of India, District Handbook 2011

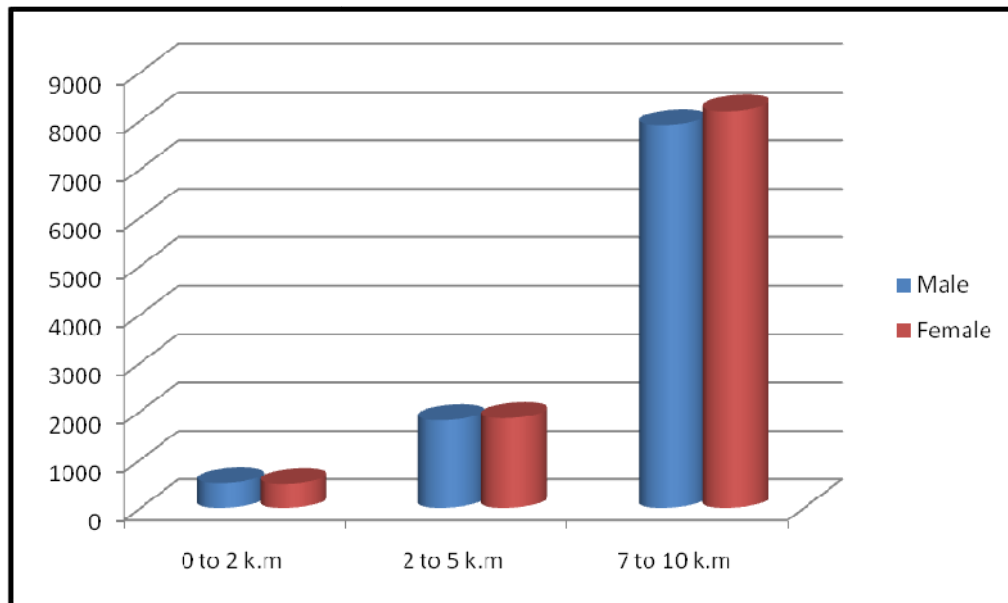


Figure 3.9: Sex Ratio of Total Population within 10.0 Km from Project Site



Figure 3.10 : Sex Ratio of 0-6 Population within 10.0 Km from Project Site

SOCIAL STRUCTURE

In the study area, Schedule Caste population is 0.01% which is 2 of the total population. The males are 0.02% of the total male population and females account for 0.0% of the total female population. The sex ratio of SC population is Zero females over thousand males.

In the study area, Schedule Tribe population is 99.58% which is 20679 of the total population. The males are 99.42% of the total male population and females account for 99.72% of the total female population. The sex ratio of ST population is 1034 females over thousand males. Table 1.2 shows the Social Stratification of Schedule Caste and Schedule Tribe in the project study area. Figure 3.11 shows the sex ratio of SC & ST in the project area segregated in the 10.0 km.

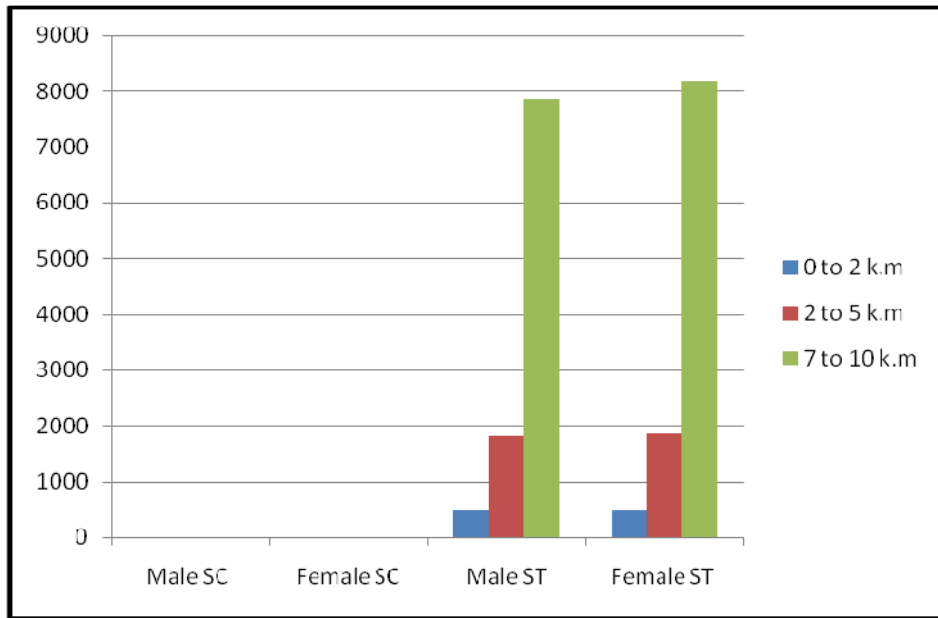


Figure 3.11: Sex Ratio (ST / SC) within 10.0 km of the study area

3.10.1.2 Literacy Status of the Study Area

Persons aged seven years and above, who can both read and write with understanding in any language are considered as literates. In the study area the literate person's are 12984, which is 62.52% of the total population. The male literates are 60.45% of the total male population and female literates are 64.54% of the total female population. Table 3.23 presents the literate population of the study area. Figure 3.12 shows the literacy rate in the study area.

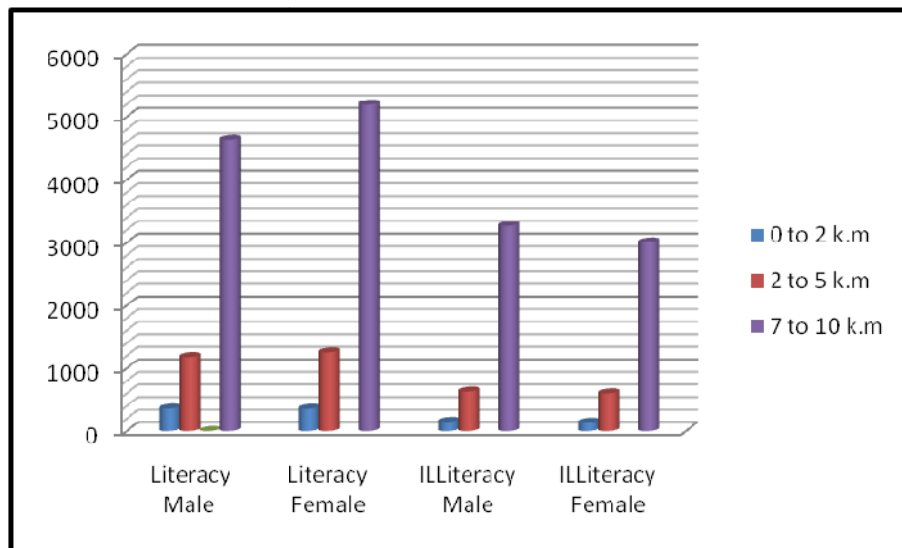


Figure 3.12: Males & Female Literacy Rate

3.10.1.3 Worker's Profile & Occupational Structure

The work participation in the study area is 9723 which account to be 46.82% of the total population. The male work participation is 51.49% with respect to male population and female work participation accounts to be 42.29% with respect to female population in the study area. Table 3.24 shows the gender wise distribution of work participation in the study area. Figure 3.13 presents the total male & female work participation.

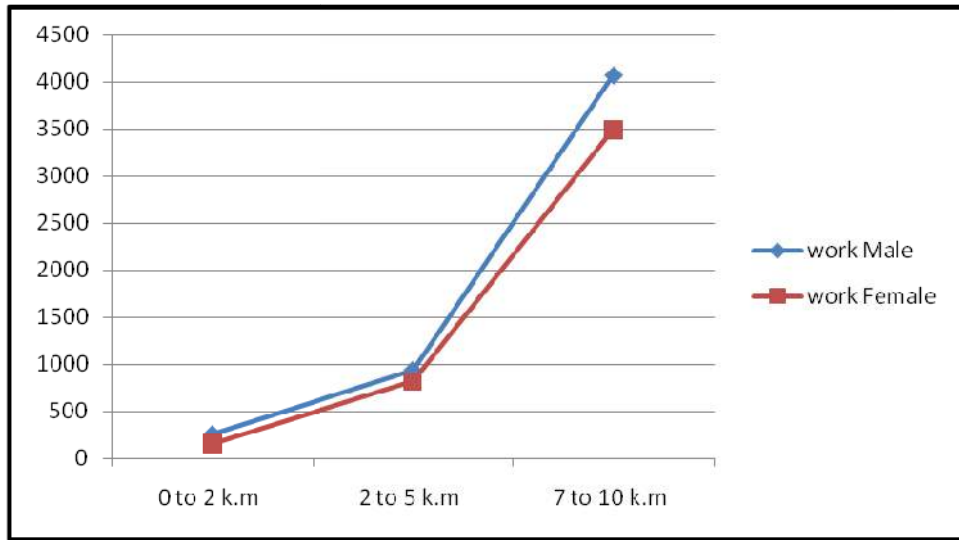


Figure 3.13: Work Participation of Males & Females

The main work participation is 42.89% and marginal work participation is 3.92% of the total working population. Further analysis of data has revealed that there exists total male dominance of 48.34% in main work participation. Marginal work participation shows total female and total male dominance which is 4.68% while marginal male work participation is 3.15%.

The males are working in the nearby small industries, agriculturist, labourers, etc as main workers. Women on the other hand work as marginal workers due to their occupancy in household and domestic chores. Women work mostly as marginal cultivators in their fields. Table 3.24 & 3.25 presents the main and marginal work participation of the study area population.

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CHAPTER - 4
ANTICIPATED
ENVIRONMENTAL IMPACT AND
MITIGATION MEASURES

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4.0 ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

4.1 GENERAL

Environmental impacts both direct and indirect on various environmental attributes due to proposed mining activity will be created in the surrounding environment, during the pre- operational, operational and post–operational.

The impacts due to mining operations commence from the exploration activities, extend through extraction and processing of minerals, may continue up to post closure of the operation, with the nature and extent of impacts varying throughout the stages of project development.

Identification of possible impacts specific to an activity is an important task since this helps in focusing attention upon relevant environmental parameters and relating them with the activities involved. The following parameters are of significance in the Environmental Impact Assessment and are being discussed in detail.

1. Land Environment;
2. Water Environment;
3. Air Environment;
4. Noise Environment;
5. Solid waste;
6. Biological;
7. Socio-Economic.

4.2 LANDENVIRONMENT

Mining and its subsequent activities have been found to degrade the land to a significant extent. Overburden removal from the mine area results in a very significant loss of top soil. Also, creation of pit for mineral extraction changes the surface and drainage pattern.

4.2.1 SOURCE

- Change in Land Use/ LandCover;
- Change in topography;

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4.2.2 IMPACT PREDICTION & MITIGATION MEASURES

| Impact | Mitigation Measures |
|--|--|
| Permanent or temporary change on land use, land cover. | The land is categorized as Private Land as per revenue records and lease document. In the conceptual phase, the pit area will be extending up to 4.35 ha. This extend will impact the physiography permanently. |
| Change in Topography | The topography of the lease area comprises of hilly terrain. The highest elevation of the lease area is 1785 mRL and lowest is 1765 mRL. The ultimate working level will be 1715 mRL, which is 50 m below from the lowest elevation. As it is a proposed project, the impact on the physical environment will be confined within the lease area. |
| Land Reclamation | The total excavated area 4.35 ha. out of which 3.45 ha. area (bottom benches) will be converted into water reservoir and rest 0.20 ha. (upper benches) area will be backfilled and reclaimed and rehabilitated by plantation. The extent of impact will however; be confined within lease area only. |
| Waste generation | About 4,47,500 Tonne of waste/subgrade will be generated during the plan period. Out of which, maximum waste will be used in construction and maintenance of approach roads, construction of site services and remaining waste will be dumped temporarily in/outside the lease area towards Southern side in the area in 0.15 ha. for 8.0m height in two terraces of 4m height each. The waste dump will be stabilized by retaining walls of rubble stone. Parapet wall and drain will also be constructed towards the lower altitude side to check the wash off during monsoon and at the end of life of mine, waste will be used for backfilling of some part of excavated area. |

4.3 WATER ENVIRONMENT

4.3.1 SOURCE

- Open –Cast Mining;
- No intersection of water table;



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4.3.2 IMPACT PREDICTION & MITIGATION MEASURES

| Ground Water | |
|--|--|
| Possible Impact | Management |
| Quantitative:- | |
| Mine workings may intersect ground water table | ➤ The lowest elevation of the lease area is 1765 mRL. The level of ground water table is below UPL so mining will not intersect ground water table. The ultimate pit limit will be 1715 mRL. Hence, ground water table will not be encountered during mine working. |
| Abstraction of water for daily use may lead to depletion of water table. | ➤ The daily water demand will be 5.0KLD. Out of which 1.00 KLD will be used for domestic purposes and 2.00 KLD for plantation & 2.0 KLD for Dust Suppression. Water demand will be met through tanker supply of nearby water streams. Hence, no significant impact is envisaged. |
| Qualitative | |
| The sewage from soak pit may percolate to the ground water table and contaminate it. | ➤ Daily sewage generation is to the tune of only 0.7 KLD. Hence, contamination is not expected due to percolation. |
| Surface Water | |
| Possible Impact | Management |
| Surface drainage may be affected due to mining. | <ul style="list-style-type: none"> ➤ Natural drainage will not be affected in any way due to mining; rain water will follow the natural topography of the lease area. ➤ There is no possibility of mining encountering any surface/subsurface water body. However, during the course of mining, rainwater in the form of surface runoff will be there during monsoon only. No water from the quarry will be discharged to any natural water course directly. The accumulated rain water will partly be used for dust suppression and afforestation and Shale being pervious in nature much of the water will percolate below the quarry surface. |



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4.4 AIR ENVIRONMENT

4.4.1 About AERMOD

AMS/EPA Regulatory Model (AERMOD version-9.5) is a steady-state plume model. It is designed to apply to source releases and meteorological conditions that can be assumed to be steady over individual modelling periods (typically one hour or less). AERMOD has been designed to handle the computation of pollutant impacts in both flat and complex terrain within the same modelling framework.

The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) was formed to introduce state-of-the-art modelling concepts into the EPA's air quality models. Through AERMIC, a modelling system, AERMOD, was introduced that incorporated air dispersion bases on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

4.4.2 Assumption

The dispersion modelling assumption considered is as follow:

- The terrain of the study area was considered as FLAT;
- Stability class and atmospheric inversion level is based on software's database
- Steady-state conditions (constant source emission strength)
- Wind speed, direction and diffusion characteristics of the plume are constant
- Conservation of mass, i.e no chemical transformations take place

4.4.3 Input Parameters

Meteorological Parameters

The hourly meteorological data considered were wind speed, wind direction, ambient atmospheric temperature, cloud cover, relative humidity & rainfall ceil heigh.

4.4.4 Point Source Emissions

Air dispersion modelling methodology - Emission from all the stacks were analysed for their impacts on the GLC for various distances using the dispersion modelling guidelines of AERMOD, developed by the AERMIC (American Meteorological Society/Environmental



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Protection Agency Regulatory Model Improvement Committee) as directed by CPCB. Maximum Ground Level Concentration (GLC's) of PM10, and PM2.5 due to proposed project activity were predicted. The pollutants considered are pollutants emitting from the Drilling, Blasting, Loading, unloading, and Transportation activities.

The detail of emissions is given in Table 4.2 below.

Table 4.2: Parameter Considered for Emission Details

| Details | Parameter |
|-------------------------------|--------------------|
| Production /Day | 1657.03 Tonnes/day |
| Bulk Density | 2.5 gm/cc |
| Width of Bench | 4.0m |
| Depth of Hole | 6.0 m |
| Diameter of hole | 100m |
| Spacing | 4.0 m |
| No of trips per day | 54 |
| Truck Capacity | 20 tonnes |
| Length and width of haul road | 1000 m and 7 m |
| Mean wind Speed | 3.22 m/s |
| Working hours per day | 8 hours |
| Total working days | 300 |

* Site Center Lat./Long.: 25°24'13.27"N, 91°51'46.66"E

Considering the above inputs emission for particulate matter were calculated using the AP42, USEAP equations for various activities and NOx and CO from CPCB criteria.

Table 4.3: Emission for various activities from mine

| Parameter | PM10 (g/s) | PM2.5 (g/s) | NOx (g/s) | CO (g/s) |
|------------------|-------------------|--------------------|------------------|-----------------|
|------------------|-------------------|--------------------|------------------|-----------------|



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| Drilling | 0.098081417 | 0.065388 | -- | -- |
| Loading & unloading | 0.00055721 | 0.000371 | -- | -- |
| Vehicular Movement | 0.86426977 | 0.57618 | 0.000247 | 0.0001109 |
| Blasting | 2.554363263 | 1.702909 | -- | -- |

Table 4.4: Maximum ground Level concentration for all activities

| Parameter | Maximum GLC | Distance in meter from site | Direction from site |
|------------------------------------|--------------------|------------------------------------|----------------------------|
| PM10 ($\mu\text{g}/\text{m}^3$) | 3.5847 | Within Site | Within Site |
| PM2.5 ($\mu\text{g}/\text{m}^3$) | 2.3898 | Within Site | Within Site |
| NOx ($\mu\text{g}/\text{m}^3$) | 0.15932 | Within Site | Within Site |
| CO (mg/m^3) | 0.0000079 | Within Site | Within Site |



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Table 4.5: Incremental Ground Level Concentrations

| Location Code | AAQM Location Name | Maximum Baseline Concentration | | | | Predicted GLC at Monitoring Location due to all sources | | | | Cumulative GLC (Baseline + Predicted) | | | |
|---------------|--------------------|--|---|---|--|---|---|--|--|--|---|-------------------------------------|------------------------------------|
| | | Max Baseline Conc. PM ₁₀ (µg/m ³) | Max Baseline Conc. PM _{2.5} (µg/m ³) | Max Baseline Conc. NOX (µg/m ³) | Max Baseline Conc. CO (mg/m ³) | Predicted GLC (µg/m ³) –PM ₁₀ | Predicted GLC (µg/m ³) –P PM _{2.5} | Predicted GLC (µg/m ³) –PNOX | Predicted GLC (mg/m ³) –CO | Total GLC (µg/m ³) –PM ₁₀ | Total GLC (µg/m ³) –P PM _{2.5} | Total GLC (µg/m ³) –NOX | Total GLC (mg/m ³) –CO |
| A1 | Mine Site | 57.14 | 20.92 | 8.29 | 0.59 | 3.5847 | 2.3898 | 0.15932 | 0.0000079 | 60.7247 | 23.3098 | 8.44932 | 0.590008 |
| A2 | Pomlum | 54.36 | 22.43 | 8.69 | 0.92 | 0.0089 | 0.00593 | 0.0004 | 0.00000002 | 54.3689 | 22.43593 | 8.6904 | 0.92 |
| A3 | Mawkajem | 50.75 | 22.4 | 8.86 | 0.55 | 0.01129 | 0.00752 | 0.0005 | 0.00000003 | 50.76129 | 22.40752 | 8.8605 | 0.55 |
| A4 | Dymmiew | 49.15 | 20.84 | 12.64 | 0.79 | 0.00295 | 0.00197 | 0.00013 | 0.00000001 | 49.15295 | 20.84197 | 12.64013 | 0.79 |
| A5 | Umktiesh | 48.69 | 27.54 | 10.46 | 0.82 | 0.00104 | 0.00069 | 0.00005 | 0 | 48.69104 | 27.54069 | 10.46005 | 0.82 |
| A6 | Lewmawiong | 45.02 | 21.38 | 10.98 | 0.85 | 0.00842 | 0.00562 | 0.00037 | 0.00000002 | 45.02842 | 21.38562 | 10.98037 | 0.85 |
| A7 | Setthiew | 53.4 | 23.84 | 10.9 | 0.92 | 0.00166 | 0.00111 | 0.00007 | 0 | 53.40166 | 23.84111 | 10.90007 | 0.92 |



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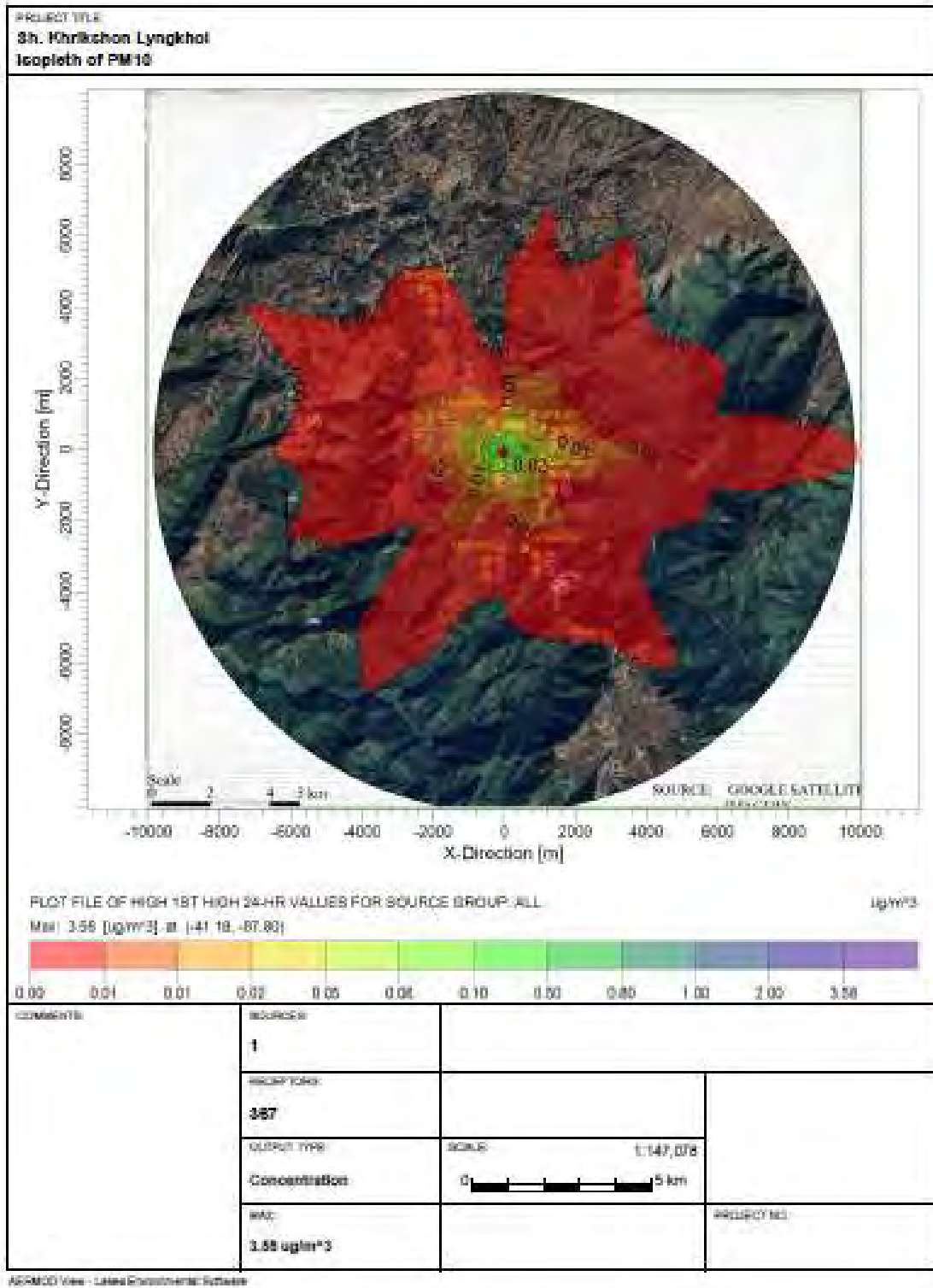


Figure 4.1: Map showing Isopleths of PM₁₀



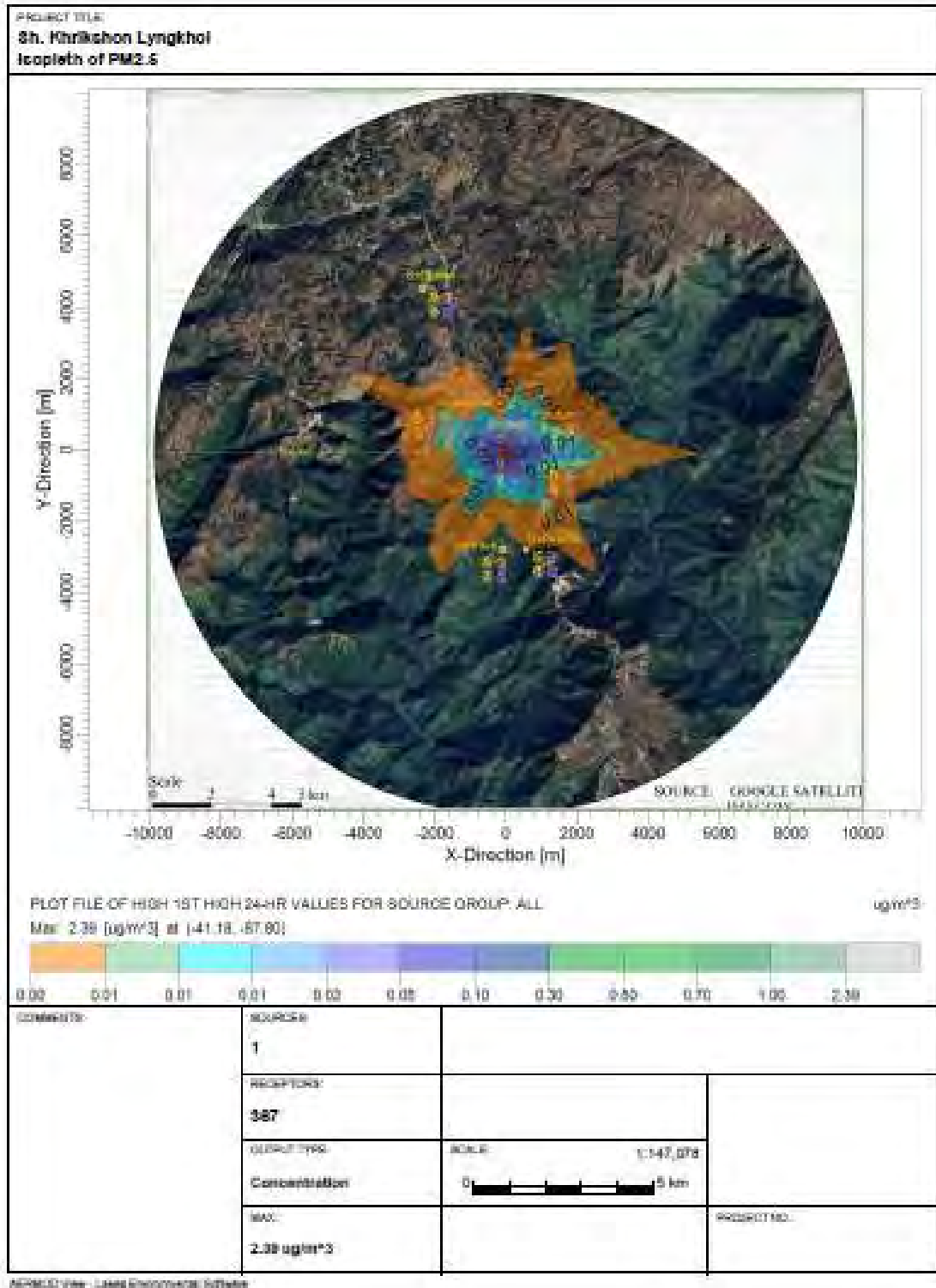


Figure4.2: Map showing Isopleths of PM_{2.5}

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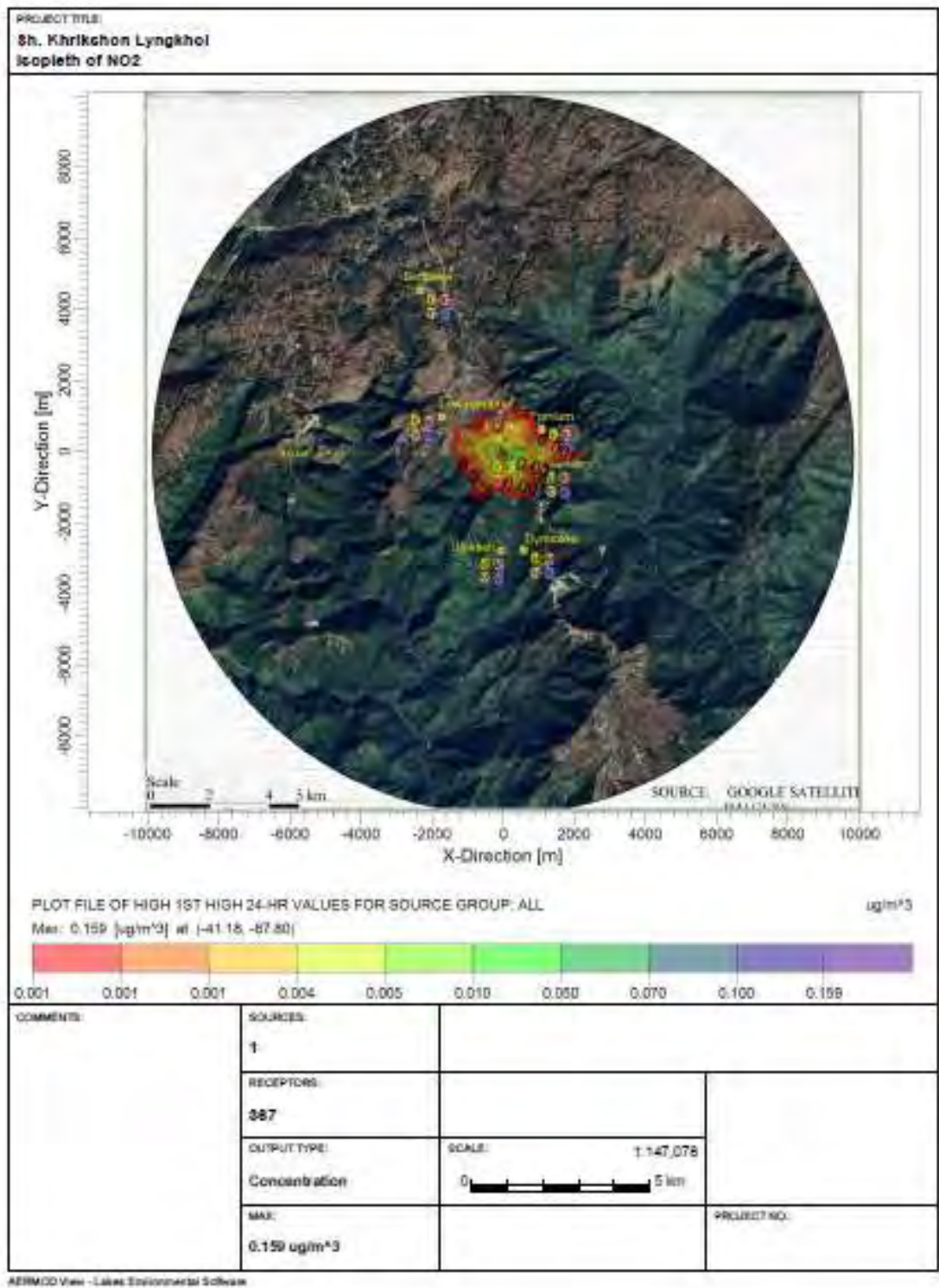


Figure 4.3: Map showing Isopleths of NO_x



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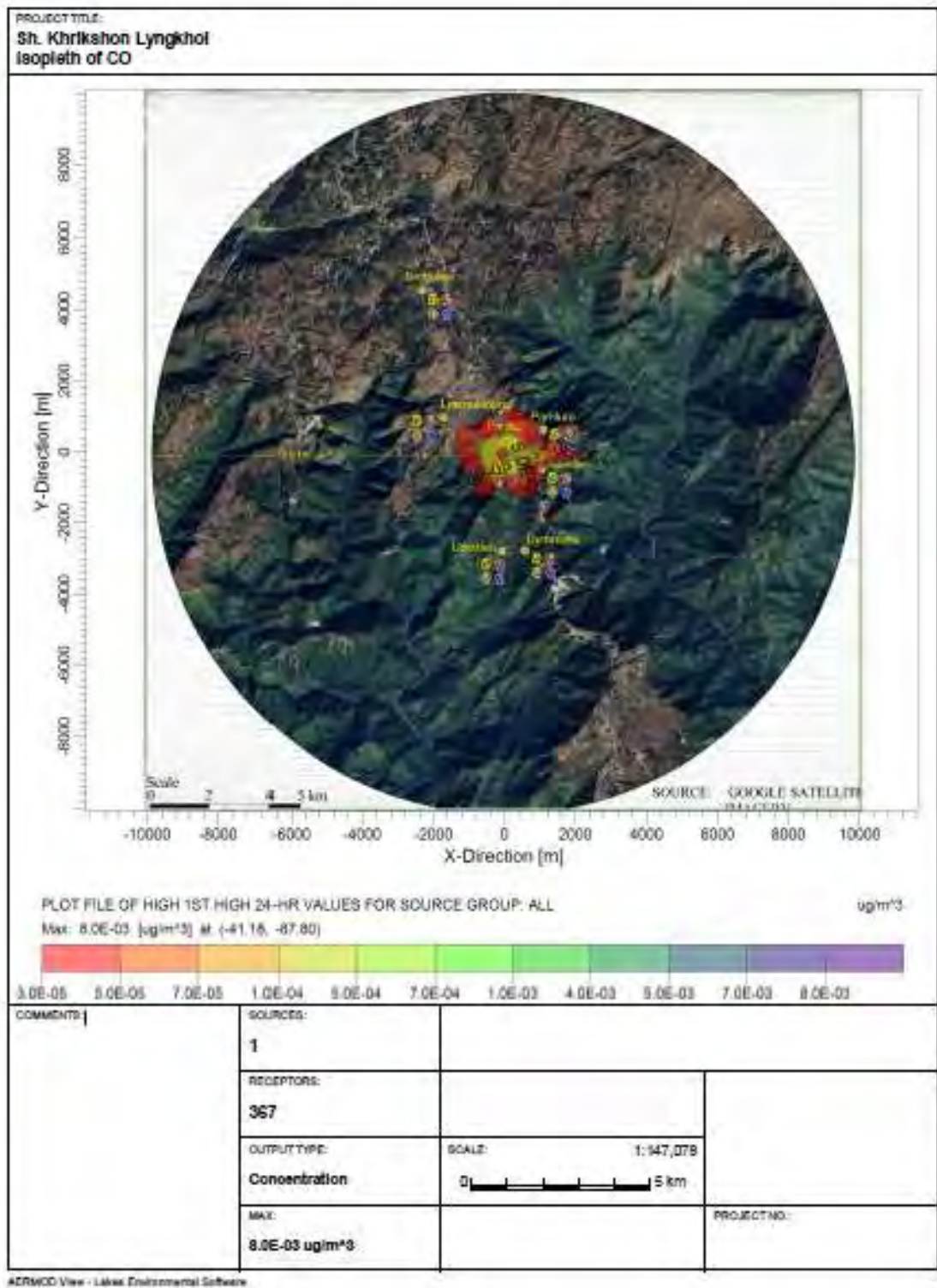


Figure 4.4: Map showing Isopleths of CO



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4.5 NOISE ENVIRONMENT

| Impact | Mitigation Measures |
|---|--|
| <ul style="list-style-type: none"> ➤ Noise impact due to mining activities. ➤ Noise impact due to vehicular movement. ➤ Auditory impact. | <ul style="list-style-type: none"> ➤ The noise levels from mining activities are periodical and restrict to particular operation. ➤ Noise generated by mining equipment will be intermittent and localized. ➤ Proper maintenance of all equipments/ machines will be carried out which help in reducing noise during operations. ➤ Compact and leveled haul road are proposed for smooth running of transport vehicles. ➤ Drilling equipment's will be regularly maintained as per maintenance manual. Anti-vibration mounts for compressors will be provided. ➤ Optimum parameters for drilling and blasting will be designed to have controlled blasting which will reduce noise and vibrations. ➤ Ear Muffs will be provided to the exhaust of wagon drills to minimize the noise level. ➤ Drilling with sharp bits and control blasting will minimize the noise pollution. ➤ Blasting will be carried out during day time and not on cloudy days. ➤ Each blast will be carefully planned, checked and executed under the supervision of statutory personnel. ➤ Speed of trucks will be limited to prevent undue noise from empty trucks. ➤ Adequate silencers in HEMM are provided to reduce generation of noise. All HEMMs will be equipped with closed cabins for operators ➤ Plantation will be carried out along the periphery of the lease area. The plantation minimizes propagation of noise and also arrests dust. ➤ Limiting time exposure of workers to excessive noise. ➤ PPE's will be provided while working on mining equipments. ➤ Regular health checkup will be conducted for any such health implications. ➤ Periodical monitoring of noise will be done. ➤ Timely maintenance of vehicles and their silencers to minimize vibration and sound. ➤ Task rotation of workers will be done exposed to noise. |

4.6 BIOLOGICAL ENVIRONMENT

4.6.1 IMPACT ON BIOLOGICAL ENVIRONMENT

A mining project can only commence with knowledge of the extent and value of the mineral ore deposit. Information about the location and value of the mineral ore deposit is obtained during the exploration phase. This phase includes surveys, field studies, and



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drilling test boreholes and other exploratory excavations. Wildlife is a broad term that refers to all plants and any animals (or other organisms) that are not domesticated. Mining affects the environment and associated biota through the removal of vegetation and topsoil, the displacement of fauna, the release of pollutants, and the generation of noise.

1. Habitat Loss: - Wildlife species live in communities that depend on each other. Survival of these species can depend on soil conditions, local climate, altitude, and other features of the local habitat. Mining causes direct and indirect damage to wildlife. The impacts stem primarily from disturbing, removing, and redistributing the land surface. Some impacts are short-term and confined to the mine site; others may have far-reaching, long-term effects. The most direct effect on wildlife is destruction or displacement of species in areas of excavation and piling of mine wastes. Mobile wildlife species, like game animals, birds, and predators, leave these areas. More sedentary animals, like invertebrates, many reptiles, burrowing rodents, and small mammals, may be more severely affected. If streams, lakes, ponds, or marshes are filled or drained, fish, aquatic invertebrates, and amphibians are severely impacted. Food supplies for predators are reduced by the disappearance of these land and water species. Many wildlife species are highly dependent on vegetation growing in natural drainages. This vegetation provides essential food, nesting sites, and cover for escape from predators. Any activity that destroys vegetation near ponds, reservoirs, marshes, and wetlands reduces the quality and quantity of habitat essential for waterfowl, shore birds, and many terrestrial species. The habitat requirements of many animal species do not permit them to adjust to changes created by land disturbance. These changes reduce living space. The degree to which animals tolerate human competition for space varies. Some species tolerate very little disturbance. In instances where a particularly critical habitat is restricted, such as a lake, pond, or primary breeding area, a species could be eliminated. Surface mining can degrade aquatic habitats with impacts felt many miles from a mining site. For example, sediment contamination of rivers and streams is common with surface mining.

2. Habitat fragmentation: - Habitat fragmentation occurs when large areas of land are broken up into smaller and smaller patches, making dispersal by native species from one patch to another difficult or impossible, and cutting off migratory routes. Isolation may lead to local decline of species, or genetic effects such as inbreeding. Species that require



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large patches of forest simply disappear.

Table 4.7: Illustrative examples of mining activities, aspects and biodiversity impacts

| Activity | Examples of Aspects | Examples of Biodiversity Impact |
|---|---|--|
| Extraction | Land clearing | Loss of habitat, introduction of plant disease, siltation of watercourses |
| Blasting | Dust, noise, vibration | Smothering stomata, disturbance of fauna |
| Digging and Hauling | Dust, noise, vibration, water pollution | Disruption of watercourses, impacts on aquatic ecosystems due to changes in hydrology and water quality. |
| Waste Dumping | Clearing, water and soil pollution | Loss of habitat, soil and water contamination, sedimentation, acid mine drainage |
| Processing/ Chemical use | Toxicity | Loss of species (fish kills, for example) or reproductive impacts |
| Tailings Management | Land clearing, water pollution | Loss of habitat, toxicity, sedimentation, water quality and stream flow |
| Air emissions | Air pollution | Loss of habitat or species |
| Effluent discharges | Water pollution | Loss of habitat or species, reduced water quality |
| Building workshops and other structures | Land clearing, soil and water pollution | Loss of habitat, contamination from fuel, waste disposal |
| Waste disposal | Oil and water pollution | Encouragement of pests, disease transfer, contamination of groundwater and soil |
| Building power lines | Land clearing | Loss or fragmentation of habitat |
| Provision of accommodation | Land clearing, soil and water pollution, waste generation | Loss of habitat, sewage disposal and disease impacts, pests, disturbance of wildlife |
| Roads and rail | Land clearing | Habitat loss or fragmentation, water logging upslope and drainage shadows down slope |
| Population growth | Land clearing or increased hunting | Loss of habitat or species, stress on local and regional resources, pest introduction, clearing |



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| Water supply (potable or industrial) | Water abstraction or mine dewatering | Loss or changes in habitat or species composition |
|--------------------------------------|--------------------------------------|---|

4.6.2 MITIGATION MEASURES

Due to operation of various mining activities, the Wild life present within the project area can be threatened. Besides the Wild-life habitat is reduced to the extent of forest area involved in the project. The Wildlife Mitigation Measures (Site Specific) therefore aims at providing safe passage to the existing wild animals from the project area to the nearby Forest areas and improving the habitat in the surrounding areas. Certain measures are also required to be taken within the mining area. The proposed measures can be taken within the project area by the proponent and beyond the project area by the Government (Forest Department) with the financial support provided by the user agency. Based on the perceived threats to wildlife as per the foregoing chapter, the Mitigation measures will be prepared to address almost all such threats. The area hold area as well as the Impact area and beyond will be treated for habitat improvement so that, more fodder and water will be available for the wild animals.

The activities taken up in the project area will pose maximum threat to wildlife. It is therefore necessary to minimize such threat. The following steps will be taken within the lease area.

1. Safe passage to Existing Wild-life
2. Restoration of habitat
3. Physiographic change of Habitat (Land Management)
4. Barbed wired fencing to prevent fall of animals in the mining pits
5. Anti-poaching /anti-depredation activity
6. Provision of hired vehicle for Rapid Response Team
7. Health Camps and Cattle Immunization
8. Awareness, Training and Capacity building

4.6.3 BUDGET ALLOCATION FOR GREENBELT PLANTATION

Greenbelt with in developed within the mine lease area during the five year plan period/end of the life of mine and estimated budget for same is as follows:-

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Total trees will be provided per hectare = 2500 (150 trees per year upto 5years)
A total of 750 trees for the next 5 years will be planted for the green area development in the close proximity of the proposed project.

Table4.8: Budget Allocations for Greenbelt Development

| Particulars | 1st Year | 2nd Year | 3rd Year | 4th year | 5th Year | Grand Total |
|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|------------------------|
| 1. Core Zone: Every year 750 sapling will be planted upto 5 years within the mine lease area at safety zone & non-mineralized area. | | | | | | |
| Saplings required for project site greenbelt | 150 | 150 | 150 | 150 | 150 | 750 sapling |
| Amount per sapling @ INR. 500 (including maintenance/ gardening cost) | 75,000 | 75,000 | 75,000 | 75,000 | 75,000 | INR 3,75,000 |



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Table 4.11: List of species for planting in mine areas

| S. No. | Species | Local Names | S. No. | Species | Local Names |
|--------|--------------------------------|---------------------------------|--------|---------------------------------|--|
| 1 | <i>Thysanolaena maxima</i> | Synsar (K) Saliva (G) | 14 | <i>Macaranga denticulata</i> | Lakhar (K) Chagro (G) |
| 2 | <i>Neyraudia reynaudiana</i> | Burma reed | 15 | <i>Artocarpus heterophyllus</i> | Sohphan (K) Tebrong (G) |
| 3 | <i>Imperata cylindrica</i> | Cogon grass | 16 | <i>Syzygium cumini</i> | Soh-um (K) Khimkhol (G) |
| 4 | <i>Saccharum arundi naceum</i> | Hardy sugar cane | 17 | <i>Artocarpus chaplasi</i> | Dieng Soham (K) Bol-sram (G) |
| 5 | <i>Saccharum spontaneum</i> | Wild sugarcane | 18 | <i>Albizia procera</i> | Kreit (K) Goroi (G) |
| 6 | <i>Arunda donax</i> | Giant cane | 19 | <i>Bombax ceiba</i> | Rui (K) |
| 7 | <i>Bambusa tulda</i> | Siej (K) Wati (G) | 20 | <i>Daubanga grandiflora</i> | Bai (K) |
| 8 | <i>Mucuna bracteata</i> | -- | 21 | <i>Erithrina indica</i> | Dieng song (K) Mendal (G) |
| 9 | <i>Litsea monopetala</i> | -- | 22 | <i>Gmelina arborea</i> | Dieng Laphiang (K) Bolgippok (G) |
| 10 | <i>Litsea cubeba</i> | -- | 23 | <i>Michelia champaca</i> | Dieng rai (K) Tita chap, Champe (G) |
| 11 | <i>Trema orientalis</i> | Dieng Lattar (K) Phakram (G) | 24 | <i>Schima wallichii</i> | Dieng ngan (K) Bol dak (G) |
| 12 | <i>Cinanomum tamala</i> | Latyrpad (K) Teji-bol (G) | 25 | <i>Sapium baccatum</i> | Dieng jalong (K) |
| 13 | <i>Emblica officinalis</i> | Sohmylleng (K) Ambare (G) | 26 | <i>Toon ciliata</i> | Bti (K) Poma (G) |

4.6.4 PLANTATION TECHNIQUE AND CARE

Plantation Technique:-

Following basic procedures need to be followed for greening the area.

- Plantation of tree species required approx. 1m³ pit for soil enrichment.
- Pit should be filled with imported soil with 3:1:1 the ratio of sand, silt and farm yard manure.
- Procure well grown saplings of recommended species from the nearby Forest Department nursery.
- Make 1m diameter ring bund around the planted saplings for water retention.
- Watering of sapling is species specific, therefore watering need to be done once in 2 or 3 days for a period of two years.



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- Soil wok and weeding need to be done once in a two months.

Monitoring Protocol

- The plantations need to be managed by regular watering, soil enrichment work, applying manure, weeding and provide proper protection.
- Replacement of sapling (replanting) required whenever mortality occurs in the plantation during the growth stage.
- Plantation requires after care for a period of minimum five years till the saplings attain matured tree stage.
- Any damage to the developed greenbelt due to any natural or cattle activity should be redeveloped and maintained by the agency.

CONCLUSION

During the biodiversity assessment and concern with local stakeholder revealed that the project study area does not fall in migration route of migratory Birds. The study area does not from part on any National park, Wild life Sanctuary and ecological sensitive area. On the other hand none of significant fauna present in core zone project area and no habitation of significant wild life in core zone of project.

All the floral and faunal species reported from the core zone are common and widely distributed in the buffer zone also. So, it can be stated that the proposed project and associated activities are unlikely to influence any floral and faunal components significantly provided that the suggestions / recommendations in this report are implemented. Strict implementations of EMP / mitigation measures are required to ensure that the biodiversity of the study area should not impacted negatively.

4.7 SOCIO ECONOMIC IMPACT

| S. No. | Impact Parameter | Anticipated Impacts | Conclusion/ Remarks |
|---------------|-------------------------|--|--|
| 1 | Human Settlement | <ul style="list-style-type: none"> • No physical or economic displacement due to the proposed • Nearest settlement is approx. 1.0 km away • Sex ratio in the study area needs to be improved especially between the 0-6 years | <ul style="list-style-type: none"> • Necessary measures will be taken for prevention of emissions etc. • Skill development programs to be encouraged |



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| | | <p>of age group population</p> <ul style="list-style-type: none"> • Schedule caste and Schedule Tribe sex ratio is better than the other population • Literacy among women and men needs to be improved • Female work participation is very low • Overall work participation needs to be drastically improved | <ul style="list-style-type: none"> • Beneficiaries of various Govt. Scheme needs to be introduced to the locals which can help them start a new venture • Females should be encouraged for higher education which will help in their overall development |
| 2 | Livelihoods | <ul style="list-style-type: none"> • No loss of existing livelihoods • Newer direct or indirect employment is expected to generate • Additional non-agricultural livelihood opportunities are expected both directly and related • Minimal influx of person is expected during operation phase | <ul style="list-style-type: none"> • Priority will be given to local people in employment |
| 4 | Incomes and Revenues | <ul style="list-style-type: none"> • Improvement of money incomes of locals engaged in tertiary businesses by an average approx. • Improved tax revenues of Nigam • The successful commissioning and running of the proposed plant will attract more industrial investments, which in turn will benefit the society and the nation | <ul style="list-style-type: none"> • Locals should be aware of the savings which will help in their growth aspects |
| 5 | Demographics | <ul style="list-style-type: none"> • Damage to the connecting roads • Nearby agriculture lands will be impacted due to dust generations • Purchasing power of people is expected to improve in tune with the rise in incomes and improvement in infrastructure facilities • The skill sets of the local residents are expected to improve in keeping with the emerging employment opportunities | <ul style="list-style-type: none"> • Signage should be placed across the road • More jobs and employment of similar nature are likely to flourish |



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| 6 | Community Health | <ul style="list-style-type: none"> • Effective measures will be taken to control the dust emissions which will help in mitigating the adverse impact of dust emission | <ul style="list-style-type: none"> • Regular health checkup of workers and nearby locals • Records of the workers' health and safety will be ensure • Training will be provided to the workers • Protective equipment's will be provided • Safety and facilities of the workers will be taken care as per the Mining rules and regulations |
| 7 | Physical Infrastructure | <ul style="list-style-type: none"> • Road and power network in the area is expected to be strengthened as a sequential development | <ul style="list-style-type: none"> • Create newer and more employment opportunities for the locals |

4.8 IMPACT ON OCCUPATIONAL HEALTH & SAFETY

Healthy and safe working conditions are among the first expectations for sustainability, i.e. the expectation that risks in mining will not deprive workers of their livelihoods or of their quality of life. Occupational injuries and ill-health have huge social and economic implications for individuals, their families and their communities. They also have an adverse impact on the economy of the society as a whole.

Occupational accidents and health hazards can also affect public health and safety, and the environment. The effect on the health and safety of people, costs to the economy and impacts the environment. Efforts will be made to address occupational health and safety with broader social agenda for sustainable development.

Hazards, which are associated with poor engineering design, contribute to increased safety risks.

Although health risks can be avoided by implementing controls at source in the work environment, designing such controls for mining environment presents considerable challenges because dust and noise are generated by mining itself. A range of control measures that act together to reduce exposure to such risks is therefore necessary. These could include methods for minimizing dust levels by reducing dust generation and



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methods for dilution, suppression, capture, and containment.

While significant uncertainties remain in controlling dust exposures and maintaining the effectiveness of controls, the use of appropriate personal protective equipment (PPE) is important.

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

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

- Control of dust through water spraying,
- Use of PPE, as appropriate (e.g. masks and respirators) to address residual exposures.

Physical hazards - Injuries during Project operation are typically related to slips and falls; contact with falling / moving objects; and lifting / over-exertion. Other injuries may occur due to contact with, or capture in, moving machinery (e.g. trucks). In case of any accident immediate & proper first –aid medical care shall be provided at the applied mine site.

Pre-Placement Medical Examination and Periodical Medical Examination Schedules

The fresh employees when taken are thoroughly medically examined under initial medical examination and thereafter during continuation of employment; the periodic medical examination will be carried out.

Measures to Control Occupational Health Hazard & Safety

The working in the applied lease area will be done with all safety measures under the supervision of qualified staff. The workers will be provided dust mask, safety boot, helmet and other safety equipment. A well-equipped first aid box will be maintained at site.

For mitigating aspect, the following measures will be implemented:

- Regular water sprinkling on haul roads.
- Dust mask will be provided to the workers.
- Periodical medical examinations will be carried out for the workers as per Norms.
- Medical records will be maintained & Medical facilities to the workers.
- Any early symptom of diseases, if observed, such workers will be taken off from the dusty atmosphere and will be employed at other suitable place.
 - Personal Protective Equipment’s will be provided to the workers.

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- Vocational Training will be provided to the workers.
- Safety of the employee during mining will be taken care as per Mine Regulations.

4.9 ENVIRONMENTAL ACTION PROGRAMME

The Company (Shri Khrikshon Lyngkhoi) is quite conscious of its responsibility for maintaining clean and a healthy environment. The management is also keen to modify and make more efficient measures towards suppression of pollution sources. Adequate fund for Pollution Control Measures are provided as a part of overall project financing to ensure the availability of proper treatment facilities. The overall investment in the project is assumed to be Rs. 7.75 Lacs as Capital Cost and Rs. 4.45 Lacs as recurring cost. This cost will be spending phase wise along with the growth of project.

The breakup of the proposed cost for Environment Management Programme is given as under:-

Table 4.12: Provision for Environmental Protection Measures

| S. No. | Description | Capital Cost (Rs. In Lacs) | Recurring Cost (Rs. In Lacs) |
|---------------|--|---------------------------------------|---|
| 1. | Environmental Monitoring (Air, Water, Noise and Soil) | -- | 2.00 |
| 2. | Occupational Health and Safety (Initial & Periodical Medical Check-ups) | 1.00 | 0.50 |
| 3. | Green Belt (phase wise greenbelt development during plantation plan period) | 3.75 | 0.60 |
| 4. | Construction & Maintenance of Settling Tank, Garland Drains etc. | 1.00 | 0.40 |
| 5. | Provision of fencing around mine pit | 1.00 | 0.20 |
| 6. | Environmental Awareness Program | -- | 0.50 |
| 7. | Rain Water Harvesting | 1.00 | 0.25 |
| Total | | 7.75 | 4.45 |



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CHAPTER - 5

ANALYSIS OF ALTERNATIVES

(TECHNOLOGY AND SITE)

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5.0 ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.1 SITE ALTERNATIVE

Site Selection Criteria

The proposed project “Boulder Stone Mine” is situated at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya. The mining activity will be carried out by open cast semi-mechanized method.

The Letter of Intent has been sanctioned in favour of Shri Khrikshon Lyngkhoi vide letter no.KH/8/ML/Stone/69/ Dated 2018 by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. The proposed mine is spread over an area of 4.99 ha. with mineable reserves of about 35,82,600 Tonnes to produce 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA).

5.2 ALTERNATIVE FOR TECHNOLOGIES

No alternative site has been examined as the project is mineral specific. The mining work will be carried out in lease area by open cast semi-mechanized method as the lease was allotted by Govt. of Meghalaya, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong.

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CHAPTER–VI

ENVIRONMENTAL MONITORING

PROGRAMME



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6.0 ENVIRONMENTAL MONITORING PROGRAMME

6.1 INTRODUCTION

Regular monitoring of environmental parameters is of immense importance to assess the status of environment during project operation. The knowledge of baseline conditions and the monitoring programme will serve as an indicator to assess any deterioration in environmental conditions due to the proposed Boulder stone Mine at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya and to enable taking up suitable mitigation steps in time to safeguard the environment. Monitoring is important for control of pollution since the efficiency of control measures can only be determined by monitoring.

Therefore, regular monitoring programme of the environmental parameters is essential to take into account the changes in the environmental quality.

6.2 ENVIRONMENTAL MONITORING AND REPORTING PROCEDURE

Monitoring will conform that commitments are being met. The objectives of the monitoring are:-


- Measure effectiveness of operational procedures;
- Conform statutory and corporate compliance; and
- Identify unexpected changes.

Shri Khrikshon Lyngkhoi for its “ Boulder Stone Mine” shall engage third party services of NABL certified and MoEF&CC recognized environmental laboratory for carrying out environmental monitoring of the core and the buffer area.

6.3 ENVIRONMENTAL MONITORING SCHEDULE

Services of NABL certified and MoEF&CC recognized monitoring laboratory shall be sourced to monitor and assess the current environmental scenario and to comply with environmental monitoring and reporting requirements as per statutory clearances.

Environmental monitoring for the mining operations will be conducted for the following parameters:

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- **Ambient Air Quality Monitoring**

Ambient air quality monitoring within core & buffer zone, considering the predominant wind direction.

- **Water Monitoring**

Groundwater quality & level in core & buffer zone shall be monitored through a network of wells and piezometers and analyzed as per IS-10500, 2012.

Surface water sample from locations in and around the core zone shall be collected and analysed periodically.

The impact of mining operations on ground water level shall be monitored. The ground water level shall be monitored monthly and its impacts assessed and reported to CGWA periodically.

- **Noise Level**

Noise level monitoring of mine equipment shall be done on monthly basis. In case of overhauling of major equipment noise measurements shall be done before and after overhaul.

- **Soil Environment**

Soil quality within M.L Area and in buffer area shall be monitored periodically at designated locations once in six months, especially for heavy metals.

Environmental Monitoring Schedule will be prepared covering various phases of project advancement, such as development and operational phase. The environmental monitoring program to be implemented is given in Table 6.1.

Table 6.1: Post EIA Environmental Monitoring Programme

| S. No. | Environmental Component | Parameters | Frequency of Monitoring | Measurement Method | Location |
|--------|-------------------------|---|-------------------------|---|-----------|
| 1. | Meteorological | Wind Speed; Wind Direction; Temperature; Dry bulb temperature; Wet Bulb temperature; Relative Humidity; Rainfall; | 24 hourly continuous | IS 5182 Part 1-20 Automatic Weather Monitoring station. | Mine Site |



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| S. No. | Environmental Component | Parameters | Frequency of Monitoring | Measurement Method | Location | |
|--------|-------------------------|---|---|------------------------------------|---|---|
| | | Cloud cover. | | | | |
| 2. | Ambient Air | PM ₁₀ , PM _{2.5} , SO ₂ , NO _X CO, and Lead in PM or as prescribed by CPCB/SPCB/ MoEF&CC | 24 hourly Once in a month | | 2 static and 2 dynamic locations within ML Area & 4 locations in buffer area (third party monitoring) | |
| 4. | Noise & Vibration | Ambient | Spot Noise level recording | Once in a quarter | IS: 4954-1968 as adopted by CPCB. | 04 locations in ML Area |
| | | Work Zone | Leq (day), Leq (night), Leq (dn) | | | D.G. Set, mine, |
| | | Peak particle velocity | - | Once in a year | PPV Meter | 150-200 mtr from the blasting site. |
| 5. | Water Quality | Ground water | Quality: As per IS: 10500, 2012 or as prescribed by CPCB/ SPCB/ MoEF&CC | Once in a quarter | IS: 2488 (Part 15) Standards methods for examination of water and waste water analysis published by American Public Health association. | 4 locations in and around M.L Area |
| | | | Level (m bgl): continuous through DWLR | Once in a month | | Piezometric wells in & around ML Area |
| | | Surface Water | Parameters specified under IS:2296 (Class C) or as prescribed by CPCB/SPCB/MoEF&C C | Once in a quarter | | Two locations inside ML Area. (upstream and downstream) |
| 6. | Soil Environment | Composite sample from the site for Physio- | Once in a quarter | Collected and analyzed as per soil | 04 locations in and | |



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| S. No. | Environmental Component | Parameters | Frequency of Monitoring | Measurement Method | Location |
|--------|-------------------------|---------------------|---|--|-----------------|
| | | chemical parameters | | analysis reference book, M.I. Jackson and soil analysis reference book by C.A. Black | around M.L Area |
| 7. | Health | Occupational Health | <ul style="list-style-type: none"> • Initial Medical Examination (IME) • Periodic Medical Examination (PME) • Once in 3 years for age > 45 years • Once in 5 year for age ≤ 45 years | -- | All employees |

6.4 PROPOSED MONITORING SCHEDULE DURING OPERATIONAL PHASE

The major attributes which merit regular monitoring based on the environmental setting and nature of project activities are listed below:-

- Source emission and ambient air quality;
- Ground water levels and ground water quality;
- Waste water & treated water quality;
- Soil quality;
- Noise levels (equipment and machinery noise levels, occupational exposures and ambient noise levels); and
- Ecological preservation and plantation



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6.5 MONITORING METHODS

6.5.1 AIR QUALITY MONITORING

Work Zone Monitoring

The concentration of air borne pollutants in the workspace/ work zone environment is being/will be monitored periodically. If concentrations are higher than threshold limit values the source of fugitive emissions is being/will be identified and necessary measures is being /will be taken as detailed in EMP.

Ambient Air Quality Monitoring

The ground level concentration of PM₁₀, PM_{2.5}, SO₂, NO_x, and CO (as per CPCB/MoEF&CC Norms) in the ambient air will be monitored at regular intervals. Any abnormal rise will be investigated to identify the causes and an appropriate action will be initiated. Greenbelt will be developed for minimizing dust propagation.

6.5.2 MONITORING OF WATER QUALITY

Monitoring of Ground Water


The monitoring of groundwater is the most important tool to find out the depletion/ increase in level of water table. Water table will be monitored at regular intervals by network of wells and piezometers within the lease area & buffer zone. Records of analysis will be maintained.

Water and Wastewater Quality Monitoring

To ensure a strict control over the water consumption, flow meters shall be installed for all major inlets. All leakages and excess shall be identified and rectified. In addition, periodic water audits will be conducted to explore further possibilities for water conservation. Domestic waste water will be channelized to sewer line.

6.5.3 MONITORING NOISE LEVELS

Noise level in the work zone environment will be monitored. The frequency will be once in a month in the work zone. Similarly, ambient noise level near habitations will also be monitored once in three months. Audiometric tests will be conducted periodically for the employees working close to the high noise sources.

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6.5.4 OCCUPATIONAL HEALTH MONITORING

The mine workers health monitoring is very important to identify any occupational health impacts arising out of the operations and the environmental conditions. All workers shall undergo a pre-employment medical health checkup at the time of joining and undergo periodic health checkup as per the stipulations of DGMS and records shall be maintained.

6.6 EIA FOLLOW UP

Voluntary reporting of environmental performance with reference to the EMP will be undertaken by Shri Khrikshon Lyngkhoi.

The EMC will coordinate regarding the monitoring programme at mines as per the regulatory requirement and data/report thus, generated will continue to be regularly furnished to the concerned regulatory agencies.

The half yearly compliance report in respect of conditions of Environmental Clearance granted by SEIAA, Meghalaya will be submitted regularly to respective authorities. The frequency of compliance reporting will be on six monthly basis to Meghalaya State Pollution Control Board (MSPCB), Regional office, MoEF&CC and CPCB.

6.7 CER/SOCIAL EMP

As per the MoEF&CC vide OM No. F. No. 22- 65/ 2017 – IA. III dated 30.09.2020 the fund allocation for the proposed CER as follows:-

| S. No. | Capital Investment (Capital Investment In Rs.) | Greenfield Project – % of Capital Investment |
|---------------|---|---|
| 1. | < 100 Crores | 2.0% |
| | Project Cost – Rs. 463.68 Lacs | Rs. 9.27 Lacs |

However, as per the MoEF&CC OM dated 30.09.2020, an amount of Rs. 9.27 Lacs as a Capital Cost will be allocated as follows: -

Table 4.11: Budget allocation for Social EMP

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| S. No. | Activities | Capital Cost (In lac) | | | | | Recurring Cost (In Rs.) |
|--------------|---|-----------------------|----------------------|-----------------------|------------------------|-----------------------|-------------------------|
| | | Total | I st Year | II nd Year | III rd Year | IV th Year | |
| 1. | Construction of Toilet Rooms at nearby villages/schools | 1.27 | 1.27 | - | - | - | - |
| 2. | Plantation along the kachha rasta/ approaching roads used for the transportation of the mineral | 2.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| 3. | Distribution of books & uniforms to the children of nearby schools | 3.50 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| 4. | Providing Computer along with table in nearby schools | 2.0 | 1.0 | 1.0 | - | - | - |
| Total | | 9.27 | 3.47 | 2.2 | 1.2 | 1.2 | 1.2 |

6.8 CONCLUSION

Post Environmental monitoring is an essential step in the EIA process, if the predicted impacts, the efficiency of mitigation measures and the shortcomings of prediction methods, measures and even regulations are to be verified and EIA practice improved. Environmental indicators could contribute to designing and evaluating monitoring programs, thus improving establishment of the cause effect relationship and the reporting and communication of environmental data.

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CHAPTER - 7

ADDITIONAL STUDIES

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7.0 ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

The said draft EIA/EMP report of Boulder Stone Mine by Shri Khrikshon Lyngkhoi is being submitted as per Terms of Reference (TOR) for Public Consultation (Public Hearing). The issues raised during Public Consultation will be submitted along with the time bound action plan for the compliance with the Final EIA/EMP report.

7.2 RISK ANALYSIS AND DISASTER MANAGEMENT PLAN

Mining basically is a hazardous profession requiring stringent safety measures to avoid incidences involving life and damage to machineries. It may cause extensive damage to property and serious disruption in work inside and outside the premises. Such situations need positioning of emergency response plan which can be executed without the loss of time. Time factor is the essence in dealing emergencies to minimize the loss of human life and disruption of work.

Any accident may develop into a major emergency even with the best safety measures and programmes in mining. Hence, an emergency preparedness plan will be planned properly and documented for ease of implementation at the time of need without losing time and avoiding and delays.

7.2.1 OBJECTIVES OF DISASTER MANAGEMENT PLAN

The objectives of DMP is to describe the company's emergency preparedness, organization, the resource availability and response actions applicable to deal with various types of situations that can occur at mines in shortest possible time.

Thus, the overall objectives of the emergency plan are summarized as:-

- Rapid control and containment of Hazardous situation.
- Minimizing the risk and impact of event/ accident.
- Effective prevention of damage to property.

In order to achieve effectively the objectives of emergency planning, the critical elements that form the backbone of Disaster Management Plan (DMP) are:-

- Reliable and early detection of an emergency and immediate careful planning.

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- The command, co-ordination and response organization structure along with availability of efficient trained personnel.
- The availability of resources for handling emergencies.
- Appropriate emergency response action.
- Effective notification and communication facilities.
- Regular review and updating DMP.
- Training of the concerned personnel.

Steps taken for minimizing the effects may include rescue operations, first aid, evacuation, rehabilitation and communicating promptly to people living nearby.

7.2.2 IDENTIFICATION OF HAZARDS AND MITIGATION MEASURES

The following types of hazards are identified and precautions to be taken against them are enumerated below:-

7.2.2.1 Fall of Sides & Roof

- Flatter slope angles are adopted where occurrences of loose earth are encountered.
- Unmanageable heights are not created.
- Loose rocks are properly dressed.
- Nature and structure of the rocks are properly studied for their slips.
- Bench height will be kept with respect to the digging depth of excavating equipment.
In case of semi mechanized open cast mine bench height will be kept 6.0m. The width of the bench will not be less than the height.
- No overhang/ under cutting will be allowed to be created in benches.
- Overloading of dumpers will not be allowed. Large size of material will not be loaded at the top of the dumpers to prevent its falling and causing injury to persons.

7.2.2.2 Storage and use of Explosives

- Safe practices will be adopted while using explosives and it will be kept and stored in magazine, duly licensed.
- DGMS qualified blaster will be appointed for carrying out blasting operations.
- All precautions will be taken before blasting like removal of persons, equipments from the place of blasting to the safe distance.

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- Proper record of receipt, storage and use of explosives/ fuel will be kept and maintained by properly authorized persons.
- Explosives will be used as per the requirement. No overcharging/ undercharging of holes will be allowed.
- All entries to the blasting area will be blocked and guarded to prevent inadvertent entry of persons.
- Alert through hoisting red flag will be given for cautioning/ warning to persons nearby before blasting.

7.2.2.3 Storage of Oil and Fuel

- Due care will be taken to avoid oil spillage.
- Oil collecting bins will be placed before taking out oil from drums/ barrels to prevent spillage on the ground. Storage will not be allowed beyond necessity.
- Sand will be spread on floor. It will be regularly scrapped and removed.
- Sand baskets will be provided within the easy reach of persons near the area of fuel/ lubricant storage.
- Sufficient no. of foam type fire extinguishers will be provided.
- All equipments deployed in the mine will be provided with fire extinguishers CO₂ type to deal with electrical fires.
- Fire hydrant will be provided with long hose pipe near the mine.

7.2.2.4 Water

- Proper drainage will be maintained to eliminate inundation of working pits during rains from run-off water.
- Garland drains will be provided to prevent outside water entering the mine pit.
- Sumps with adequate capacity will be developed inside the mine.
- Adequate pumping capacity will be developed to deal with accumulated water.
- Dumping area will be benched and sloped at the top towards the low altitude side.
- Parapet wall of 1m x 1m will be provided on the low altitude side of the dumps.
- Siltation ponds (3m x 3m x 2m) will be provided to arrest silt coming with runoff water/ garland drains.

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7.3 OCCUPATIONAL HEALTH HAZARDS

Open cast method involves dust generation by excavation, loading and transportation of mineral. At site, during excavation and loading activity, dust is main pollutant which affects the health of workers whereas environmental and climatic conditions also generate the health problems.

Addressing the occupational health hazard means gaining an understanding of the source (its location and magnitude or concentration), identifying an exposure pathway (e.g. a means to get it in contact with someone), and determination of likely a receptor (someone receiving the stuff that is migrating).

Occupational hazard due to open cast mining mainly comes under the physical hazards. Possible physical hazards are as below mention:-

7.3.1 PHYSICAL HAZARDS DUE TO MINING OPERATIONS

Following health related hazards were identified in open cast mining operations to the workers:-

1. **Light:** - The workers may be exposed to the risk of poor illumination or excessive brightness. The effects are eye strain, headache, eye pain and lachrymation, congestion around the cornea and eye fatigue.
2. **Heat and Humidity:** - The most common physical hazard is heat. The direct effects of heat exposure are burns, heat exhaustion, heat stroke and heat cramps; the indirect effects are decreased efficiency, increased fatigue and enhanced accident rates. Heat and humidity are encountered in hot and humid condition when temperatures and air temperatures increase in summer time up to 48°C or above.
3. **Eye Irritation:** - During the high windy days in summer the dust could be the problems for eyes like itching and watering of eyes.
4. **Respiratory Problems:** - Large amount of dust in air can be a health hazard, exacerbating respiratory disorders such as asthma and irritating the lungs and bronchial passages.
5. **Noise Induced Hearing Loss:** - Machinery is the main source of noise pollution at the mine site.

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7.3.2 MANAGEMENT

| Particulars | Control Measures |
|--------------|---|
| Heat & Light | <ul style="list-style-type: none"> ➤ The mine site will have adequate drinking water supply so that workers do not get dehydration. ➤ Lightweight and loose fitting clothes having light colors will be preferred to wear. ➤ Rigorous exercise and more physical activities will be avoided in hot weather. |
| Noise | <ul style="list-style-type: none"> ➤ Noise exposure measurements will be taken to determine the need for noise control strategies. ➤ The personal protective equipment will be provided for each mine workers. ➤ Supervisor will be instructed for reporting any problems with hearing protectors or noise control equipment. ➤ At noisy working activity, exposure time will be minimized. ➤ Machineries will be labeled with noise levels. |
| Respiratory | <ul style="list-style-type: none"> ➤ PPE's like face mask, ear plugs, helmets, shoes etc. will be provided during mining activity. ➤ Periodic medical examinations will be provided for all workers. ➤ Awareness program will be organized for workers. |

7.3.3 MEDICAL EXAMINATION SCHEDULE

To minimize the health impacts PPE's like dust masks, ear plugs/ muffs and other equipments will be provided for use by the work personnel. All workers will be subjected to Initial Medical Examination as per Mines Rule 1955 at the time of appointment. Periodical Medical Examination will be conducted at least once in five years. Medical camps will be organized. The detail of health check up and periodical medical examination schedule is given below in Table 7.1.

Table 7.2: Medical Examination Schedule

| S. No. | Activities | 1 st Year | 2 nd Year | 3 rd Year | 4 th Year | 5 th Year |
|-----------|--|----------------------|----------------------|----------------------|----------------------|----------------------|
| 1. | Initial Medical Examination (Mine Workers) | | | | | |
| a. | Physical Check - up | | -- | -- | -- | -- |
| b. | Psychological Test | | -- | -- | -- | -- |
| c. | Audiometric Test | | -- | -- | -- | -- |
| d. | Respiratory Test | | | | | |
| 2. | Periodical Medical Examination (Mine Workers) | | | | | |
| a. | Physical Check - up | -- | | | | |



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| | | | | | | |
|-----------|---|----|--|--|--|--|
| b. | Audiometric Test | -- | | | | |
| c. | Eye Check - up | -- | | | | |
| d. | Respiratory Test | -- | | | | |
| 3. | Medical Camp (Mine Workers & Nearby Villagers) | -- | | | | |
| 4. | Training (Mine Workers) | | | | | |

Medical Follow ups:- Work force will be divided into three targeted groups age wise as follows:-

| Age Group | PME as per Mines Rules' 1955 | Special Examination |
|------------------------|-------------------------------------|----------------------------|
| Less than 25 years | Once in a Three Years | In case of emergencies |
| Between 25 to 40 Years | Once in a Three Years | In case of emergencies |
| Above 40 Years | Once in a Three Years | In case of emergencies |

Medical help on top priority immediately after diagnosis/ accident is the essence of preventive aspects.

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CHAPTER - 8

PROJECT BENEFITS



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8.0 PROJECT BENEFITS

8.1 GENERAL

Mining operations engage with local and indigenous communities and generate net benefits by:-

- Provision of well paid-employment under conditions that comply with accepted labour standards;
- Provision for educating and training programmes;
- Development of local industries and businesses;
- Support of government initiatives and social activities;
- Investment in infrastructure development that benefits the communities;
- Provision of health and sanitation programmes (such as malaria prevention vaccination and the related);
- Complying by the laws of the Federal, state and municipal of the proposed project location
- Increase the local employment and generate skilled employees

8.2 EMPLOYEMENT

8.2.1 DIRECT EMPLOYMENT

During the operational phase, about 67 people will be employed directly. Considering that some of the skilled personnel to be employed for the project will not be from the surrounding area. Un-skilled/ semi or skilled personnel will be from within the study area, the project will add to the well being of the area.

8.2.2 INDIRECT EMPLOYMENT

The project will also provide some indirect employment to the people of nearby area of mine site. Locals will be engaged in petty shops like tea shop, vehicle repair centre etc. It will provide need based opportunity to the locals. The project will provide following indirect employment to the local people:-

- The Stone available will provide agency employment in the value chain analysis, for place utility and retail.



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- Transportation and warehousing in the region required to transfer the mineral will eventually be needed and therefore trucks and jobs in logistical activities will come up.
- There will be development of externalities for the mine workers petty shops (tea, repair stations for trucks etc.) as supporting services.
- As there would be vocational training camps and Technical Training of mining to the regional people, hence there will be potential manpower available for the proposed and surrounding mines of the Tehsil.
- Indigenous will be skilled employees for sustainable development

8.3 IMPROVEMENTS IN PHYSICAL AND SOCIAL INFRASTRUCTURE

The proposed project will enhance the socio-economic activities in the adjoining areas. This will result in the following benefits:-

- Improvements in physical infrastructure;
- Improvements in social Infrastructure;
- Increase in employment potential;
- Contribution to the exchequer;
- Post-mining enhancement of green cover.

8.3.1 IMPROVEMENTS IN PHYSICAL INFRASTRUCTURE

It is a proposed project. It will give numerous positive impacts on society such as growth in schools, hospitals etc. It will also attract other entrepreneur to establish their venture in the region.

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

- Improved road communication;
- Strengthening of existing community facilities through the Community Development Programme;
- Rain water reservoir to augment the water availability for irrigation and plantation;
- Skill development & capacity building like vocational training to persons for income generation.



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- Awareness program and community activities, like health camps, family welfare programs, immunization camp, plantation etc.

8.3.2 IMPROVEMENTS IN SOCIAL INFRASTRUCTURE

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

Following are the benefits in specific area of social domain:-

Socio-Economic:- There will be positive impact in socio-economic area due to increased economic activities, creation of new employment opportunities, infrastructural development and better educational and health facilities.

Health Care Facilities: - Company will undertake awareness program and community activities like health, camps, family welfare camps etc.

Employment Potential: - There is a possibility of creation of direct and indirect employment opportunities due to working of this mine.

The mine will contribute to the Exchequer of State and Central Government as per norms.

8.4 HEALTH

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

8.5 OTHER BENEFITS

The other tangible benefits includes metrics and improvements demonstrating process and system cost savings, compliant inspections and customer audits, faster product approvals and manufacturing throughput, less rejected material, reduced nonconformance issues, and more efficient continuous improvement and project implementation. Intangible benefits include improved staff morale, quick, more accurate and transparent decision making, increased staff accountability and an enhanced culture of quality throughout the organization.



CHAPTER - 9

ENVIRONMENTAL COST BENEFIT ANALYSIS



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9.0 ENVIRONMENTAL COST BENEFIT ANALYSIS

9.1 ENVIRONMENTAL COST BENEFIT ANALYSIS

As per EIA Notification 14th September' 2006, this chapter of the “Environmental Cost Benefit analysis is applicable only if it is recommended at the scoping stage. As per the ToR points issued by SEIAA, Meghalaya for the proposed project; the Environmental Cost Benefit Analysis is not applicable.



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CHAPTER - 10

ENVIRONMENTAL

MANAGEMENT PLAN



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10.0 ENVIRONMENTAL MANAGEMENT PLAN

10.1 INTRODUCTION

A site-specific Environmental Management Plan will be formulated and diligently practiced at Boulder stone Mine, subsequent to this EIA study as per the Standard Terms of Reference to ensure that the appropriate environmental management practices are followed in compliance with the environmental legislations.

10.2 COMPONENTS OF EMP

Following elements are the major components of Environment Management Plan:-

Commitment and policy: to implement environment management plan that comprehensively covers all issues related to air, land and water.

Planning: This head includes identification of environmental impacts, legal requirements and setting environmental objectives.

Implementation: This comprises of resources available for the project, accountability of employees, contractors training of operational staff associated with environmental control facilities and documentation of measures to be taken.

Measurement and evaluation: This includes monitoring, corrective actions and record keeping.

The following Policy & Programs shall be developed to ensure proper implementation of EMP for the proposed mining project:

- Formulating Environment, Occupational Health & safety and quality Policy
- Formation of Environment Management Cell (EMC)
- Greenbelt Development & Plantation Programme
- Allocating annual budget for environmental management measures & ensuring implementation



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10.3 INSTITUTIONAL ARRANGEMENTS FOR EMP IMPLEMENTATION

10.3.1 CORPORATE ENVIRONMENT POLICY

The Company shall draft a well laid down Corporate Environment Policy covering the nine key principles including Environment prescribed by SEBI vide Circular No. CIR/CFD/CMD/10/ 2015 dated November 04, 2015.

The key principles to be covered under the policy are as follows-

1. Ethics, Transparency and Accountability
2. Sustainability
3. Wellbeing of Employees
4. Disadvantages, vulnerable and marginalized stakeholders
5. Human Rights
6. Environment
7. Public and regulatory policy advocacy
8. Inclusive growth and equitable development
9. Value to Customers

10.3.2 REDRESSAL MECHANISM

The Environmental Management Committee shall oversee the implementation of the Policy and address the stakeholders' grievances related to the said Policy.

- **Independent Audit/ Evaluation of working of the Policy**

Independent Audit/ evaluation of implementation & effectiveness of the Policy will be done by the Internal Auditor on annual basis and report the same to the Chief Financial Officer and Whole Time Director, being designated by the Board of Directors as responsible Director for the preparation and implementation of the Corporate Environment Policy.

- **Reporting Mechanism**

The company shall report extensively on their operations in the annual report, highlighting their vision, commitment and achievements and have a copy of the same accessible to its stakeholders on the company website.

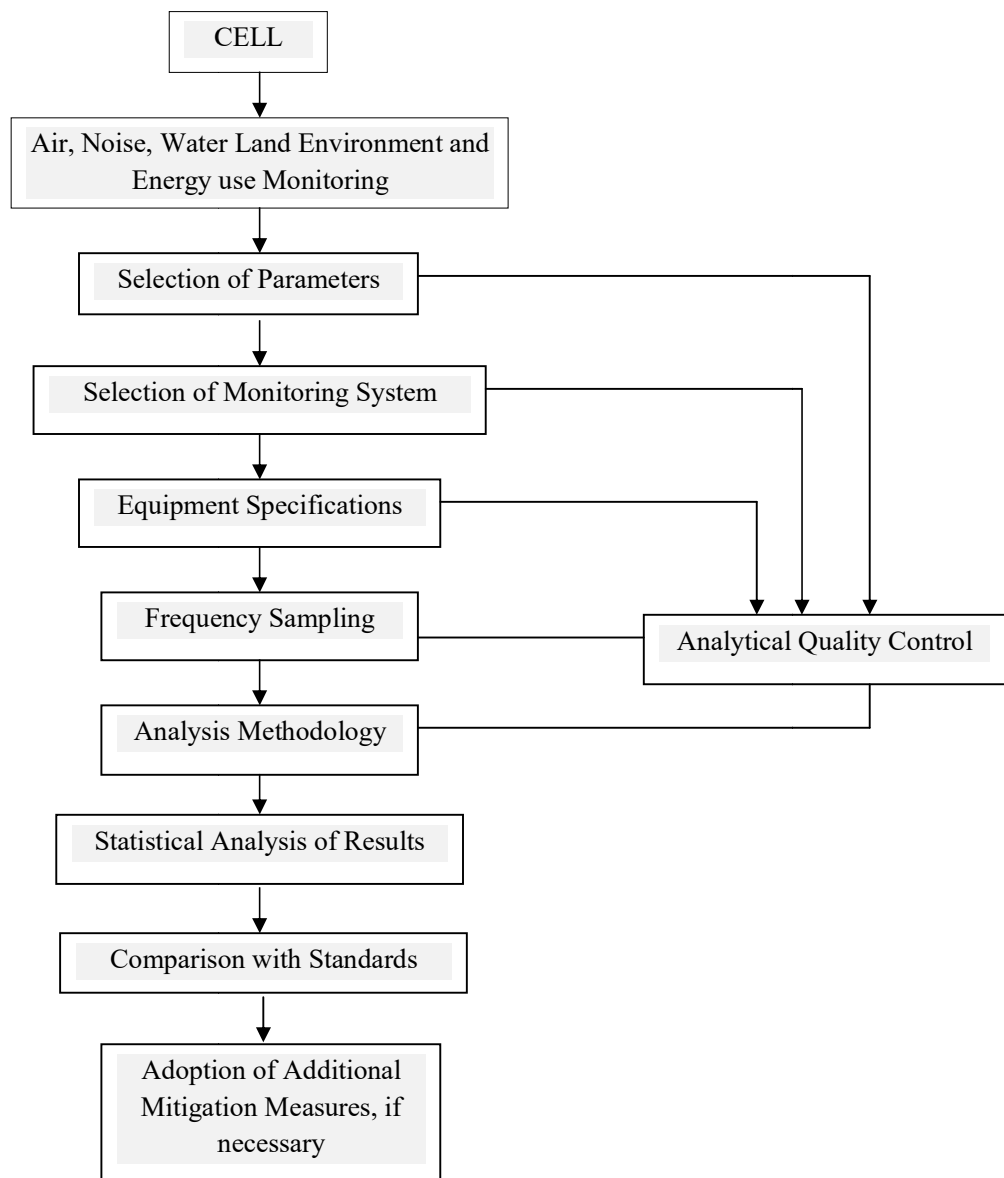
The company shall monitor and communicate their progress on environmental parameters in the annual report.



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10.3.3 ENVIRONMENTAL MANAGEMENT CELL (EMC)

To comply with environmental quality standards, regular inspections, audits & monitoring of various environmental components is necessary. Shri Khrikshon Lyngkhoi will formulate an Environmental Management Cell (EMC) for environmental monitoring and reporting. The EMC team will be responsible for pollution monitoring and implementation of control measures as discussed in Chapter IV of this EIA/EMP Report. Suitably qualified personnel including an engineer & technicians will be deputed for maintenance, up-keep and monitoring of the pollution control equipment. The Organizational structure of EMC is given below:-



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10.3.4 RESPONSIBILITIES OF EMC

The responsibilities of the EMC include the following:-

1. Environmental monitoring of the core and buffer zone.
2. Verifying adequacy & ensuring smooth running of pollution control equipment.
3. Specification and regulation of maintenance schedules for pollution control equipment.
4. Ensuring that environmental standards viz. ambient air quality, water and effluent quality, noise level, soil quality stipulated in statutory clearances are maintained.
5. Monitoring the progress of green belt development.
6. Ensuring optimum usage of natural resources including water.
7. Carrying out the Environmental Management Plan.
8. Ensuring compliance of statutory clearances and submission to concerned authorities.
9. Maintain documentation of good environmental practices and applicable environmental laws as ready reference.
10. Maintain environment related records.
11. Coordination with regulatory agencies, external consultant, monitoring laboratories.
12. Maintain log of public complain and the action taken.
13. Organizing meetings of the Environmental Management Committee and reporting to the technical head, project head and location head.

The applicant believes in sustainable development and is committed towards effective environmental management as an integral part of its business.

The applicant will ensure compliance with all environmental laws and regulations applicable to its activities i.e. mining, storage and transportation of Limestone and will work towards reducing negative footprint on environment and shall obtain following certifications as a part of its good management practices:

- ISO 14001:2015
- ISO 9001:2015
- BS OHSAS 45001: 2018

10.4 ACTIVITIES FOR EMP IMPLEMENTATION

1. Training and Environmental Awareness;
2. Documentation and record keeping;
3. Reporting Procedures;



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4. Stakeholder/ Project Proponent engagement;
5. Auditing;
6. Responding to Non-compliance.

10.5 ENVIRONMENTAL ACTION PROGRAMME

The management of “**Shri Khrikshon Lyngkhoi**” is aware of their responsibility for maintaining clean environment & shall ensure sustainable development. Adequate funds for pollution control measures will be provided as a part of overall project financing to ensure the availability of proper pollution control facilities before the commissioning of the proposed mining project. The EMP budget is Rs. 7.75 Lacs (capital cost) and the recurring cost will be Rs.4.45 Lacs per annum for the environment protection program. Details are given in Chapter IV of this EIA/EMP report.

Table 10.1: Environment Management Plan & Responsibility

| S. No. | Designation | Nos. | Role/Responsibilities |
|--------|----------------------|------|--|
| 1. | Mines Manager | 01 | <ul style="list-style-type: none"> • Responsible for discharging duties as Mines Manager of Boulder Stone Mine as per Mines Act 1952, MMR 1961, Mines Rules 1955, MCDR 2017 and Office Memorandum issued by regulatory authorities from time to time. • To identify and comply with the applicable Statutory & Regulatory requirements • Create awareness on potential environmental aspects & occupational hazards & risk. • Ensure judicious use of all natural resources including energy, minerals, water etc. • Ensure environment friendly operations with a view to keep the emissions/effluents within the prescribed norms. • To plan for new equipment, equipment modification etc. for quality improvement in mine operations, reduction of environmental impact & Risk etc.) in consultation with Operations Head. • To identify, control and reduce the EHS hazards and risks. • Training need assessment of employees for effective implementation of the EMP & notify Incident controller in case of any emergency. |



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| S. No. | Designation | Nos. | Role/Responsibilities |
|--------|---|-----------|---|
| | | | <ul style="list-style-type: none"> To ensure effective & continuous operation of pollution control & safety equipment Overall environmental performance of the Mines. Coordination with statutory / regulatory bodies/authorities. Ensure the EMP is implemented and is effective. Assist the Environment Manager with regulatory authorities and/or community consultation (i.e. addressing complaints). |
| 2. | Environmental Manager & Environment Engineer | 01 | <p>Implement EMP as stipulated.</p> <ul style="list-style-type: none"> Ensure that all the applicable environmental parameters are regularly monitored & reports submitted to the concerned regulatory authorities. Ensure that the environmental objectives and targets are established and achieved. <ul style="list-style-type: none"> Review and evaluate contractor's EMP to ensure that the same is consistent with the EMP of the Shri Khrikshon Lyngkhoi. Coordinate with regulators and other agencies as required in unison with the Mines Manager for effective implementation of the EMP. Assist operations staff in improving work practices / procedures or adding more stringent requirements / controls) Ensure that any change in any of the activities/ equipment/processes is duly evaluated in order to ensure no increase in or introduction of new environmental risks or impacts. Ensure that the requirements of the EMP and related management programs have been addressed in all contractor environmental management documentation. Undertake regular audits (or appoint an appropriately qualified external auditor) for evaluating the environmental performance of the mine. Undertake routine environment monitoring as per schedule. Daily inspection of the premises, preparing inspection reports. Checking of emission/ noise level of mining equipment for mid-course correction. Ensure that regular water sprinkling is done on the haul roads and |



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| S. No. | Designation | Nos. | Role/Responsibilities |
|--------|----------------------------|------|--|
| | | | <p>around waste dumps for effective control of fugitive emissions</p> <ul style="list-style-type: none"> Supervising the overall progress of environmental management programs and ensuring all applicable regulations are adhered to. Prepare and submit regular reports to concerned authorities Assist horticulturist in developing greenbelt in mining premises in line with stipulated guidelines Assist mining engineers in implementing best waste management practices Coordinate with mining and other concerned engineers for effective implementation of the EMP |
| 3. | Horticulturist | 01 | <ul style="list-style-type: none"> Planning for plantation and greenbelt development in mining area Seek assistance from local forest department regarding selection of species for plantation Ensure regular watering of saplings is done as per schedule to ensure maximum survival rate. Ensure optimum survival of saplings Development of lawns and gardens around office and other areas Ensure regular maintenance of saplings planted in mining area |
| 4. | Mechanical Engineer | 01 | <ul style="list-style-type: none"> Daily inspection of machinery & equipment Regular maintenance of equipment as per Original Equipment Manufacturer (OEM) recommendations Keeping maintenance logs Regular monitoring of fuel consumption of vehicles and coordination with suppliers/ OEM if the fuel consumption exceeds the committed values. Ensure that the mining machinery conform to the applicable environmental norms Ensure that the emission/noise levels from the mining machinery do not exceed the permissible levels |
| 5. | E&I Engineer | 01 | <ul style="list-style-type: none"> Ensure electrical supply in mining area for operation of monitoring and measuring instruments Troubleshooting, maintenance and periodic calibration of environmental monitoring equipment. Maintain appropriate inventory of spares. |



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10.6 CONCLUSION

Various aspects of mining activities were considered and related impacts were evaluated. Considering all the possible ways to mitigate the environmental concerns Environmental Management Plan has been prepared and fund has been allocated for the same. Details are given in Chapter IV. The EMP is dynamic, flexible and subjected to periodic review.

Senior Management of the project shall conduct a review of EMP and its implementation to ensure that the EMP remains effective and appropriate. Thus, proper steps shall be taken to accomplish all the goals mentioned in the EMP so that the proposed mining project brings a net positive impact in the study area.



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CHAPTER - XI

SUMMARY AND CONCLUSION

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11.0 SUMMARY AND CONCLUSION

11.1 INTRODUCTION

The proposed project “Boulder Stone Mine” is situated at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya. The total lease area of the project is 4.99 Ha. The mining activity will be carried out by open cast semi-mechanized method.

The Letter of Intent has been sanctioned in favour of Shri Khrikshon Lyngkhoi vide letter no.KH/8/ML/Stone/69/ Dated 2018 by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. The proposed mine is spread over an area of 4.99 ha. with mineable reserves of about 35,82,600Tonnes to produce 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA).

11.1.1 LOCATION OF LEASE AREA

The proposed project “Boulder Stone Mine” is situated at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya.

11.1.2 DETAIL OF MINING LEASE

| S. No. | Particulars | Details |
|---------------|--------------------|--|
| 1. | Name of Project | Boulder Stone Mine |
| 2. | Location | Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya |
| 3. | Lease Area | 4.99 Ha. |
| 4. | Land Type | Private Land |
| 5. | Seismic Zone | Zone – V |

11.2 PROJECT DESCRIPTION

The Letter of Intent has been sanctioned in favour of Shri Khrikshon Lyngkhoi vide letter no.KH/8/ML/Stone/69/ Dated 2018 by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. The proposed mine is spread over an area of 4.99 ha. with mineable reserves of about 35,82,600Tonnes

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to produce 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA).

The proposed mining operations will be carried out by open cast semi - mechanized method.

11.2.1 GEOLOGY

11.2.1.1 Local Geology

The succession of rocks in the lease area is as given below:-

Table 11.1: Local Geology

| Geological Age | Group Name | Formation Name | Rock Type |
|------------------------|----------------|------------------|---------------------------|
| Recent | Newer Alluvium | Unclassified | Sand, Silt and Clay |
| -----UNCONFIRMITY----- | | | |
| Eocene | Jaintia Group | Shella Formation | Calcareous Boulder Stonee |

11.2.1.2 Physiography

The topography of the lease area is hilly terrain. Highest elevation is 1785 mRL and lowest is 1765 mRL.

11.2.2 GEOLOGICAL AND MINEABLE RESERVES

| A) Total Mineral Reserves | UNFC Code | Boulder Stone (Tonnes) |
|---------------------------------|-----------|------------------------|
| Proved Mineral Reserves | 111 | 16,44,400 |
| Probable Mineral Reserves | 121 & 122 | 19,38,200 |
| Total Mineable Reserves | | |
| B) Total Remaining Resources | | |
| Feasibility Mineral Resources | 211 | 2,90,190 |
| Pre-Feasible Mineral Resources | 221+222 | 8,30,630 |
| Measured mineral resources | 331 | |
| Indicated Mineral resources | 332 | |
| Inferred Mineral Resources | 333 | 9,22,940 |
| Reconnaissance mineral resource | 334 | |

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11.2.3 MINING

The mining will be done by open cast semi-mechanized method of mining. The salient features of mode of working as per approved Mining Plan with PMCP are:-

- The mining will be carried out by open – cast semi-mechanized method.
- The bench height and width will be kept 6m.
- Total seven benches will be developed i.e. from Bench levels 1781 mRL (Top Bench), 1775 mRL, 1769 mRL, 1763 mRL, 1757 mRL, 1751mRL, 1745 mRL (lowest bench).
- The bench slope will be providing 85°.
- The loading will be from pits or from stocks.

11.2.4 PRODUCTION DETAILS

The year wise development of mines for five year will progress as per the table below:-

Table 11.2: Production Details

| Year | ROM (T) | Mineral Boulder Stone(T) | Waste/ sub-grade (T) |
|-----------------|------------------|--------------------------|----------------------|
| 1 st | 430320 | 344260 | 86060 |
| 2 nd | 430320 | 344260 | 86060 |
| 3 rd | 437580 | 350060 | 87520 |
| 4 th | 442200 | 353760 | 88440 |
| 5 th | 497110 | 397690 | 99420 |
| Total | 22,37,530 | 17,90,030 | 4,47,500 |

**Source:- Approved Mining Plan with PMCP*

11.2.5 LAND USE PATTERN

Land use plan of the mine lease area to encompass pre-operational, operational and post-operational phases is given below:-

Table 11.3(a): Land Use Pattern

| S. No. | Land Use Category | Pre-Operational (Ha.) | Operational (Ha.) | Post-Operational (Ha.) |
|--------|-------------------|-----------------------|-------------------|------------------------|
| 1 | Top Soil Dump | -- | 0.01 | -- |
| 2 | Overburden Dump | -- | 0.15 | 0.15 |

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| | | | | |
|------------------------------------|------------------------------|-------------|-------------|-------------|
| 3 | Pit & Quarry Area | -- | 3.95 | 4.35 |
| 4 | Road | -- | 0.05 | -- |
| 5 | Infrastructure/Plant/Crusher | -- | 0.40 | -- |
| 6 | Afforestation | -- | 0.30 | 0.40 |
| 7 | Mineral Storage | -- | -- | -- |
| 8 | Waste/Sub – grade stack yard | -- | -- | -- |
| 9 | Reclamation* | -- | -- | * |
| 10 | Undisturbed Area | 4.99 | 0.13 | 0.09 |
| Total | | 4.99 | 4.99 | 4.99 |
| <i>*Shown at table no. 2.6 (b)</i> | | | | |

Table 11.3 (b) : Reclamation

| Conceptual Land Degradation | Proposed Reclamation | |
|------------------------------------|-----------------------------|--|
| Area in Ha. | Area in Ha. | Measures |
| 4.90 | 0.55 | Green belt and afforestation of waste dump by plantation |
| | 3.45 | Bottom benches shall be converted for water storage |
| | 0.20 | Back-filling with waste & rejects and subsequent afforestation |

11.3 DESCRIPTION OF THE ENVIRONMENT

For monitoring the environmental parameters like meteorology, air, water, soil and noise quality, the monitoring stations have been established at seven locations in the study area. The baseline data has been collected in the summer season (December, 2022 to February, 2023). The detail of the sampling locations is given in below:-

Table 11.4: Sampling Location

| Sampling Location | Distance (Km) | Direction | Components |
|--------------------------|----------------------|------------------|-------------------------|
| Mine Site | -- | -- | Air, Water, Noise, Soil |
| Pomlum | 1.3 | ENE | Air, Water, Noise, Soil |
| Mawkajem | 1.1 | ESE | Air, Water, Noise, Soil |
| Dymmlew | 2.7 | SSE | Air, Water, Noise, Soil |
| Umktieh | 2.7 | S | Air, Water, Noise, Soil |
| Lewmawlong | 2.0 | WNW | Air, Water, Noise, Soil |

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| | | | |
|-----------|------|-----|-------------------------|
| Setthliew | 5.15 | NNW | Air, Water, Noise, Soil |
|-----------|------|-----|-------------------------|

11.3.1 LAND ENVIRONMENT

11.3.1.1 Soil Quality

Soil samples were collected at seven representative sampling locations. The soil analysis results are given below:-

| | | |
|--------------------|---|--------------------------|
| pH | : | 7.12 to 7.65 |
| Soil Conductivity | : | 364 to 427 μ mhos/cm |
| Total Nitrogen (N) | : | 161 kg/ha. to 360 kg/ha. |
| Phosphorus as P | : | 56 kg/ha to 59 kg/ha. |
| Potassium as K | : | 236.00-248.50 (mg/kg) |

11.3.2 WATER ENVIRONMENT

Seven ground water samples have been considered in the study area. The analysis results are presented below:-

Table 11.6: Water Quality Status

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| S.No. | Parameter | Units | Requirement (Desirable Limits). | Permissible Limits in the Absence of Alternate Source. | Mine Site | Pomlum | Mawkajem | Dymmiew | Umktieh | Lewmawiong | Setthliew |
|---|-------------------------------------|------------|---------------------------------|--|-----------|-----------|-----------|-----------|-----------|------------|-----------|
| Organoleptic & Physical Parameters | | | | | | | | | | | |
| 1. | Colour | Hazen Unit | 5 | 15 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 2. | Odour | - | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable |
| 3. | Taste | - | Agreeable | - | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable |
| 4. | Turbidity | NTU | 1 | 5 | <1.0 | <1.0 | <1 | <1 | <1.0 | <1.0 | <1 |
| 5. | pH value | - | 6.5-8.5 | - | 7.54 | 7.16 | 7.35 | 6.98 | 7.48 | 7.18 | 6.93 |
| 6 | Total Dissolve Solid (TDS) | mg/l | 500 | 2000 | 389.2 | 321.0 | 402.0 | 241.9 | 325.0 | 380.0 | 260.0 |
| General Properties | | | | | | | | | | | |
| 7 | Aluminum (as Al) | mg/l | 0.03 | 0.2 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 8 | Total Ammonia | mg/l | 0.5 | No Relaxation | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 9 | Anionic surface Detergents(as MBAS) | mg/l | 0.2 | 1.0 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 10 | Barium (as Ba) | mg/l | 0.7 | No Relaxation | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 11 | Boron (as B) | mg/l | 0.5 | 2.4 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 12 | Calcium(as Ca) | mg/l | 75 | 200 | 56.95 | 56.95 | 54.32 | 61.47 | 65.27 | 56.82 | 52.39 |
| 13 | Chloramines (as Cl ₂) | mg/l | 4.0 | No Relaxation | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 14 | Chloride (as Cl) | mg/l | 250 | 1000 | 15.73 | 14.62 | 14.69 | 13.95 | 16.26 | 14.39 | 13.82 |
| 15 | Copper (as Cu) | mg/l | 0.05 | 1.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 16 | Fluoride(as F) | mg/l | 1.0 | 1.5 | 0.38 | 0.31 | 0.28 | 0.32 | 0.29 | 0.30 | 0.28 |
| 17 | Free Residual Chlorine | mg/l | 0.2 | 1.0 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 18 | Iron (as Fe) | mg/l | 1.0 | No Relaxation | 0.129 | 0.124 | 0.132 | 0.129 | 0.128 | 0.121 | 0.120 |
| 19 | Magnesium (as mg) | mg/l | 30 | 100 | 3.84 | 3.79 | 4.10 | 4.18 | 3.92 | 4.06 | 3.65 |
| 20 | Manganese (as Mn) | mg/l | 0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 21 | Mineral Oil | mg/l | 0.5 | No Relaxation | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 22 | Nitrate (as NO ₃) | mg/l | 45 | No Relaxation | 0.32 | 0.31 | 0.30 | 0.32 | 0.33 | 0.31 | 0.30 |
| 23 | Selenium (as Se) | mg/l | 0.01 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 24 | Silver (as Ag) | mg/l | 0.1 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Sulphate (as SO ₄) | mg/l | 200 | 400 | 26.75 | 24.65 | 26.82 | 26.83 | 25.81 | 23.92 | 22.87 |
| 26 | Sulphide(as H ₂ S) | mg/l | 0.05 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |



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|---|--|--------------|--------|---------------|---------|---------|---------|---------|---------|---------|---------|
| 27 | Alkalinity(as Ca CO ₃) | mg/l | 200 | 600 | 201.0 | 194.0 | 187.0 | 187.0 | 189.0 | 176.0 | 179.0 |
| 28 | Total Hardness (as CaCO ₃) | mg/l | 200 | 600 | 174.0 | 167.0 | 164.0 | 165.0 | 173.0 | 161.0 | 160.0 |
| 29 | Zinc (as Zn) | mg/l | 5 | 15 | 0.162 | 0.159 | 0.151 | 0.148 | | | |
| Parameters Concerning Toxic Substances | | | | | | | | | | | |
| 30 | Cadmium (as Cd) | mg/l | 0.003 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Cyanide (as CN) | mg/l | 0.05 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Phenol | mg/l | 0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 33 | Lead (as Pb) | mg/l | 0.01 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 34 | Mercury (as Hg) | mg/l | 0.001 | No Relaxation | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 35 | Molybdenum (Mo) | mg/l | 0.07 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 36 | Nickel (as Ni) | mg/l | 0.02 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Poly nuclear Aromatic | mg/l | 0.0001 | No Relaxation | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| 38 | Poly chlorinated biphenyl | mg/l | 0.0005 | No Relaxation | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Microbiological Parameter | | | | | | | | | | | |
| 39 | Escherichia coli | Absent/100ml | | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| 40 | Coliform Bacteria | Absent/100ml | | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |



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11.3.3 AIR ENVIRONMENT

To assess the baseline status of the air quality in the study area systematic ambient air quality monitoring has been carried out for criteria pollutants (PM₁₀, PM_{2.5}, NO_x, SO₂ and CO) at seven representative ambient air quality monitoring stations.

11.3.3.1 Ambient Air Quality

Ambient air quality monitoring has been carried out with a frequency of two days a week at seven locations covering one complete season i.e. December 2022 to February 2023. The summary of these results for all the locations is given below. These are compared with the standards prescribed by Central Pollution Control Board (CPCB) for rural and residential zone.

Table 11.7: Ambient Air Quality Status

| S. No | Sampling Location | | Parameters | | | | |
|-------|-------------------|-----------|--|---|---|---|----------------------------|
| | | | PM ₁₀ (µg/m ³) | PM _{2.5} (µg/m ³) | SO ₂ (µg/m ³) | NO _x (µg/m ³) | CO (mg/m ³) |
| 1. | Mine Site | Min | 40.29 | 13.68 | 3.93 | 5.25 | 0.47 |
| | | Max | 57.14 | 20.92 | 6.18 | 8.29 | 0.59 |
| | | Avg. | 44.27 | 16.33 | 5.34 | 6.80 | 0.53 |
| | | 98th% ile | 55.35 | 20.57 | 6.11 | 8.26 | 0.59 |
| 2. | Pomlum | Min | 40.26 | 15.43 | 5.37 | 6.55 | 0.32 |
| | | Max | 54.36 | 22.43 | 7.67 | 8.69 | 0.92 |
| | | Avg. | 45.65 | 17.76 | 6.10 | 7.45 | 0.57 |
| | | 98th% ile | 53.38 | 22.06 | 7.64 | 8.64 | 0.90 |
| 3. | Mawkajem | Min | 32.58 | 13.79 | 4.8 | 6.14 | 0.45 |
| | | Max | 50.75 | 22.4 | 6.5 | 8.86 | 0.55 |
| | | Avg. | 41.31 | 17.29 | 5.63 | 7.45 | 0.51 |
| | | 98th% ile | 50.18 | 22.37 | 6.41 | 8.69 | 0.55 |
| 4. | Dymmiew | Min | 36.02 | 13.76 | 4.33 | 7.09 | 0.46 |
| | | Max | 49.15 | 20.84 | 8.44 | 12.64 | 0.79 |
| | | Avg. | 45.87 | 18.12 | 7.22 | 9.58 | 0.62 |
| | | 98th% ile | 48.92 | 20.40 | 8.43 | 12.64 | 0.78 |
| 5. | Umktieh | Min | 32.69 | 22.61 | 4.24 | 8.43 | 0.47 |
| | | Max | 48.69 | 27.54 | 8.14 | 10.46 | 0.82 |
| | | Avg. | 45.76 | 24.44 | 6.00 | 9.43 | 0.58 |
| | | 98th% ile | 48.58 | 27.17 | 7.72 | 10.46 | 0.81 |
| 6. | Lewmawiong | Min | 35.41 | 14.32 | 5.35 | 8.54 | 0.47 |
| | | Max | 45.02 | 21.38 | 7.89 | 10.98 | 0.85 |



| | | | | | | | |
|--|-----------|---|------------|-----------|-----------|-----------|----------|
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| | | Avg. | 40.98 | 16.62 | 6.89 | 9.95 | 0.62 |
| | | 98th% ile | 44.61 | 21.22 | 7.89 | 10.98 | 0.82 |
| 7. | Setthliew | Min | 40.92 | 16.72 | 5.03 | 8.84 | 0.48 |
| | | Max | 53.4 | 23.84 | 7.54 | 10.9 | 0.92 |
| | | Avg. | 44.97 | 18.79 | 6.18 | 9.80 | 0.70 |
| | | 98th% ile | 51.48 | 23.38 | 7.51 | 10.89 | 0.89 |
| NAAQ STANDARDS | | | 100 | 60 | 80 | 80 | 2 |

11.3.4 NOISE ENVIRONMENT

The noise monitoring has been conducted for determination of noise levels at seven locations in the study area. The noise levels at each location were recorded for 24 hrs. The results obtained were compared with the national standards and were found to be within the standards. The collected data are:-


Table 11.8: Ambient Noise Level Status

| Location | Date of Sampling | Day Time (6.00 AM to 10.0PM) | Night Time (10.00 PM to 6.00 AM) |
|-------------------------------|-------------------------|---|---|
| Mine Site | 08.12.2022 | 56.8 | 35.5 |
| Pomlum | 24.12.2022 | 51.4 | 38.1 |
| Mawkajem | 05.12.2022 | 52.6 | 40.5 |
| Dymmiew | 04.01.2023 | 50.0 | 35.6 |
| Umktieh | 18.01.2023 | 53.6 | 40.3 |
| Lewmawiong | 23.01.2023 | 54.8 | 42.0 |
| Setthliew | 01.02.2023 | 52.5 | 38.5 |
| Standards | | | |
| Category of Area/ Zone | | Day Time | Night Time |
| Industrial Area | | 75 | 70 |
| Commercial Area | | 65 | 55 |
| Residential Area | | 55 | 45 |
| Silence Zone | | 50 | 40 |

11.3.5 SOCIO-ECONOMIC ENVIRONMENT

The study area includes the 39 Villages SyllaiMadan, Laitkynsew, Sub Division- Pynursla, District- East Khasi Hills, Meghalaya within 10 km of area from mine periphery.

Table 11.9: Demography Profile of the Study Area

| | | |
|---|--|--------------------|
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| | |
|--|---|
| Project:- Boulder Stone Mine | |
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| S. No. | Particulars | Details |
|---------------|--------------------|----------------|
| 1. | No. of Villages | 37 |
| 2. | Total Population | 20767 |
| | a. Male | 10224 |
| | b. Female | 10543 |
| 3. | No. of Households | 4037 |
| 4. | No. of Literates | 12984 |
| | a. Male | 6180 |
| | b. Female | 6804 |
| 5. | Main Workers | 8908 |
| | a. Male | 4942 |
| | b. Female | 3966 |
| 6. | Marginal Workers | 815 |
| | a. Male | 322 |
| | b. Female | 493 |
| 7. | Non-workers | 11044 |
| | a. Male | 4960 |
| | b. Female | 6084 |

(Source: Census, 2011)

11.3.6 BIOLOGICAL ENVIRONMENT

| |
|---------------------------------|
| Buffer Zone |
| Flora |
| Climber – 19 Specie |
| Herb – 40 Species |
| Shrubs - 70 Species |
| Tree – 74 Species |
| Fauna |
| Amphibian – 17 Species |
| Fish - 16 Species |
| Avifauna – 92 Species |
| Butterflies – 28 Species |
| Mammals – 27 Species |

11.4 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

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

| Impact | Mitigation Measures |
|---|--|
| Land Environment | |
| Land will be degraded due to mining and dumping of waste | <ul style="list-style-type: none"> ➤ The total excavated area 4.35 ha. out of which 3.45 ha. area (bottom benches) will be converted into water reservoir and rest 0.20 ha. (upper benches) will be backfilled and reclaimed and rehabilitated by plantation. The extent of impact will however; be confined within lease area only. |
| Water Environment | |
| Discharge of effluents water from the mine. Intersection of ground water table during mining operations. | <p>There will be no discharge of effluent from the mine.</p> <p>As per the approved Mining Plan along with PMCP, ultimate pit level (1715 mRL) will be above the ground water table and hence it will not be intersected.</p> |
| Air Environment | |
| <ul style="list-style-type: none"> ➤ Dust will be generated mainly during excavation, loading & unloading activities. ➤ Gaseous pollutants will be generated mostly by the traffic. | <ul style="list-style-type: none"> ➤ It will be ensured that all the vehicles plying in the working zone are properly tuned and maintained to keep emissions within the permissible limits. ➤ At loading & unloading points and transportation routes, arrangement for water sprinkling will be made to minimize dust generation. ➤ In order to predict changes in the air quality, AERMOD version 8.8.0 model was used. The maximum ground level concentrations of particulate matter PM₁₀ & PM_{2.5}, NO_x, CO from the different mining activities for the study period (Winter Season) were observed to be in permissible limit. ➤ The resultant will remain within the National Ambient Air Quality Standards for industrial/ residential areas. |
| Noise Environment | |
| ➤ Noise due to mining | ➤ The noise levels from all these sources are periodical and restricted to |



| | |
|--|--|
| <p>activities.</p> <p>➤ Noise due to vehicular movement.</p> | <p>particular operation.</p> <p>➤ The noise measurement data indicated that present noise levels in the study area is within the permissible limits of National Ambient Noise Quality Standards.</p> <p>➤ Thus, due to natural attenuation effects by proper green belt/ maintenance of machines etc., the impact of noise levels will be minimal.</p> |
|--|--|

Socio-Economic Environment

| | |
|--|--|
| <p>➤ Employment generation</p> <p>➤ Health impacts</p> <p>➤ Education Facilities</p> | <p>➤ The mining activity puts negligible change in the socio economic profile.</p> <p>➤ No displacement (0) is proposed due to proposed mine.</p> <p>➤ Approx. 67 local workers will get employment opportunities along with periodical training to generate local skills.</p> <p>➤ New patterns of indirect employment/ income will generate.</p> <p>➤ Regular health Check up camp.</p> <p>➤ Assistance to schools and scholarship to children will be provided.</p> |
|--|--|

Biological Environment

| | |
|---|--|
| <p>➤ Impact on biodiversity</p> <p>➤ Impact on threatened species</p> | <p>➤ The mining activity will have insignificant effect on the existing flora and fauna. The purpose of the project itself is to save the flora around the project area.</p> <p>➤ The existing vegetation within the mining area includes trees and shrubs vegetation. They will not be disturbed due to the mining activity. So, the impact on the vegetation is very less.</p> <p>➤ The transportation of waste may create dust pollution which may create loss of biodiversity of the area.</p> <p>➤ Dust in atmosphere, contributed by mining and associated activities, when deposited on the leaves of the plants in the surrounding areas may retard their growth.</p> <p>➤ The growth of vegetation in and around the complexes. Noise and vibrations due to blasting and operation of the machines drive away the wild animals and birds from the nearby nests.</p> <p>➤ The cluster area and its buffer zone are devoid of any eco sensitive area. So the impact on the biodiversity and wild life is minimal.</p> |
|---|--|

- Green belt will be developed along the individual lease boundary which will act as a pollution barrier for the biological environment.
- There is the proposal for plantation along the haul road of individual lease and also along the connecting road.
- The blasting, drilling and transportation will be carried out during the day time only minimizing the impact on the wild fauna movement.
- All the necessary pollution control measures will be undertaken by the lessee to minimize the impact on the surrounding environment.

11.5 ENVIRONMENTAL MONITORING PROGRAMME

11.5.1 AIR

Air quality monitoring will be carried out as per norms of SPCB and CPCB.

11.5.2 WATER

Regular monitoring of ground water quality will be carried out at suitable locations. Water samples will be collected four times in a year i.e. Pre - Monsoon, Monsoon, Post - Monsoon and Winter.

11.5.3 NOISE

Noise level will be recorded periodically at mine site near operating machines during day and night time.

11.5.4 HEALTH AND SANITATION

Periodical medical checkup of workers is being done and medical facility provided. Toilets and urinals will be provided near the mine site. Drinking water will be made available to the workers.

11.6 ADDITIONAL STUDIES

11.6.1 PUBLIC HEARING

Public hearing will be conducted as per the guidelines of EIA Notification 14th September, 2006 and its subsequent amendments.



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| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XI –Summary and Conclusion |

11.6.2 RISK ASSESSMENT & MANAGEMENT

Risk analysis is the systematic study of uncertainties and risks encountered in various areas. Risk analysts seek to identify the risks involved in mining operations, to understand how and when they arise, and estimate the impact (financial or otherwise) of adverse outcomes. It also defines and analyzes the dangers to individuals, businesses and government agencies posed by potential natural and human-caused adverse events.

However, there are various factors, which can create unsafe working conditions/ hazards in mining of Boulder Stone (Minor minerals). The following types of hazards are identified during the Stone mining operations:-

1. Accident during mineral loading, transportation and dumping
2. Accident due to vehicular movement
3. Inundation/ Flooding

Following procedure will be followed for effective management of any disaster in the mine.

Step 1: Identification of Disaster risk.

Step 2: Identification of persons at risk

Step 3: Removal of Hazard

Step 4: Evaluation of the risk

Step 5: Control measures to be taken

Step 6: Maintain Assessment records

Step 7: Review

11.7 PROJECT BENEFITS

The demand of Boulder Stone has been rising in the state as a result of rising in industrial activities and development of the existing project aims to fulfill the supply of boulder Stone. The capacity of mine is 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA) aiming to fill the demand – supply gap.

This boulder stone mining will generate direct and indirect employment. Economy of the area will get a boost and there will be overall growth of the region in terms of education, health, training, awareness, transport, automobile, industry, and infrastructure. The standard of living accordingly will also get an upliftment on the positive side. Plantation will be carried out as social forestry programme in villages, school and the areas

| | |
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| Project:- Boulder Stone Mine | |
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allocated by the Panchayat/ State authorities to improve environment of its surrounding area.

11.8 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) aims at the reservation of ecological system by considering in – built pollution abatement facilities at the mine site. Some of the major criteria governing the environmental measures will be adopted.

11.8.1 LAND USE MANAGEMENT

The following reclamation plan will be adopted in this mine.

- 1) At the end of life of mine, total excavated area will be of 4.35 ha.
- 2) Plantation is proposed over an area of 0.75 ha. out of which plantation will be done on backfilled area (0.20 ha.), Dump area (0.15 ha.) and un-worked area (0.40 ha.).

11.8.2 WATER POLLUTION MANAGEMENT


Some of the control measures adopted for controlling water pollution are as follows:-

- Based on results from monitoring corrective regulatory measures will be taken.
- Measurement of water level fluctuations to assess impact of mining activity on the water table depletion in close proximity of dug wells and bore wells.
- Regular monitoring and analysis of water samples at strategic locations will be carried out to monitor the water quality.
- Domestic waste water will be channelized into septic tank followed by soak pit.

11.8.3 AIR POLLUTION MANAGEMENT

Following mitigation measures are envisaged:-

- The speed of the vehicles will be maintained uniform.
- Regular pollution checks and certification of vehicles will be done.
- Limited number of mine-related vehicle will be maintained on the public roadways to reduce the traffic to minimize impacts on local people.
- The loaded vehicles will be covered with tarpaulin.
- Over loading will be avoided and free board will be left in the loaded trucks to prevent spillage.
- The roads will be maintained.
- Regular cleaning will be done to reduce the chances of road dust to become airborne.

| | | |
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- Water sprinkling will be done on a fixed stretch of paved road.
- Natural barriers will be developed along the roadside to control the dispersion of dust particles.
- Speed breakers will be constructed to restrict the speed of transporting vehicles. However, limiting of vehicular speed will be adopted.
- Regular monitoring and analysis will be carried out through collection of air samples from strategic monitoring sites. If the parameters go beyond the permissible tolerance limits, corrective regulation measure will be taken.

11.8.4 NOISE POLLUTION MANAGEMENT

The following control measures are to be undertaken to bring down the noise levels:-

- Noisy activities will be scheduled at normal working hours (daytime hours) to the extent possible when the environment is least sensitive to noise impact.
- Regular inspection and maintenance of vehicles and equipment will be performed to ensure efficiency and worn parts will be replaced.
- The vehicles will be maintained in good condition and overloading will not be done.
- Speed limits will be enforced in relation to road conditions and on-route communities.
- Noise monitoring will be conducted on a regular basis to determine compliance with noise criteria.
- Personal Protective Equipments i.e., earmuffs and earplugs will be provided to workers, working in high noise areas.
- Periodical medical checkup will be organized for all workers to check any noise related health problems.
- Operational noise level status will be displayed on machines to identify the extent of noise level and to control the exposure times at which worker are exposed to higher noise levels.

11.8.5 OCCUPATIONAL HEALTH AND SAFETY

- To avoid any adverse effect on the health of the workers due to dust, noise etc. extensive measures has to be adapted related to safety aspect.
- Regular maintenance and testing all the tools & equipments as per manufacturer's guidelines.

| | |
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| Project:- Boulder Stone Mine | |
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- Provision of personal protective equipment to the workers working in the mine.
- Periodical Medical Examination of all workers by medical specialists will be conducted.
- Awareness program will be organized for workers.

11.8.6 SOCIO-ECONOMIC MANAGEMENT

- Environmental Officer will be responsible to take care the performance of mine on environmental issues.
- Approx. 50 local workers will be directly and about 17 will be indirectly employed.
- Employment opportunities along with periodical training to generate local skills.
- Local employment will be ensured. On the job training to local people will be given and periodically upgraded.
- Regular health camps will be carried out.

11.8.7 BIOLOGICAL MANAGEMENT

No adverse impact & no genetic diversity loss are anticipated from the mining activity. However due care & extensive plantation activity will be undertaken to reduce impact from the activity.

11.9 CONCLUSION

EIA study was performed as per the approved ToR. Various environmental attributes were studied relating with aspects of mining activities. The related impacts were identified and evaluated. Considering all the possible ways to mitigate the environmental concerns Environmental Management Plan was prepared and accordingly fund was allocated. The EMP has been dynamic, flexible and subject to periodic review.

The project will increase the revenue of the State Govt. as well as it will help in the social upliftment of the local people. The greenbelt development programme will help in increasing the green cover in the nearby areas. Thus, the project is not likely to affect the environment or adjacent ecosystem adversely. The Management will be responsible for the project review of EMP and its implementation to ensure that the EMP remains effective and appropriate. Thus, the proper steps will be taken to accomplish all the goals mentioned in the EMP and the project will bring the positive impact in the study area.

| | |
|--|--|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XII –Disclosure of Consultant Engaged |

CHAPTER - 12

DISCLOSURE OF CONSULTANT ENGAGED

| | |
|--|--|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XII –Disclosure of Consultant Engaged |

12.0 DISCLOSURE OF CONSULTANT ENGAGED

| | | |
|--|--|--|
| Name of the Project:- “Boulder Stone Mine” | | |
| Location:- At Umduba, P.O. Jorbil, P.S Khanapara, Raid Marwet, Ri Bhoi District (Meghalaya) | | |
| Nature of Consultancy | Name and address of the Consultant/Expert | Approvals, if any from (NABL/DGMS/IBM/ NRBPT/MoEF/CPCB/others etc)*, give reference |
| EIA/ EMP Organization | Gaurang Environmental Solutions Pvt. Ltd. #102, SNG Shri Ratna Apartment, Peetal Factory, Jhotwara Road, Jaipur-302016 E-mail :gaurangenviro@gmail.com | NABET/ EIA/ 2023/ RA 0192 (Rev.02) dated valid up to Dec 07, 2023. |
| EIA Coordinator | Neha Bhargava | |
| FAE-LU | Vinod Kumar Verma | |
| FAE-AP | Pooja Yadav | |
| FAE-AQ | Neha Bhargava | |
| FAE-WP | Pooja Yadav | |
| FAE-SC | Pradyuma A. Despande | |
| FAE-EB | Dr. Yati Kachhawa | |
| FAE-NV | Mallikarjuna M. Guttula | |
| FAE-SE | Gajendra Singh Rathore | |
| FAE-HG | Mukesh Suroliya | |
| FAE-GEO | Mukesh Suroliya | |
| FAE-RH | Ginni Barotia | |
| FAE-SHW | Pooja Yadav | |
| Environmental Monitoring & analysis | Noida Testing Laboratory GT - 20, Sector - 117, Noida, Gautam Buddh Nagar, Uttar Pradesh, India | NABL Certificate No. TC-6814 issue dated 03.12.2021 valid until 02/12/2023 |
| Hydro geological study | Mukesh Suroliya #102, SNG Shri Ratna Apartment, Peetal Factory, Jhotwara Road, Jaipur-302016 | NABET/ EIA/ 2023/ RA 0192 (Rev.02) dated valid up to Dec 07, 2023. |
| Soil Investigation | Not Applicable | -- |

| | |
|--|--|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XII –Disclosure of Consultant Engaged |

| | | |
|---|---|---|
| Mining Plan | Jaipal Singh #C-47, Raghu Marg, Hanuman Nagar, P.O. Vaishali Nagar, Jaipur-302021 | RQP/AJM/378/2015/A |
| Rainwater Harvesting | Vidya Bhushan Trivedi #102, SNG Shri Ratna Apartment, Peetal Factory, Jhotwara Road, Jaipur-302016 | NABET/ EIA/ 2023/ RA 0192 (Rev.02) dated valid up to Dec 07, 2023. |
| Risk Assessment | Ginni Barotia #102, SNG Shri Ratna Apartment, Peetal Factory, Jhotwara Road, Jaipur-302016 | NABET/ EIA/ 2023/ RA 0192 (Rev.02) dated valid up to Dec 07, 2023. |
| Report Writing & EIA documentation | Damini Kumari #102, SNG Shri Ratna Apartment, Peetal Factory, Jhotwara Road, Jaipur-302016 | -- |
| Architectural Plan | Not Applicable | -- |
| Ground Vibration Study | Not Applicable | -- |
| Subsidence Study | Not Applicable | -- |
| Services (STP/ETP design) etc. | Not Applicable | -- |
| Others, such as project consultants etc. | Not Applicable | -- |

Project:- Boulder Stone Mine

Applicant:- Shri Khrikshon Lyngkhoi

ANNEXURE



Gaurang Environmental Solutions Pvt. Ltd.

Report Ref: GESPL_ /EIA/2022-23/

Rev. No. 00

Project:- Boulder Stone Mine

Applicant:- Shri Khrikshon Lyngkhoi

ANNEXURE – I

COPY OF DORBAR NOC



Gaurang Environmental Solutions Pvt. Ltd.

Report Ref: GESPL_ /EIA/2022-23/

Rev. No. 00

DORBAR SHNONG LAITKYNSEW

RAID MAWLIEH, KHYRIM SYIEMSHIP

P.O. LAITLYNGKOT – 793110

EAST KHASI HILLS, MEGHALAYA

Dated: 31/10/2017

NO OBJECTION CERTIFICATE

This is to certify that a stone quarry is allowed and has no objection by the Dorbar Shnong of Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District, Meghalaya, to set up in Syllai Madan, Area Laitkynsew, Raid Mawlieh Khyrim Syiemship, East Khasi Hills District, Meghalaya, 793110 to Shri Khrikshon Lyngkhoi son of (L) S. Khardewsaw Inhabitant of K.L Complex, Demseiniong, Laitumkhrah, Shillong, 793011, Meghalay.

Er. Star Khong
Rangbah Shnong
Laitkynsew Raid Mawlieh

B.K. Malai
Secretary Shnong
Laitkynsew Raid Mawlieh

Project:- Boulder Stone Mine

Applicant:- Shri Khrikshon Lyngkhoi

ANNEXURE – II

COPY OF NO FOREST LAND

CERTIFICATE



Gaurang Environmental Solutions Pvt. Ltd.

Report Ref: GESPL_ /EIA/2022-23/

Rev. No. 00



GOVERNMENT OF MEGHALAYA
THE DEPARTMENT OF FORESTS AND ENVIRONMENT
OFFICE OF



THE DIVISIONAL FOREST OFFICER:: KHASI HILLS (T) DIVISION:: SHILLONG

NO KH/9/NOC/STONE/41/PI IV: 16/

Dated Shillong, the 13/04/2018

To,

Shri. Khrikshon Lyngkhor
K L Complex, Maccabe Road,
Demseiniang,
East Khasi Hills District

Subj Non Forest land certificate for stone quarry located at Syllai Madan, Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District in respect of Shri. Khrikshon Lyngkhor.

Ref Your letter No dated -nil-

Sir,

With reference to the above I am to inform you that the land measuring 4.99 hectares at Syllai Madan, Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District is not part of RF/PF under this office and it is 'Non Forest' land as per definition of 'Forest'. Hence, this office issue Non-Forest land certificate for stone quarrying subject to the following conditions :-

1. That you shall obtain Mining lease / quarry permit under Meghalaya Minor Mineral Concession Rules, 2016
2. That your Stone Quarry is subjected to inspection by the staff/official of this office
3. This Non Forest Land Certificate is liable for cancellation for violating any Act and Rules of the State Government and District Council

4. The G P S Co-ordinates of Stone Quarry is

| | |
|----------------------|-------------------|
| A. N 25° 24' 12.636" | E 91° 51' 40.788" |
| B. N 25° 24' 13.356" | E 91° 51' 40.246" |
| C. N 25° 24' 14.292" | E 91° 51' 39.384" |
| D. N 25° 24' 14.976" | E 91° 51' 39.132" |
| E. N 25° 24' 17.424" | E 91° 51' 40.716" |
| F. N 25° 24' 14.292" | E 91° 51' 52.164" |
| G. N 25° 24' 12.708" | E 91° 51' 55.008" |
| H. N 25° 24' 10.584" | E 91° 51' 55.008" |

APPROVED

Yours faithfully,



(Shri. T. Wanniang, I.F.S.)
Divisional Forest Officer,
Khasi Hills (T) Division,
Shillong

Memo NO KH/9/NOC/STONE/41/PI IV: 16/ Dated Shillong the 13/04/2018

Copy to

1. The Conservator of Forests (T) Khasi & Jaintia Hills, Shillong, Meghalaya This has a reference to his letter No MFG 16/17/KL/250 dated Shillong, 5th April 2018
2. The Member Secretary, State Environmental Impact Assessment Authority, Meghalaya for information
3. The Member Secretary, Meghalaya State Pollution Control Board for information.
4. The Range Forest Officer, i/c Southern Range, for information and necessary action. He is instructed to monitor/inspection for any violation of any Acts & Rules of the State Government and District Council

Divisional Forest Officer,
Khasi Hills (T) Division,
Shillong

Selva
Director of Mineral Resources,
Meghalaya, Shillong

Project:- Boulder Stone Mine

Applicant:- Shri Khrikshon Lyngkhoi

ANNEXURE – III
COPY OF LETTER OF INTENT ALONG WITH
LEASE AGREEMENT



Gaurang Environmental Solutions Pvt. Ltd.

Report Ref: GESPL_ /EIA/2022-23/

Rev. No. 00



GOVERNMENT OF MEGHALAYA
THE DEPARTMENT OF FORESTS AND ENVIRONMENT
OFFICE OF



THE DIVISIONAL FOREST OFFICER:: KHASI HILLS (T) DIVISION SHILLONG

No KH/8/MU/Stone/69/10515-B

Dated Shillong the 29/1/2018

To

Shri Khnkshon Lyngkhor
K L Complex, Damseiniang
Shillong East Khasi Hills District

Subj

Letter Of Intent (LOI) for granting of mining lease under Meghalaya Minor Mineral Concession Rules 2016 for Boulder stone mining at Syllai Madan Lalkynsew Raid Mawlieh Khyrim Syiemship East Khasi Hills District

Ref

Your application dated 19th 1 2018

Sir,

With reference to the above mentioned subject I do hereby issue Letter of Intent (LOI) for granting mining lease under Meghalaya Minor Mineral Concession Rules 2016 for Boulder stone mining on area of 4.99 hectares, at Syllai Madan Lalkynsew, Raid Mawlieh Khyrim Syiemship East Khasi Hills District. On receipt of this Letter of Intent, you shall within a period of six months furnish the following documents for grant of mining lease

- 1) Mining Plan duly approved by Director of Mineral Resources
- 2) Environmental clearance under the Environmental (Protection) Act, 1986
- 3) Consent to establish under the Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981
- 4) Clearance from Revenue and Disaster Management Department
- 5) Clearance from Labour Department for occupational Health and Labour Laws including Child Labour.

APPROVED

This is for your information and necessary action

Yours faithfully,

(Shri. T. Wanjlang, M.F.S)
Divisional Forest Officer,
Khasi Hills (T) Division,
Shillong

Director of Mineral Resources
Meghalaya, Shillong

| |
|--|
| Project:- Boulder Stone Mine |
| Applicant:- Shri Khrikshon Lyngkhoi |

ANNEXURE – IV

**COPY OF APPROVED MINING
PLAN ALONG WITH APPROVAL
LETTER**



| | |
|--|--------------------|
| Gaurang Environmental Solutions Pvt. Ltd. | |
| Report Ref: GESPL_ /EIA/2022-23/ | Rev. No. 00 |

CATEGORY B



MINING PLAN
WITH
PROGRESSIVE MINE CLOSURE PLAN

For
BOULDER STONE MINE
NEAR VILLAGE- SYLLAI MADAN, LAITKYNSEW
SUB DIVISION- PYNURSLA,
PS- LAITLYNGKOT,
DISTRICT- EAST KHASI HILLS,
MEGHALAYA
(AREA 4.99 HECT.)

(Prepared and submitted as per the Guide Lines of Indian Bureau of Mines, TMP
Division, Ministry of Mines, Govt. Of India, Vide their notification
No.296/7/2000/MRC, dated 16 May 2011)

And

Rule 10(a) and Rule 19 of Meghalaya Minor Mineral Concession Rules, 2016

Lessee:-

SHRI KHRIKSHON LYNGKHOI
C/O K.L. COMPLEX (OPPOSITE NEEPCO),
DEMSEINIONG, SHILLONG,
DISRICT-EAST KHASI HILLS,
STATE- MEGHALAYA
PIN CODE: - 793011
SEPTEMBER 2016

APPROVED


Director of Mineral Resources
Meghalaya, Shillong

PREPARED BY:-

JAIPAL SINGH
RQP/AJM/378/2015/A
G-47, RAGHU MARG, HANUMAN NAGAR
JAIPUR (RAJASTHAN)
PIN CODE: 302021
TELEPHONE: 91 9485112301, 91 8014004951



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| 3 | DETAILS OF APPROVED MINING SCHEME | 5 |
| 4 | GEOLOGY AND RESERVES | 6 |
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| 6 | MINE DRAINAGE | 18 |
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APPROVED

JAIPAL SINGH
RQP/AJM/378/2016/A

Director of Mineral Resources
Meghalaya, Shillong




List of Annexure

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| 1. | Land Document |
| 2. | NOC from Autonomous District Council |
| 3. | NOC from Divisional Forest Officer |
| 4. | Letter of Intent |
| 5. | RQP Certificate |


JAIPAL SINGH
RQP/AJM/378/2015/A

APPROVED


Director of Mineral Resources
Meghalaya, Shillong



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| 5 | COMPOSIT PLAN & YEARWISE SECTIONS |
| 6 | CONCEPTUAL PLAN |

APPROVED

A handwritten signature in black ink, appearing to read "Jaipal Singh".

JAIPAL SINGH
RQPI/AJM/378/2013/A

A handwritten signature in black ink, appearing to read "Jaipal Singh".

Director of Mineral Resources
Meghalaya, Shillong



Shri Khrikshon Lyngkhoi

C/O K. L. Complex (opposite Neepeo)
Maccabe Road, Demseiniong
Shillong, District- East Khasi Hills
State- Meghalaya
Pin Code: 793011

AUTHORIZATION LETTER

UNDERTAKING/CERTIFICATE FROM THE LESSEE

01. The Mining Plan with PMCP in respect of Lime Stone Mine, over an area of 4.99 ha, in village- Syllai Madan, Laitkynsew, Sub-Division Pynursla, PS Laitlyngkot, District- East Khasi Hill, State Meghalaya, under rule 10 (a) & 19 MMMCR 2016 has been prepared by RQP Shri Jaipal Singh (RQP/AJM/378/2015/A).

This is to request the Department of Mining and Geology, Meghalaya, to make any further correspondence regarding any correction of the Mining Plan with PMCP with the said recognized person at his address below:

Shri Jaipal Singh
RQP/AJM/378/2015/A
Qualified person as per rule 19(2) of MMMCR 2016
Validity upto 5.8.2025.
C-47, Raghu Marg,
Hanuman Nagar
P.O. Vaishali Nagar,
Jaipur, Pin 302021
e-mail:jaipal1965@gmail.com

APPROVED

I hereby undertake that all modification/ updating as made in the Mining Plan with PMCP by the said recognized person be deemed to have been made with our knowledge and consent and shall be acceptable on us and binding in all respects.

02. It is certified that the CCOM Circular no 2/2010 will be implemented and complied with when an authorized agency is approved by the State Government.

03. It is certified that the progressive Mine Closure Plan of Boulder stone Mine Syllai Madan, Laitkynsew of Shri Khrikshon Lyngkhoi over an area of 4.99 ha complies with all statutory rules, regulations, Orders made by Central or State Government, Statuary organization, Court etc which have been taken into consideration and wherever any specific permission is required the lessee will approach the concerned authorities.

The information furnished in the Progressive Mine Closure Plan is true and correct to the best of our kind knowledge and records.

04 "The provisions of Mines Act, Rules and Regulations made there under have been observed in the Mining Plan with PMCP over an area of 4.99 ha in village- Mine Syllai Madan, Laitkynsew, District- East Khasi Hill, Meghalaya State belonging to Boulder Stone Mine and where specific permissions are required, the applicant will approach the DGMS. Further, standards prescribed by D.G.M.S. in respect of miner's health will be strictly implemented."

Shri Khrikshon Lyngkhoi
Applicant/ Lessee

Place- East Khasi Hill
Dated- November , 2017

Director of Mineral Resources
Meghalaya, Shillong



JAIPAL SINGH

RQP/AJM/378/2015/A
Qualified person as per rule 19(2) of MMMCR 2016
Validity upto 5.8.2025.
C-47, Raghu Marg,
Hanuman Nagar
P.O. Vaishali Nagar,
Jaipur, Pin 302021
e-mail: jaipal1965@gmail.com
mobile: 91 9485112301, 91 8955956927


CERTIFICATE

The provisions of MMMCR 2016 (Meghalaya Minor Mineral Concession Rules 2016) have been observed in the preparation of the Mining Plan with PMCP for Syllai Madan, Laitkynsew Boulder Stone Mine, over an area of 4.99 ha of Shri Khrikshon Lyngkhoi in village- Syllai Madan, Laitkynsew of East Khasi Hills (Meghalaya) and whenever specific permission are required, the lessee will approach the concerned competent authorities of the State Government.

The information furnished in the Mining Plan with PMCP is true and correct to the best of my knowledge.

Place- Shillong
Dated- November, 2017

APPROVED


Jaipal Singh RQP/AJM/378/2015/A
Qualified Person under rule 19(2)
Of MMMCR 2016
RQP/AJM/378/2015/A
Valid up to August 5, 2025


Director of Mineral Resources
Meghalaya, Shillong



1.0 GENERAL INTRODUCTION

Lessee:-

Shri Khrikshon Lyngkhoi Lessee/ applicant of this mining lease for Boulder Stone, area 4.99 hectares is interested to involve in mining with this mining lease located near village-Syllai Madan, Laitkynsew, Sub Division- Pynursla, District- East Khasi Hills, Meghalaya, India.

Lease details:-

The lease is for Boulder Stone

| | |
|--------------------------------------|--|
| Lessee | Shri Khrikshon Lyngkhoi |
| Mining Lease Number | M.L. |
| Area of Lease | 4.99 hectares |
| LOI issued | |
| Lease period required | For 30 years as per rule 19 of MMMCR 2016 |
| Lease will be sanctioned under rule | 10 (a) of MMMCR 2016 |
| Reason for submission of mining Plan | As the LOI issued for sanctioned of the mining lease, thus as per LOI for sanction of the lease this mining plan is prepared and submitted for approval. |

For preparation of the Mining plan with PMCP the lessee approached the RQP and authorized the RQP for preparation of Mining plan with Progressive Mine Closure Plan.

The survey work was conducted in October 2017 and the plan with progressive mine closure plan has been prepared. This mining plan with Progressive Mine Closure Plan has been prepared as per the new guide lines provided by the approving authorities and circulars issued time to time.

Approach

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| From | To | Distance | Road |
|-----------|--------------------------|----------|--------------------|
| Mine Site | Dainshyieng | 2 Kms | Kacha and Tar Road |
| Mine Site | Laitlyngkot | 9 Kms | NH- 40 |
| Mine Site | NH-40 | 1.0 kms | Kacha Rasta |
| Mine Site | Shillong Airport | 53 Kms | NH-40, |
| Mine Site | Guwahati Railway Station | 101 kms | NH-40 |
| Mine site | Shillong | 33 kms | NH 40 |

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1.1

GENERALa) **Name and address of lessee****Name:****Shri Khrikshon Lyngkhoi**

C/O K. L. Complex (opposite Neepeco)

Maccabe Road

Demseiniong

Shillong

District- East Khasi Hills

State- Meghalaya

Pin Code: 793011

b) **Status of Lessee:**

Private Individual.

c) **Mineral which are included in prospecting license:**

Not applicable.

d) **Mineral which are included in the letter of Intent/ lease deed**

Boulder Stone.

e) **Mineral which lessee intends to mine**

Boulder Stone.

f) **Name of Recognized Person under MMMCR 2016****Who prepared the mining plan/ scheme****Name:****Jaipal Singh**

RQP/AJM/378/2015/A

C-47, Raghu Marg,

Hanuman Nagar

P.O. Vaishali Nagar,

Jaipur,

Pin 302021


Telephone: 91-9485112301**Registration Number (under rule 22B of MCR 1960)**

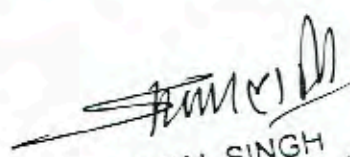
RQP/AJM/378/2015/A

Date of Grant- 6.08.2015

Valid up to - 5.08.2025.

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2.0

LOCATION AND ACCESSIBILITY



- a) **Lease details**
Name of the mine:
Syllai Madan Boulder Stone Mine
N/V-Syllai Madan, Laitkynsew
Sub Division- Pynursla
District- East Khasi Hills-Shillong
State- Meghalaya
Pin Code: 793108
- b) **Name of Lessee:**
Shri Khrikshon Lyngkhoi
C/O K. L. Complex (opposite Neeeco)
Maccabe Road
Demseiniong
Shillong
District- East Khasi Hills
State- Meghalaya
Pin Code: 793011
- c) **Details of lease area with location plan**
Location plan is enclosed as Plate-1.

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| Forest | | Non-Forest | |
|--------|-----|--|---|
| Nil | Nil | 4.99 hectares Own land (Private land) occupied by the lessee/ applicant | Lease area is required for 30 years |

The lease area of 4.99 hectares is a part of survey of Indian G.T. Sheet No.

District- East Khasi Hills Meghalaya
Village- Syllai Madan, Laitkynsew

Whether the area falls under coastal Regulation Zone (CRZ)
No

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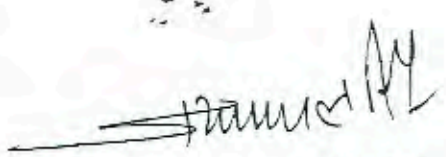
**Existence of public road/ railway line**

| From | To | Distance | Road |
|--|-------------|----------|--------------------|
| Mine Site | Dainshyieng | 2 Kms | Kacha and Tar Road |
| Mine Site | Laitlyngkot | 9 Kms | NH- 40 |
| Mine Site | NH-40 | 1.0 kms | Kacha Rasta |
| The lease area is near the road and connected by kacha rasta | | | |
| Nearest Railway Station is Guwahati Railway Station- 101 kilometres from the lease area | | | |
| Nearest Airport is at Shillong around 53 kilometers. | | | |
| Nearest village is Laitkynsew near the lease area. | | | |
| Nearest Secondary School, Market, PHC as hospital, Rest House, Circuit house, College etc are at Laitlyngkot around 9 kilometers away. | | | |
| Market, School, PHC, Secondary School, etc are available at Laitlyngkot around 8 kms away. | | | |
| Water supply by PHED as available at Dainshyieng from there it will be brought by tankers etc. | | | |
| Electric power is available along the tar road | | | |
| Nearest National Highway is around 1.0 kilometers away towards northern side. | | | |
| Bangladesh Border is around 25 kilometers S side by aerial distance. | | | |

- d) The Location Plan (not to scale) is enclosed (plate-1) showing the access routes with a Key plan (Plate-2).
- e) **Pillars of the lease area:**

| Pillar | Latitude | Longitude | From | To | Bearing | Distance |
|--------|---------------|---------------|------|----|---------|----------|
| A | 25°24'12.636" | 91°51'40.788" | A | B | 327°00' | 027 |
| B | 25°24'13.356" | 91°51'40.248" | B | C | 318°00' | 038 |
| C | 25°24'14.292" | 91°51'39.384" | C | D | 340°00' | 023 |
| D | 25°24'14.976" | 91°51'39.132" | D | E | 030°00' | 088 |
| E | 25°24'17.424" | 91°51'40.716" | E | F | 107°00' | 337 |
| F | 25°24'14.292" | 91°51'52.164" | F | G | 124°00' | 095 |
| G | 25°24'12.708" | 91°51'55.008" | G | H | 231°00' | 109 |
| H | 25°24'10.584" | 91°51'52.02" | H | A | 281°00' | 322 |


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3.0 DETAILS OF APPROVED MINING PLAN/SCHEME OF MINING



| | |
|-----|--|
| 3.1 | Date and reference of earlier approved mining plan/ scheme It will be a fresh area and thus this chapter is not applicable |
| 3.2 | Details of last modification if any (for the previous approved period) of approved mining plan/ scheme indicating date of approval, reason for modification. Not applicable. |
| 3.3 | Give review of earlier approved proposals (if any) in respect of exploration, excavation and reclamation etc. Prospecting: Not applicable. Waste Disposal Not applicable. Plantation Not applicable. |
| 3.5 | Indicate and give details of any suspension / closure/ prohibitory order issued by any Government agency under any rule or court of law Not applicable. |
| 3.6 | In case the MP/SOM submitted under rules 10 (a) or under rule 19 of MMMCR 2016 for approval of modification, specify reason and justification under these rules. Not applicable |

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PART-A
GEOLOGY AND RESERVES

4.0

a) The elevation range within the lease area is 1785 mRL to 1765 mRL. The mineral is exposed in the whole lease area. Drainage in the lease area is almost easterly. General drainage outside the area is almost southerly. The area is hilly and stony. Area broken by nalahs in the five kilometers periphery is illustrated on plate-2. No habitation located in and near the lease area. Nearest habitation is located in village Laitkynsew. The deposit is in private land. The forestland not located in the area. No PWD road passes through the area.

b) **Regional Geology**

Regional Stratigraphic Succession

General Stratigraphic Sequence of The Formation of Meghalaya Plate

| Geological Age | Group Name | Formation Name | Rock Type |
|------------------------|----------------|-------------------------------|--|
| Recent | Newer Alluvium | Unclassified | Sand, Silt and Clay |
| -----UNCONFIRMITY----- | | | |
| Pleistocene | Older Alluvium | Unclassified | Sand, Clay, Pebble, Gravel and boulder deposits |
| -----UNCONFIRMITY----- | | | |
| Mio- Pliocene | Dupitula Group | Unclassified | Mottled Clays, Feldspathic sandstone and conglomerate. |
| -----UNCONFIRMITY----- | | | |
| APPROVED | Garro Group | Chengopara Formation | Sand, Siltstone, Clay, Mart |
| | | Baghmara Formation | Feldspathic Sandstone, Pebble, Conglomerate, Clay, Silty Clay. |
| | | Simsang Formation | Shale, Sandstone, Mart |
| Eocene | Jaintia Group | Kopili Formation | Siltstone-sandstone alternations, sand |
| | | Shella Formation | Alternation of sandstone- lime stone |
| | | Langpar Formation | Calcareous Shale, Sandstone, Limestone |
| Upper Cretaceous | Khasi Group | Mahadek Formation | Arkose(glaucconitic) |
| | | Bottom Conglomerate Formation | Conglomerate, Arkose |
| | | Jadukata Formation | Sandstone- Conglomerate alternation |
| -----UNCONFIRMITY----- | | | |

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| | | | |
|------------------------|-------------|---|---|
| Jurassic | Sylhet Trap | - | Basalt, alkali Basalt, Rhyolite acid tuff. |
| -----UNCONFIRMITY----- | | | |
| Pre- Cambrian | - | Intrusives (acid and basic) Shillong Group | Ponphyritic and coarse granites, aplite, quartz vein, epidiorite, dolerite, basalt Quartzite, Phyllite, Conglomerate |
| -----UNCONFIRMITY----- | | | |
| Archaean | - | Gneissic Complex | Biotite- gneiss, Biotite- Hornblend gneiss, granitic gneiss, Migmatite, mica-schist, sillimanite-quartz schist, biotite-granulite-amphibolites, pynoxene-granulite etc. |

Local Geology:

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Succession of rocks in the lease area (Local Geology) (Source GSI)

| Geological Age | Group Name | Formation Name | Rock Type |
|------------------------|----------------|----------------|---------------------|
| Recent | Newer Alluvium | Unclassified | Sand, Silt and Clay |
| -----UNCONFIRMITY----- | | | |
| Pre- Cambrian | - | Shillong Group | Quartzite |

c) DETAILED DESCRIPTION OF GEOLOGY

Lithology:

The Boulder stone is exposed in the whole lease area. No other rocks presently exposed in the lease area.

Structure

The Boulder stone has strike almost north- south and dip seems vertical in absence of workings.

No fault, fold and geological disturbances are observed in the area.

Nature of Mineralization:

The Boulder stone of this area belongs to Shillong Group of Pre Cambrian era. The mineral is exposed in whole lease area. The soil is not observed. It comes across in small patches.

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Effect of Weathering

The cracks and joints at surface are due to weathering effect.

Nature of Wall Rocks

No wall rock is exposed in the area.

Geological Sections

The Geological sections are prepared at 40 meters interval across the strike and one longitudinal section is also drawn.

Recovery

Recovery of the Boulder Stone seems 80% in this deposit. Rest 20% is lower grade, intrusive and can be used as low grade or as other purpose. The recovery may increase or decrease as per the availability of Boulder stone compactness.

Physical and Chemical Characteristics

Physically the Boulder Stone is of light brownish to off white in colour. As the rock is medium hard and compact the bulk density is 2.2 tones per cu. Meter of rock.

d) Name of prospecting agency

It will be a fresh mining lease for Boulder Stone. Previously it was mapped by Geological Survey of India. The maximum area will be exposed by proposed mining, thus proposed prospecting will not be required.

e) Details of prospecting/ exploration already carried out:

It is a fresh area and no prospecting made by lessee/ applicants

f) Surface cum surface Geological Plan is provided as plate-4.**g) Surface Geological Plan is provided as plate-4.****h) Geological sections are provided on plate-4.****i) Future program of exploration:**

The prospecting is not required as maximum area will be excavated during the mining of next five years.

j) Method of Estimation of Reserves:

Reserves and Resources as per UNFC (as per recent survey in January 2018)

The reserves are estimated by following formula:

Volume of mineral = Area of section X Sectional influence length

Mineral in tonnes = Volume of mineral × Recovery percentage x Bulk density

2.2 tonnes per cu. metre.



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The reserves are computed for proved, probable and possible categories.
The details are as follows:
The sections are prepared at 40 meters interval.



Proved category (111+211):

The mineral is exposed up to 1760 mRL in the lease area and mineral is continuing in depth in the applied lease area. The mineral is also exposed surrounding the lease area in nalah. Thus, proved category reserves are computed up to 1755 mRL as shown on Surface Geological Plan. The surface limits are shown on plan and sections. As per UNFC considering economical viability, feasibility study and Geological study the proved category reserves are considered under code 111 and 211 of UNFC.


Probable category (121+ 222):

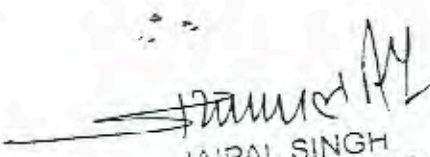
The mineral is exposed in the area and in pit and is continuing in depth and in sides. Thus, considering the continuity in depth the probable category reserves are computed for 30 meters thickness as per the continuity of minerals in depth. Thus, probable category reserves are computed between 1755mRL-1725mRL. The other limits are considered same as considered for proved category. As per UNFC considering economic viability, feasibility study and Geological study the probable category reserves are considered under code 121+221 of UNFC.

Possible category (333):

Considering the possibility of continuing the deposit beyond the probable category limit in depth the possible category reserves are considered for 10 meters in depth vertically beyond the probable category reserves limit. Considering these aspects, the possible category reserves are computed between 1725 mRL and 1715 mRL. The other limits are considered same as considered for proved category reserves. As per UNFC considering economically viability, feasibility study and Geological study the possible category reserves are considered under code 333 of UNFC.

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k) Reserve Calculations
Proved Category (111+211)

| Section | Area of section M ² | Sectional Influence length M | Volume of Mineral M ³ | Volume of Useable Mineral 80% M3 | Mineral in tonnes V x 2.2 |
|--------------------------|-----------------------------------|---------------------------------|-------------------------------------|-------------------------------------|------------------------------|
| AA' | 7720 | 40 | 308800 | 247040 | 543488 |
| BB' | 9660 | 40 | 386400 | 309120 | 680064 |
| CC' | 8080 | 50 | 404000 | 323200 | 711040 |
| Total | | | | | 1934592 |
| Reserves in nearest tens | | | | | 19,34,590 |


Probable Category (211+221)

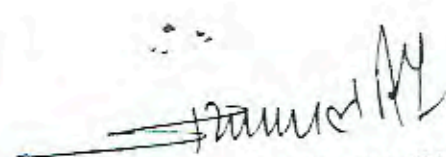
| Section | Area of section M ² | Sectional Influence length M | Volume of Mineral M ³ | Volume of Useable Mineral 80% M3 | Mineral in tonnes V x 2.2 |
|--------------------------|-----------------------------------|---------------------------------|-------------------------------------|-------------------------------------|------------------------------|
| AA' | 11580 | 40 | 463200 | 370560 | 815232 |
| BB' | 12600 | 40 | 504000 | 403200 | 887040 |
| CC' | 12120 | 50 | 606000 | 484800 | 1066560 |
| Total | | | | | 2768832 |
| Reserves in nearest tens | | | | | 27,68,830 |

Possible Category (333)

| Section | Area of section M ² | Sectional Influence length M | Volume of Mineral M ³ | Volume of Useable Mineral 80% M3 | Mineral in tonnes V x 2.2 |
|--------------------------|-----------------------------------|---------------------------------|-------------------------------------|-------------------------------------|------------------------------|
| AA' | 3860 | 40 | 154400 | 123520 | 271744 |
| BB' | 4200 | 40 | 168000 | 134400 | 295680 |
| CC' | 4040 | 50 | 202000 | 161600 | 355520 |
| Total | | | | | 922944 |
| Reserves in nearest tens | | | | | 9,22,940 |

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Meghalaya, Shillong


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I) Mineral Reserves/ Resources: Mineable

Quantity is in tonnes

| A) Total Mineral Reserves | UNFC Code | Boulder Stone |
|----------------------------------|-------------|---------------|
| Proved Mineral Reserves | 111 | 16,44,400 |
| Probable Mineral Reserves | 121 and 122 | 19,38,200 |
| B) Total Remaining Resources | | |
| Feasibility Mineral Resources | 211 | 2,90,190 |
| Pre-feasible Mineral resources | 221+222 | 8,30,630 |
| Measured mineral resources | 331 | |
| Indicated Mineral resources | 332 | |
| Inferred mineral resources | 333 | 9,22,940 |
| Reconnaissance mineral resources | 334 | |

Total mineable reserves= 35,82,600 tonnes (111+121+122)

MINEABLE RESERVES AND ANTICIPATED LIFE OF THE MINE

The mineable reserves of stone are of the order of 35,82,600 tones (111+121 and 122)

The production in the period of this mining plan will be around 17,90,030 tones in 5 years.


Balance reserves: $35,82,600 - 17,90,030 = 17,92,570$ tones

Production target is 3,97,690 tones.

The balance reserves will sufficient for $17,92,570 / 3,97,690 = 4.50$ years

Thus, total life of the mine is $5 + 4.50 = 9.50$ or say 10 years.

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5. MINING

a) Briefly describe the existing and proposed method for excavation:

Existing Mining:

It will be a fresh mining lease. The work will be started in the lease area.

Proposed Mining:

The opencast method of mining with semi mechanization is proposed to excavate the mineral and waste and for other mining activities. Bench height and width are proposed 6 meters each considering semi mechanization.

continue in future for excavation of mineral and waste and for loading the same. Approach roads are available in the lease area and will be provided in future as required time to time. Blasting will be done by short or long holes with the permission of DGMS. The pneumatic breaker and hydraulic breakers will be used for excavation of mineral.

The fencing around the pit/ excavation will be provided to check the inadvertent entry of human and livestock in the working zone.

The soil if comes across during mining in small layer or cavity will be scraped and stacked separately to be used for plantation during each monsoon.


Drinking water is being brought from nearby tubewells and stored in water pitchers at site office and near the working sites for drinking purpose and in cement tanks near the site office for other purpose.

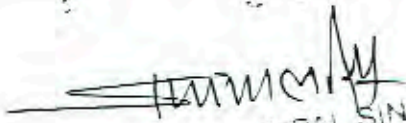
The following works are proposed:

1. The barbed wire fencing will be provided around the proposed and existing workings to check the inadvertent entry of human and livestock in mining zone.
2. The soil which may come across during mining in patches or in cavities will be scraper and stacked separately to be used for plantation ion monsoon.
3. The proper plantation will be done in the lease area and nearby the lease area in each monsoon and will report to the department with photographs.
4. Garland drains with parapet walls will be provided around the pit to check the entry of monsoon flowing water towards working pit.
5. Drinking water will be brought from tubewells and stored in water pitchers for drinking purpose and in cement tanks for other purpose
6. The workings will be done by maintaining the proper benches.
7. The waste will be dumped at one place inside the lease area towards eastern side. Some waste will be dumped outside the lease area.
8. The site services, site office, water tanks, workshops, kitchen, bathrooms etc will be provided in or near lease area.

The crushing plant will be established in the lease area with 350TPH capacity
The details is given in Chapter -8 Para (e).

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b) The Development year wise is proposed for first five years.

In the period of this mining plan the lessee will develop Seven benches i.e. From Bench levels 1781mRL (top bench), 1775mRL, 1769mRL, 1763mRL, 1757mRL, 1751mRL and 1745mRL as lowest bench.



The approach roads up to faces will be provided time to time for movement of vehicles. The bench height and width are proposed 6 meters but the lessee may take permission from DGMS for bench height more than 6 meters.

The bench slope will be providing 85°. The loading will be from pits or from stocks.

The lessee will work as per proper benches and develop the benches as required but in the manner as proposed and as shown on plate-6. The length and width of workings are as per the situation at field.

| Year | Bench number mRL | Area in Sq. Meter | Average Depth of bench in meter | Total volume in Cu. Meter | Waste in M ³ | Mineral in M ³ |
|------|------------------|-------------------|---------------------------------|---------------------------|-------------------------|---------------------------|
| I | 1781 | 13250 | 6 | 79500 | 15900 | 63600 |
| | 1775 | 19350 | 6 | 116100 | 23220 | 92880 |
| II | 1775 | 8250 | 6 | 49500 | 9900 | 39600 |
| | 1769 | 24350 | 6 | 146100 | 29220 | 116880 |
| III | 1769 | 10110 | 6 | 60660 | 12130 | 48530 |
| | 1763 | 23040 | 6 | 138240 | 27650 | 110590 |
| IV | 1763 | 11460 | 6 | 68760 | 13750 | 55010 |
| | 1757 | 22040 | 6 | 132240 | 26450 | 105790 |
| V | 1757 | 7660 | 6 | 45960 | 9190 | 36770 |
| | 1751 | 24400 | 6 | 146400 | 29280 | 117120 |
| | 1745 | 5600 | 6 | 33600 | 6720 | 26880 |

Year wise development in tonnes

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| Year | Tentative excavation in tones (ROM) | Waste / sub-grade of Boulder stone in tones | Mineral Boulder Stone in tones |
|-------|-------------------------------------|---|--------------------------------|
| I | 4,30,320 | 86,060 | 3,44,260 |
| II | 4,30,320 | 86,060 | 3,44,260 |
| III | 4,37,580 | 87,520 | 3,50,060 |
| IV | 4,42,200 | 88,440 | 3,53,760 |
| V | 4,97,110 | 99,420 | 3,97,690 |
| Total | 22,37,530 | 4,47,500 | 17,90,030 |

The mineral from the place of crusher will be excavated after exhaust of mineral in the rest of the lease area.

Dump re-handling (for the purpose of recovery of mineral)

No recovery will be carried out from the dumps.

[Signature]
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c) **Enclose development plans and sections**

The development plan and sections are enclosed as composite plan and sections.

d) **Describe briefly giving salient features of the proposed method of workings indicating Category of Mine.**

--Blasting

The blasting is needed to excavate the stone. The safe blasting is proposed by adopting all the safety measures as per Mines Act' and with the permission of DGMS.

i) **Broad blasting parameters**

-Deep Hole Blasting

| | |
|-------------------------|---------------------------|
| Deep Hole Drill road | 6 meters effective length |
| Deep Hole Drill machine | Down the hole drill |
| Burden | 3 meter |
| Spacing | 4 meter |
| Hole Diameter | 4 inch (100mm) |

-Short Hole

| | |
|---------------|-----------------------------|
| Drill road | 1.5 meters effective length |
| Drill machine | Jack Hammer |
| Burden | 0.8 meter |
| Spacing | 1.0 meter |
| Hole Diameter | 32 mm |



ii) **Explosive Used**

Blasting will be done by various types of explosives. Generally, the following conventional types of explosives are used in the mine.

Slurry explosive (AN based) viz. power gel, Acquadyne, Superdyne etc. are proposed as primer. Blasting agent is proposed as ammonium nitrate fuel oil (ANFO) mixture.

The ANFO mixture will be readily produced at site by mixing ammonium nitrate (94.5%) with diesel oil (5.5%). If ANFO is not allowed the other slurry explosive may be used.

Initiation is proposed by half second delay detonators.

iii) **Powder Factor**

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Deep Hole:

Charges per hole is 0.125 kg of primer, 5.5 kg per meters of blasting agent and One detonator (as inquired by Mines Manager).

$$\text{Powder Factor} = \frac{\text{Effective Depth of hole} \times \text{Burden} \times \text{Spacing} \times \text{Bulk Density}}{\text{Total charge in Kg}}$$

$$\begin{aligned} \text{Powder factor} &= \frac{6 \times 3 \times 4 \times 2.2}{0.125 + 33} \\ &= 158.4/33.125 = 4.78 \text{ tonnes of rock/kg of explosive} \end{aligned}$$

Short Hole:

Charges per hole is 0.125 kg of primer, 0.45 kg of blasting agent and One detonator.

$$\text{Powder Factor} = \frac{\text{Effective Depth of hole} \times \text{Burden} \times \text{Spacing} \times \text{Bulk Density}}{\text{Total charge in Kg}}$$



$$\begin{aligned} \text{Powder factor} &= \frac{1.5 \times 0.8 \times 1 \times 2.2}{0.125 + 0.45} \\ &= 3.00/0.575 = 4.59 \text{ tonnes of rock/kg of explosive} \end{aligned}$$

iv) **Secondary Blasting**

Secondary blasting will not be needed

v) **Storage of explosive**

Considering the consumption of explosive, a 200-kg portable magazine is proposed for storing the explosive.

ANFO mixing shed is proposed for manufacture of ANFO. A room will provide for storage of Ammonium Nitrate.

It is advised to lessee that he should apply for explosive magazine for 200 kg capacity to the competent authority and for ANFO mixing shed to the competent authority. It is expected that the lessee should try to get the license within six months.

--**Loading of Mineral and Material**

Loading of mineral and waste in trucks/tippers and tractor trolleys is by hydraulic loaders. The hydraulic loaders will be used for this purpose.

--**Transportation of Material**

Transportation of waste material from workings to dump site is by trucks/tippers/ tractor trolleys. Boulder Stone from face to consumers will be transported in hired trucks/ tractor trolleys.

--**Dewatering**

The monsoon water will collect in the mine in deep cuttings. Deep cuttings will be observed in fourth and fifth year. The water will be dewatered through a sump made in the bottom of the mine to check the silt. From sump, the dewatering will be done in a surface tank and will be used for plantation. The garland drain with parapet wall will be provided around the pit to check the entry of monsoon water in the working pit.

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--**Beneficiation**

No beneficiation will take place at site. The ROM mineral will be dispatched to the consumers.

--**Extent of Mechanization**

Assumptions:

| | |
|---|-----------------------|
| Excavation target per Year | 497110 tonnes |
| Number of working days per year | 300 days |
| Average production of Limestone per day | 1657 tonnes (approx.) |

Drilling Pattern:

| | |
|------------------|---|
| Burden | 3 meters |
| Spacing | 4 meters |
| Depth | 6 meters |
| Diameter of hole | 100 mm |
| Tonnes per hole | 180 tonnes (3 X 4 X 6 X 2.5=180 tonnes) |

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|------------------------------------|--|
| Number of holes required per day | $1657/180 = 9.2$ or 10 holes per day |
| Total drilling length in meter/day | $10 \times 6.5 = 65$ meters/day including 0.5 m subgrade drilling. |

Equipment requirements:

• **Drill Machine Requirements**

| | |
|--|------------------------------------|
| Type of drill | Wagon drill (Tyre/Crawler mounted) |
| Drill Diameter | 100 mm |
| Drilling rate/hour | 8 meters per hour |
| Number of shifts per day | 1 |
| Operating hours per day | 6 |
| Total drilling per machine per day in meters | $6 \times 8 = 48$ meters |
| Number of drill machines required | $65/48 = 1.35$ or 2 drill machine |

• **Excavator Requirements**

| | |
|---|------------------------------------|
| Output excavator per day (Only 1 shift) | 600-700 tonnes |
| Total excavation | 1657 tonnes per day |
| Total Excavator required | $1657/650 = 2.549$ or 3 excavators |

- Jack hammers and pneumatic breakers are for small hole drilling as required at different places.
- For operating Three jack hammers at different places, Two mobile compressors are proposed.
- Two water tanks are proposed for supply of water at different places and for spray water on approach roads.
- One tipper can handle 200 tones of rocks per shift, thus 9 tippers are proposed considering 2 as stand by.

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The following machineries are proposed (as per MMMCR 2016):

| Item | Quantity |
|---|---|
| Compressor of 120 psi | Three mobile/ tractor mounted or stable |
| Jack hammer and other pneumatic | Three Jack hammer, Three pneumatic breakers |
| Hydraulic excavator with rock breaker arrangement | Three |
| Long hole drill machine | One |
| Tractor with water tank | Two |
| Tippers- 10 to 20 tonnes capacity | Nine |
| Other machineries | As needed |

e) Conceptual Plan

i) Ultimate Extent & Size of The Pit

The ultimate extent and size of the workings will be as follows:

Dimensions of workings are given below

| Dimension | Deposit |
|-----------|-------------------------------------|
| Length | 2370 meters maximum |
| Width | 123 meters average |
| Depth | Up to 1715mRL, or 60 meters maximum |

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ii) The Final Slope Angle Adopted

Considering the stability of rocks the final slope angle or says ultimate pit slope is proposed 45° from vertical. This slope angle will remain quite safe for these deposits.

iii) Ultimate Capacity Of Dumps

Total waste will be of 4,47,500 tones. Maximum waste will be used in construction and maintenance of approach roads, construction of site services and rest will be dumped outside the area and a part of inside the lease area. In the area towards southern side in the area in 0.15 ha area for 8 meters in height in two terraces of 4 meters height each. Some waste will be dumped outside the area in own land of lessee. The waste dump will be stabilized by retaining walls of rubble stone. Parapet wall and drain will also be constructed towards lower altitude side to check the wash off during monsoon.

iv) Stabilization Of Dumps

The waste dump is proposed to stabilize by retaining wall of rubble stones. The wall is proposed towards lower altitude side. The plantation is also proposed over the matured dumps for stabilization.

v) Ultimate Pit Limit

The section has been prepared and ultimate slope is drawn over the sections from end bottom point of possible reserves with ultimate slope (refer plate-4). The upper points of these slopes have been projected over the plan. By joining these points, the ultimate pit limit has been drawn, which is shown on Conceptual Plan.

vi) Reclamation

No reclamation is proposed during the period of this mining plan, as reserves will remain alive in the lease at the end of mining plan period. However, if reserve will be exhausted during the lease period, the exhausted benches will be reclaimed by mine rejects, spreading of topsoil and plantation will be done. It is also proposed to convert the pit into a water reservoir.

vii) Land Use pattern

All figures in hectares

| S. No | Item | As on date | End of 5th year | End of lease |
|-------|-------------------------------|------------|-----------------|--------------|
| 1 | Area to be excavated | 0.00 | 3.95 | 4.35 |
| 2 | Storage of top soil | 0.00 | 0.01 | 0.0 |
| 3 | Overburden dump | 0.00 | 0.15 | 0.15 |
| 4 | Mineral/Sub-grade stack | 0.00 | 0.00 | 0.00 |
| 5 | Infrastructure/ plant/crusher | 0.00 | 0.40 | 0.00 |
| 6 | Roads | 0.00 | 0.05 | 0.00 |
| 7 | Green belt | 0.00 | 0.30 | 0.40 |
| 8 | Reclamation | 0.00 | 0.0 | 0.0 |
| 9 | Others | 0.00 | 0.00 | 0.00 |
| | Total Disturbed land | 0.00 | 4.86 | 4.90 |

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6.0 MINE DRAINAGE

- a) **Minimum and Maximum depth of water table based on observations from nearby wells and water bodies:**

In five kms periphery:

General ground level near the lease area is 1500mRL in 5 kms periphery towards northeastern side

Minimum depth of water table is 40 mbgl (meter below ground level) i.e. at 1460 mRL (as per tube well in nearby area)

- b) **Indicate minimum and maximum depth of workings**

Minimum depth of workings- 1751 mRL

Maximum depth of workings- 1725 mRL up to probable category reserves

- c) **Quality and quantity of water likely to be encountered, the pumping arrangements and places where the mine water is finally proposed to be discharged**


There is a sufficient gap between proposed workings up to conceptual and level of ground water table, thus ground water will not be encountered in the workings at any stage.

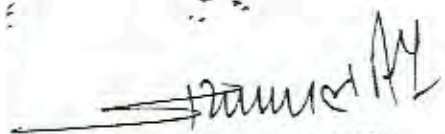
- d) **Describe regional and local drainage pattern with annual rain fall, catchment area, and likely quantity of rain water to flow through the lease area, arrangement to arresting the solid wash off etc.**

The water comes across in the workings during monsoon. The water will fill in the working pits. Some water will flow by joints and cracks and rest water has to dewater during and after the monsoon.

The monsoon water which directly precipitates over the working will fill in the pit and rest water which precipitates outside the pit will flow down towards lower altitude side by slope of the area. The rainfall remains around 1000 mm to 1200 mm per year towards maximum. The water accumulate in the working pit is being dewatered by 10 HP diesel operated pumps and this practice will be continued in future. The water will fill in the non-working pits for use for plantation and also dewatered in nearby nalahs. The rubble stone walls are constructed towards lower side of the dumps to check the wash off during monsoon.

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7.0 STACKING OF MINERL REJECTS/ SUB GRADE MATERIAL AND DISPOSAL OF WASTE

- a) Indicate briefly the nature and quantity of top soil, overburden/waste and mineral rejects to be disposed off.

The soil may come across in small patches and in cavities on the proposed mining site and the soil which come across will be scraped and stacked separately in 0.01 ha area. The soil will be used for plantation in each monsoon. No mineral rejects come across during mining.

The waste dump management is discussed in the mining chapter in conceptual plan.

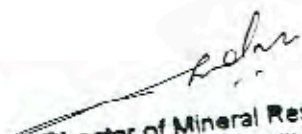
- b) The proposed dumping ground within the lease area be proved for presence or absence of mineral and be outside the UPL unless simultaneous backfilling is proposed or purely temporary dumping for a short period is proposed in mineralized area with technical constraints and justification

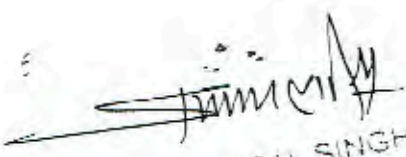
The details are given in Conceptual Mining Plan.

- c) Attach a note indicating the manner of disposal of waste, configuration and sequence of year wise build up of dumps along with the proposals for protective measures

The waste is proposed to dump towards western side in 0.15 ha area for 8 meters height. The dumps are shown on enclosed plate. The stone walls will be provided time to time towards lower altitude side of the dumps to arrest the solid wash off. Plantation will also provide along both side of the dump.

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8.0 USE OF MINERAL AND MINERAL REJECTS



- a) Describe briefly the requirement of end use industry specially in terms of physical and chemical compositions;

The Boulder stone will be supplied to the consumers of construction works and to the grit plants. The lessee may export the mineral as per market requirement to Bangladesh.

- b) Give brief requirement of intermediate industries involved in upgradation of mineral before end use.

Not required.

- c) Give details requirement for other industries, captive consumption export associated industrial use

Not applicable

- d) Indicated precious physical and chemical specification stipulated by buyers

The Boulder stone will be supplied to the consumers of construction works and to the grit plants so no specific grade is required by purchasers.

- e) Give details of processes adopted to upgrade the ROM to suit the user requirement

The lessee will install a crushing/screening plant of 350 TPH (tonne per hour) in the lease area towards pillar E as shown on Development Plan:

The plant has the following machineries:


1. Grizzly Feeder and a Jaw Crusher
2. Cone Crusher with Screens
3. Belt conveyors, hoppers, etc


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Process: The stone will be fed into a hopper of 30m³. The (-)100 mm material passes through the opening of Grizzly Feeder and (+) 110 through Jaw Crusher. The natural fines of Grizzly are removed by a screen and stacked at stockpile by conveyor belt.

The (+) 100 mm through Jaw Crusher fed into an intermediate bin by a conveyor belt. From intermediate bin through a conveyor belt the material feed to cone crusher.

The output of this secondary cone crusher is fed to a Final Classifying Screen for separation of (-) 40mm grains and (+) 40 size again fed to cone crusher for re-crushing. (-40) size in different meshes will be dispatched to consumers.


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9.0



PROCESSING OF ROM AND MINERAL REJECTS

No process takes place at mine site.

The ROM mineral is being dispatched to the consumers.

- a) If processing/ beneficiation of the ROM or Mineral Rejects is planned to be conducted, briefly describe nature of processing/ beneficiation.

Not Applicable.

- b) Give a material balance chart with a flow sheet or schematic diagram of the processing procedure indicating feed, product, recovery and its grade at each stage of processing

Not applicable.

- c) Explain the disposal method for tailings or reject from the processing plant

Not applicable

- d) Quantity and quality of tailing/ rejects proposed to be disposed

Not applicable.

- e) Specify quantity and type of chemicals if any to be used in the processing plant

Not applicable

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- f) Specify quantity and type of chemicals to be stored

Not applicable

- g) Indicate quantity (Cu. M per day) of water required for mining and processing and sources of supply of water, disposal of water and extent of recycling.

Around 5 Cu. M. water required for mining for drinking and other purpose. The water is brought from tube wells.

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10.0 OTHERSa) **Site services**

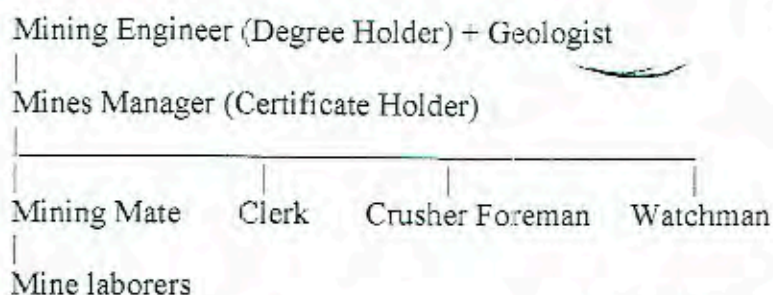
The site office, workshop, rest shelters, kitchen etc are available near the lease area as shown on plate-3.

b) **Employment Potential**

The following employment is proposed from nearby local area:

Highly Skilled: 5
 Skilled: 17
 Semi-Skilled: 20
 Un Skilled: 25 (as per semi mechanization)

The following supervisory personnel are proposed with management chart:



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c) **Personal Protective Equipment**

1. **Safety Helmet-** Uses for the safety of head
2. **Safety Goggles-** Uses for the safety of Eyes from sun, welding and other flying rock particles.
3. **Dust Respirators:** Uses for dust free air at dusty areas in the mine.
4. **Ear Plugs:** Uses for protection of air from unwanted sound i.e. noise pollution.
5. **Safety Belts with Rope-** For safety of body which may fall from high faces.
6. **Hand Gloves-** for protection of hand during welding or other hot things/ articles.
7. **Safety Boots-** For protection of foot from fall of stone and for safety from injury.

d) **Other requisite requirements for laborers:**

1. WC (Latrines and Urinals) one for each and up to 50 laborers. Separate for Male and Females (Section 20 Mines Act, 33 of Mines Rules).
2. Rest Shelter for laborers for taking rest during off hours (Rule 62 of Mines Rules).
3. Water hut for storing of cold water for laborers (at least 2 liters for each labor for drinking purpose) (Section 19 Mines Act, 30 of Mines Rules).
4. First Aid Boxes in sufficient numbers (Section 21 of Mines Act).

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11.0 ENVIRONMENT ASSESSMENT AND ENVIRONMENT MANAGEMENT PLAN

11.1 MEASURE TAKEN AND TO BE TAKEN FOR PROTECTION OF ENVIRONMENT IN AND AROUND THE LEASE AREA



Existing: Presently the lease is not sanctioned. Thus the aesthetic environment beauty of the area is good.

Proposed: Due to mining operations pits, dumps, roads etc will be developed. No tree will destroy by proposed mining activities. For protection of environment and improving the aesthetic beauty of the area following measures will be provided:

The mining will be systematic and scientific in supervision of technical staff.

The dump, stack will be at proper place as suggested and fully stabilized as proposed.

The plantation between tar road and mine site and along the lease area will improve the environment. Good scenario will develop by plantation for the people who travel on the road.

The land use by mining is as follows:

All figures in hectares

| S. No | Item | As on date | End of 5th year | End of lease |
|-------|------------------------------|------------|-----------------|--------------|
| 1 | Area to be excavated | 0.00 | 3.95 | 4.35 |
| 2 | Storage of top soil | 0.00 | 0.01 | 0.0 |
| 3 | Overburden dump | 0.00 | 0.15 | 0.15 |
| 4 | Mineral/Sub-grade stack | 0.00 | 0.00 | 0.00 |
| 5 | Infrastructure/plant/crusher | 0.00 | 0.40 | 0.00 |
| 6 | Roads | 0.00 | 0.05 | 0.00 |
| 7 | Green belt | 0.00 | 0.30 | 0.40 |
| 8 | Reclamation | 0.00 | 0.0 | 0.0 |
| 9 | Others | 0.00 | 0.00 | 0.00 |
| | Total Disturbed land | 0.00 | 4.86 | 4.90 |

Flora and Fauna

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The main flora in the lease area is shrubs and bushes, however in surrounding area the flora is Ma Krisal, Dieng Ling, Dieng Bai, Dieng Sring, Dieng Swot, etc observed.

The fauna found as live stock and the rarely appearance of wild animals like Sial, Squirrel etc, which will be not affected by mining activities.

The flora of the area will improve by proposed plantation.

The barbed wire fencing will be provided around the excavation to check the inadvertent entry of human and live stock and fauna. In absence of wild fauna, no adverse impact will encounter thus no measures are called for. No adverse impact will be anticipated.

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Climatic Conditions

Climate of the area is semi arid zone type. The average rain fall remains around 1000mm per year to 1200mm per year. The maximum, mean and lowest temperature remain around 34°C, 24°C and 4°C. Maximum precipitation takes place during month of July and August. The hottest months are May and June and coldest are of December and January.

Public buildings, Places of Worship and Monuments

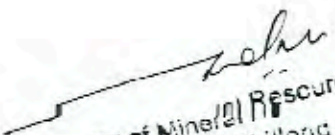
No such things are observed in and near the lease area thus no measures are called for.

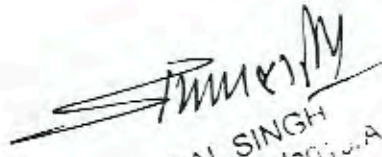
The roads, highway observed in 5 kilometers periphery of the applied lease area are illustrated on plate-2

Human Settlements

No human settlement observed in the lease area. Nearest village is Laitkynsew. The habitants belong to ST, SC, Minority, OBC and general categories. The main vocation of the habitants is agriculture. The habitants also have jobs at nearby mines and nearby towns.

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11.2 MEASURE TAKEN AND TO BE TAKEN FOR DUMPING OVERBURDEN, STACKING OF TOP SOIL AND UTILISATION OF TOP SOIL

In Boulder Stone mine the maximum quantity of excavated rock is saleable in the form of lump, grit and powder.

Waste dump and stabilization:

As per the mining plan around 4,47,500 tonnes of waste will come across during the period of the mining plan. The waste will be used in construction and maintenance of approach roads, construction of site services. The waste will also be lifted by local habitants for constructing the walls along the agriculture field.

In the area towards eastern side in the area in 0.15 ha area for 8 meters in height in two terraces of 4 meters height each. Some waste will be dumped outside the area in own land of lessee. The waste dump will be stabilized by retaining walls of rubble stone. Parapet wall and drain will also construct towards lower altitude side to check the wash off during monsoon.

The waste dump will be stabilized by retaining walls of rubble stones. Parapet wall and drain will also be constructed towards lower altitude side to check the wash off/silt during monsoon. The drain alongside the parapet wall will facilitate as desilting tank by retaining the silt etc. at parapet wall and the flow of clean water through the drain.

As the dump is for waste stacking, so the parapet wall will retain the silt/wash off and over flowing clean water will flow through the alongside drain. The accumulated silt will be removed or the parapet wall height will be increased from time to time.

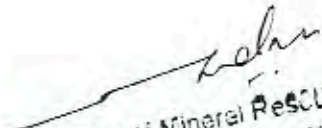
Top soil


No separate soil is observed in the applied lease area.

The soil may come across in thin layer somewhere at surface. The soil will be scraped and stacked separately to be used for plantation during the monsoon.

Thus, there will be no permanent stack of soil.

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11.3 MEASURE TAKEN AND TO BE TAKEN FOR CONTROL OF WATER, NOISE AND AIR POLLUTION

Water:

The general ground level near the lease area (outside the lease area towards northeastern side) is around 40 mRL (refer plate-2).

The level of ground water table is around 40 meter below from the general ground level of 1500mRL in study area of 5 kms periphery. Thus, during dry season the level of ground water table is 1460 mRL. Proposed workings are far above to this level of ground water table, thus ground water table will not intersect in workings at any stage.

Dewatering:

During monsoon, the rain water of direct precipitation will collect in the working pits. The monsoon water of upper altitude side may also collect in the pit.

A drain will be provided towards higher altitude side of the pit to divert the rain water away from the pit.

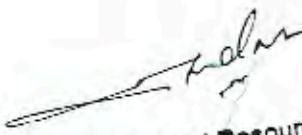
The dewatering will be done through a sump made in the bottom of the pit and through a water tank at surface. Thus, the silt will be checked and not allow to spread in the nearby area of lower altitude side and in agriculture lands.


APPROVED The drinking water will be analyzed twice in a year for quality. The source of drinking water is tube well and hand pumps, which are away from the area and thus not get any adverse effect from mining.

Air:

Present air is fresh and healthy as no mining activity is in existence.

The **magnitude of air pollution** in a mine varies with method of mining, type of mineral, level of mechanization and beneficiation of mineral. The gaseous pollution in the mine is due to emissions from diesel engines, transport vehicles as well as during blasting. The dust pollution is due to movement of mine machineries etc. drilling, blasting and vehicular movement. The dust once allowed to go into atmosphere cannot be controlled. Hence, it is necessary to suppress and minimize the dust at its generating point/source and will be maintained as per the guidelines of MSPCB.


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Measures proposed:


Dust pollution


- a) Sharp drill bits are used and the drilling machine is kept leakage proof. Dust extractor will be provided in drill machine.
- b) Controlled blasting is proposed only on hire requirement after taking permission from DGMS and other local authorities. Water Sprinklers provided over haul road to control the fly of dust.
- c) All the haul roads will be kept wide, leveled and compact. Regular water Sprinklers should be done on road from site to tar road once or twice in a day especially during dry season to check the generation of dust during vehicular movement.
- d) The green belt as shown on plate 6 in and near the lease area will minimize dispersion of dust in nearby area. The proposed plantation is illustrated on the plan.
- e) The proposed plantation along both sides of haul road from tar road and between tar road and mine site will also check the spread of dust in nearby area.
- f) Monitoring in six months is proposed for assessment of impact for generation of dust due to vehicular movement, drilling, blasting and loading etc. and measures should be adopted to minimize the gaseous pollution

Gaseous Pollution

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- a) The emissions from diesel engines will be minimized by proper maintenance of all diesel operated mine machineries like diesel engines, D.G sets and transport vehicles
- b) The gaseous pollution due to blasting is for a short duration. The gases are diluted by wind in a short period in opencast mining
- c) All the machineries like compressor, trucks should be operated by trained operators
- d) Gaseous pollution from diesel engines is proposed to minimize by using good quality of silencers and proper maintenance.
- e) Monitoring in one year is proposed for assessment of impact due to vehicular movement and measures should be adopted to minimize the gaseous pollution


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**Noise Pollution**

The noise will generate due to movement of vehicles, operation of diesel operated machineries and drilling and blasting

The following protective measures will be provided to control the noise pollution:

| S. No. | Measures |
|--------|--|
| 1 | The adequate silencers will be provided in diesel operated mine Machineries and trucks and tractors. |
| 2 | Compact and leveled haul road are proposed for smooth running of transport vehicles. |
| 3 | The transport vehicles should be filled up to rated capacity of the vehicle to minimize the noise. |
| 4 | The shrubs and bushes located in the area and proposed plantation will check the propagation of noise. |
| 5 | The booms on haul/ approach roads are proposed to remove time to time. The voids on haul roads are proposed to fill by waste and leveled time to time. |
| 6 | Drilling with sharp bits and control blasting will minimize the noise pollution. |

APPROVED**Personal protective equipment:**

The safety helmet, safety shoes, safety belts will be provided to the laborers. Ear plugs will be provided to the workers who will work near the noise creating machines.


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11.4 CONTRIBUTION REGARDING THE SOCIAL DEVELOPMENT OF THE NEARBY RESIDENTS




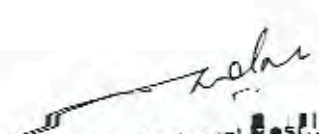
There is no impact of mining on local residents of the area as habitation is away from the applied lease area. The maximum persons will be employed from nearby villages. There is no source of employment in nearby area and thus the employment will develop by the proposed mining activity in nearby area. The villagers may use the waste free of cost. The applicant after become lessee will help in maintenance of village kacha roads with request of local bodies. The lessee will provide maximum assistant to local body on their request. The lessee will develop the plantation along the roads. The lessee will contribute some fund from the income and the fund will be used only for the social development of the people in the field of Education and medical,

11.5 DETAILS OF HEALTH CHECKUP AND INSURANCE OF ALL THE EMPLOYED PERSONS (FOR EXISTING LEASE)

Periodic health checks up will be provided as per rules. The labor insurance will be provided as per rules.

APPROVED


JAIPAL SINGH
RQP/AJM/378/20


Director of Mineral Resources
Meghalaya, Shillong

12.0 PROGRESSIVE MINE CLOSURE PLAN UNDER RULE 19 (1) (g) OF MMMCR 2016



12.1 Environment Base Line Information

The lease area is non-forest land. The lease area is of 4.99 hectares. The area is fresh. The rasta etc are observed in the lease area. The present degradation of land is as follows:

All figures in hectares

| S. No | Item | As on date |
|-------|-------------------------|------------|
| 1 | Area to be excavated | 0.00 |
| 2 | Storage of top soil | 0.00 |
| 3 | Overburden dump | 0.00 |
| 4 | Mineral/Sub-grade stack | 0.00 |
| 5 | Infrastructure | 0.00 |
| 6 | Roads | 0.00 |
| 7 | Green belt | 0.00 |
| 8 | Reclamation | 0.00 |
| 9 | Others | 0.00 |
| | Total Disturbed land | 0.00 |

a) Water Regime:

No water reservoir or perennial stream etc observed in the lease area and around 500 meters periphery of the lease area. The local water reservoir observed in five kilometers periphery as shown on plate-2. These fisheries ponds are located towards eastern side away from the lease area and these ponds will not get adverse impact from the proposed mining activities.

b) Quality of air:

The lease area is away from the habitation. Presently in absence of workings the air pollution is within limits.

c) Ambient Noise Level:

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The noise level in the lease area is within the prescribed limit as there is no working in the area.

d) Flora and fauna:

The main flora in the lease area is shrubs and bushes, however in surrounding area the flora is Ma Krisal, Dieng Ling, Dieng Bai, Dieng Sning, Dieng Swot observed.

The fauna found as live stock and the rarely appearance of wild animals like Sial, Squirrel etc, which will be not affected by mining activities.

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Director of Mineral Resources
Meghalaya, Shillong

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e) **Climatic Conditions:**

Climate of the area is semi arid zone type. The average rain fall remains around 1000mm per year to 1200mm per year. The maximum, mean and lowest temperature remain around 34°C, 14°C and 4°C. Maximum precipitation takes place during month of July and August. The hottest months are May and June and coldest are of December and January.

f) **Human Settlement:**

No human settlement observed in the lease area. Nearest village is Laitkynsew. The habitants belong to ST, SC, Minority, OBC and general categories. The main vocation of the habitants is agriculture. The habitants also have job at nearby mines and nearby towns.

g) **Public building, place of worship and monuments**

No such things are observed in and around the lease area. The other things observed in five kilometers periphery is illustrated on plate-2

i) **Indicate any sanctuary is located in the vicinity of leasehold**

No sanctuary observed in the vicinity of the lease area.

12.2

Impact Assessment:**APPROVED**

The land of the lease area will degrade by excavation, dumps and roads.

- i) The infrastructure, waste dump, roads, workings etc will be come across during the period of the mining plan. Thus, the fresh area will degrade by proposed workings.

The land use at the end of five years will be as follows:

All figures in hectares

| S. No | Item | As on date | End of 5th year |
|-------|------------------------------|-------------|-----------------|
| 1 | Area to be excavated | 0.00 | 3.95 |
| 2 | Storage of top soil | 0.00 | 0.01 |
| 3 | Overburden dump | 0.00 | 0.15 |
| 4 | Mineral/Sub-grade stack | 0.00 | 0.00 |
| 5 | Infrastructure/plant/crusher | 0.00 | 0.40 |
| 6 | Roads | 0.00 | 0.05 |
| 7 | Green belt | 0.00 | 0.30 |
| 8 | Reclamation | 0.00 | 0.0 |
| 9 | Others | 0.00 | 0.00 |
| | Total Disturbed land | 0.00 | 4.86 |

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Meghalaya, Shillong

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- ii) **Air Quality:**
The quality of air is likely to be effected by drilling and transportation of mineral and waste. The drilling will be by wet process. The lessees will use rock breakers, pneumatic breakers for excavation of mineral and waste. Water spray will be used over the haul/approach roads time to time and this practice is proposed to continue in future. Crushing Plant will have an integrated dust suppression system.
- iii) **Water Quality:**
The quality of water is affected by mining if ground water comes across in mining.
There is a high gap between the level of ground water and the depth of proposed deepest workings thus ground water will not intersect the workings at any stage. If ground water will intersect the lessee will get necessary permission.
The garland drain will prevent the monsoon water to enter the lease area whereas the outgoing water from the lease area will pass through the surface desiltation tank. Thus, there will be no pollution/contamination to the streams.
- iv) **Noise Level**
The diesel operated machineries and blasting will create noise in the mining. The following measures are proposed:
The high-quality silencers will be provided to the diesel operated machineries uses for excavation and loading of mineral and waste and water pump etc. The approach roads will be provided smooth and wide.
- v) **Vibration level (due to Blasting)**
Blasting will be done in the area. The vibrations come across on small scale. The area is in interior, thus the impact will not very much significant.
- vi) **Water Regime:**
No perennial water regime is observed in and near the lease area in 500 meters periphery. Thus, water regime will not be disturbed by proposed mining activities.
- vii) **Acid Mine Drainage**
Not applicable in this mine.
- viii) **Surface subsidence**
It is an opencast mining and no such subsidence will come across in past by mining and none is expected by future mining.
- ix) **Socio- Economic**
The socio-economic conditions of an area will improve by having and economic activity near by the habitation. The local habitants will get permanent extra income from the source of employment near the villages.

APPROVED



x) **Historical Monuments etc**

In absence of such monuments in and around the lease area no impact will be anticipated.

12.3 PROGRESSIVE RECLAMATION PLAN

The mining is from top to bottom side. The reserves will not exhaust during the period of this mining plan; as reserves will remain alive in the lease at the end of mining plan period.

However, if reserve will be exhausted during the lease period, the exhausted benches will be reclaimed by mine rejects, spreading of topsoil and plantation will be done. It is also proposed to convert the pit into a water reservoir.

12.3.1 MINED OUT LAND

All figures in hectares

| S. No. | Item | As on date | End of 5th year | End of lease |
|--------|------------------------------|------------|-----------------|--------------|
| 1 | Area to be excavated | 0.00 | 3.95 | 4.35 |
| 2 | Storage of top soil | 0.00 | 0.01 | 0.0 |
| 3 | Overburden dump | 0.00 | 0.15 | 0.15 |
| 4 | Mineral/Sub-grade stack | 0.00 | 0.00 | 0.00 |
| 5 | Infrastructure/plant/crusher | 0.00 | 0.40 | 0.00 |
| 6 | Roads | 0.00 | 0.05 | 0.00 |
| 7 | Green belt | 0.00 | 0.30 | 0.40 |
| 8 | Reclamation | 0.00 | 0.0 | 0.0 |
| 9 | Others | 0.00 | 0.00 | 0.00 |
| | Total Disturbed land | 0.00 | 4.86 | 4.90 |

12.3.2 TOP SOIL MANAGEMENT

The soil come across during mining will be scraped and stacked separately in 0.01 ha area as shown on plate-5. The soil will be used for plantation in each monsoon.

12.3.3 TAILING DAM MANAGEMENT

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In absence of such tailing dams in the lease area and nearby no measures are called for.

12.3.4 ACID MINE DRAINAGE

In absence of acid mine drainage, no management will be anticipated.

12.3.5 SURFACE SUBSIDENCE

Surface subsidence mitigation measures though backfilling of mine voids or by any other means and its monitoring mechanism.

No such things are proposed in this progressive mine closure plan.

The cost required for plantation (with watering, fencing and survival) and waste dump management etc is given below.

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Director of Mineral Resources
Meghalaya, Shillong

JAIPAL SINGH
JAIPAL SINGH
2016/11/378/2015/A



The retaining wall is proposed to construct during next five years. The fencing by waste blocks and wire is already in existence. The fencing will be provided in non-fenced area. Around 10 metres retaining wall is proposed to construct each year. The cost is given below in table.

| ITEM | DETAILS | AREA (HECT) | QUANTITY | EXPENDITURE | REMARKS |
|---|--|------------------------------------|--|--|---|
| (A) RECLAMATION AND REHABILITATION OF MINES OUT LAND/AREA | (i) Backfilling | Nil | NA | NA | "Nil" & "NA" because during the 5 years Plan period, the reserve remains alive. |
| | (ii) afforestation on backfilled area | Nil | NA | NA | |
| | (iii) Others (please Specify) eg. Afforestation on exhausted benches | Nil | NA | NA | |
| | (iv) Pisciculture | Nil | NA | NA | |
| | (v) converting into water reservoir | Nil | NA | NA | |
| | (vi) Picnic Spot | Nil | NA | NA | |
| (B) STABILIZATION & REHABILITATION OF DUMPS (Within Lease) | (i) Terracing | One | - | - | Part of dumping |
| | (ii) Construction of parapet wall /retaining wall at toe of dump | 10 running metre Per year | 10 running metre Per year | Rs 2000/- | Toe of dump |
| | (iii) Construction of settling ponds (Garland drains etc) | 230 running metre/year | 230 running metre/year | Rs 75000/- | Periphery of Mine |
| | (iv) Afforestation on dumps | Nil | NA | NA | Continuous Dumping |
| (C) REHABILITATION OF BARREND AREA (Within Lease) | (i) Afforestation (Greenbell building) | 0.06 ha Per year | 60 trees | 10000/- | Along lease boundary and along road |
| | (ii) Others (Please Specify) Wire Fencing | 20 metre Per year | 20 running metre per year | 5000/- | Around the excavation |
| (D) ENVIRONMENTAL MONITORING (Core Zone & Buffer Zone separately) | (i) Ambient air quality | Lease area | 1 sample per year | 3000/- | From lease area |
| | (ii) Water quality | well | 2 sample per year | 5000/- | From nearby well |
| | (iii) Noise Level Survey | Lease area | 1 measurements per year | 2000/- | Near working pits and hydraulic machineries |
| | Total | 0.06 ha per year. Total 0.30 ha | 50 meters parapet wall; 1150 meters garland drain; 300 trees; 100 meters wire fencing; 20 samples of air, water and noise (5 each) | 102,000/- per year including all (Total for 5 years 5,10,000/-) | APPROVED |

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Meghalaya, Shillong

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12.4 DISASTER MANAGEMENT PLAN

No landslide and inundation like disaster were come across in this area and nearby the area in past. The workings are proposed from top to bottom by forming proper benching. The proposed workings will be by opencast mining method. Underground mining is not proposed. Face height will maintain safe. No tailing dam is proposed. Thus high -risk accidents like land slide, subsidence, flood, inundation, fire, seismic activities etc. not come across. Small accidents like fire, explosion in explosive and accident and fall of face like disaster may come across. A fire fighting station (sand filled buckets) is proposed at site in the supervision of mines manager and mate. After receiving the information, the officials will reach up to site and will remove men and machineries from the site. Magazine approved is proposed for storing the explosive and approved boxes are proposed for handling the explosive from magazine to site. Any person, who notices any explosion or accident, should immediately take steps to give warning by suitable mean and at the same time take necessary action for withdrawal of men from the site. He shall also inform the mines manager and other officials without any delay. The persons should be trained properly to handle the situation. Detailed warning system, implementation procedure, emergency control center, shall be maintained at the mine with names of trained persons. Proper arrangements should be made for treatment of injured persons. Fiore fighting arrangements should be provided at all the prone sites. All the safety equipments should be available at mine site. A vehicle should always remain at site (vehicles remain available on road passes through the area. The lessee is capable to meet any type of risk. The fire stations are available at East Khasi Hills – Shillong around 33 kilometers away. Dispensary is available at nearby Laitkynsew village and other prominent villages.

The responsible person is as follows:

Shri Khrikshon Lyngkhoi Lessee

And

Manager of the mine

APPROVED

12.5 MINE CLOSURE:

Care And Maintenance During Temporary Discontinuance:

No mining operation is proposed to temporary discontinuance during the period of this progressive mine closure plan. During any discontinuance, the mining workings will be in the watch of a watchman. Before re-open of the mine the maintenance will be provided to all the machineries deployed at mine. Before entering the laborers into mine the workings are proposed to inspect by manager for safety purpose as per Mines Act.

12.6 ENVIRONMENTAL SAFEGUARD:

The systematic workings are proposed keeping in view the conservation of mineral, Protection of Environment and safety of human and machineries.

No natural water courses are observed in and near the lease area and no such thing will be obstructed by proposed mining activities. The workings will be far above the level of ground water table and thus ground water will not intersect at any stage in workings. Although no separate soil observed at proposed mining

*Director of Mineral Resources
Meghalaya, Shillong*

RAJENDRA SINGH



site, however any soil come across in thin layer or in cavities will be scraped and temporarily stacked separately at proposed site. The soil will be used for plantation during each monsoon. The waste generated during mining will be used in construction and maintenance of approach roads, construction of site services. The lessee will also sell the waste by permit from the concerning department. Rest waste will be dumped at proposed site as per the planning. The regular water sprinkling will be provided over the approach road and all other dust creating points and places to minimize the dust during mining and other operations. The safe blasting as per Mines Act will be conducted by certified blaster by implementing all measures to arrest of Fly rock and minimize the ground vibrations. The nearby structures should not be disturbed by blasting. Drilling will be either wet process or by using dust extractors. In case of deep hole blasting the lessee will take permission from DGMS. For the safety of the laborers the personal protective devices will be provided and proper training will be provided for environment and safety. The height and width of the benches and face slope are proposed as per Metalliferous Mines Regulation 1961. Regular health checkups will be provided with periodically organized occupational health surveillance program for the workers. Insurance/ Group insurance will be provided for all laborers as per rules. Vehicular emissions will be checked by adopting good quality of silencers and by maintain wide and smooth roads. The noise level/pollution will be maintained within the permissible limit. Plantation as per approved planning will be provided in the lease area to increase the aesthetic environment of the lease area and nearby the lease area. The lessee will also follow the conditions imposed in the Environment Clearance for environment protection measures, ESR, CSR etc.

12.7 FINANCIAL ASSURANCE

There is no provision of financial assurance as per Meghalaya Minor Mineral Concession Rules 2016.
Security Deposit will be Rs 50,000 for 4.99 hectares area.

Shri Khrikshon Lyngkhoi
Lessee

Jaipal Singh
RQP/AJM/ 378/2015/A

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RQP/AJM/378/2015/A

APPROVED

Director of Mineral Resources
Meghalaya, Shillong

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भारतीय गैर न्यायिक



Administered by Act XXV of 19 87
 Exempted from the provisions of the Stamp Act, 1899
 by the Meghalaya Stamp Act, 1987

INDIA NON JUDICIAL

Scheduled No. 23, OP No. 420600P in the original Deed
 MEGHALAYA 03AA 085183

Sd/- M. K. Shir
 Sub-Registrar,
 Shillong.

THIS DEED OF CONVEYANCE IS MADE ON THIS THE 26th DAY OF June 2017 AT
 SHILLONG

BY AND BETWEEN (Plot. No.. 3)

Smt. Mirsha Khongwir, daughter of Shri. Peacely Ksing, aged, about 60 years, resident of Laitlyngkot, Khyrim Syiemship, East Khasi Hills District, Meghalaya 793110, hereinafter together called the "First Party" the **VENDOR** which terms, shall unless repugnant to the context, mean and include her respective heirs, successors, executors, administrators, legal representatives and assigns of the One Part;

AND

Shri Khrikshon Lyngkhoi, son of Late S. Khardewsaw, aged about 65, resident of K. Complex, Demseiniong, Maccabe Road, Shillong- 793011, East Khasi Hills District, Meghalaya hereinafter called the "Second Party", the **PURCHASER** which term shall, unless it be repugnant to the context, means and include his heirs, successors, administrators, representatives and assigns of the Other Part.

Mirsha Khongwir

Mirsha Khongwir

Fees Paid
 50% EXP.
 A. 63713.00
 R. 14.00
 Dt. 14/11/2017

*Compared by
 M. K. Shir*

Certified to be true Copy

M. K. Shir
 Sub-Registrar,
 Shillong.

WHEREAS the Vendor is the absolute owner in possession of a vacant plot of land known as "Syllai Madan" and lying situated at Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District, Meghalaya and more specifically mentioned in the Schedule- A below at the end of this indenture.

AND WHEREAS the Purchaser offered to purchase a part of the said plot of land measuring about 16.925 Acres more or less of the said vacant plot of land and more specifically mentioned in the Schedule- B below at the end of this indenture and the Vendor agreed to the offer of the Purchaser and decided to sell the aforesaid vacant plot of land to the Purchaser for a consideration amount of Rs. 6,77,000/- (Rupees Six Lakh Seventy Seven Thousand) only.

AND WHEREAS upon payment of full consideration money to the Vendor both the parties thought it convenient to execute the sale and thus the VENDOR hereby executes this Deed of Sale on the following terms and conditions as set forth herein below in favour of the PURCHASER:-

NOW THIS DEED OF SALE WITNESSES AS FOLLOWS:

1. That the Purchaser had paid in full consideration of the said vacant plot of land amounting to Rs. 6,77,000/- (Rupees Six Lakh Seventy Seven Thousand Only) vide Cheque No..... pay Mirsha Khongwir A/C No – 30685429027 dated and drawn on SBI, Laitumkhrah, and the receipt of which the vendor hereby acknowledges on being fully satisfied.
2. That the Vendor hereby agrees to convey and transfer by way of sale unto the Purchaser the said Property description of which is more fully given in the annexed Schedule herein below together with the fences hedged, ways, water courses, liberties easements, privileges and appurtenances whatsoever to the said land or usually held, or occupied therewith or purported to belong or appurtenant thereto; and all the estate, rights, title, interest, claim and demand whatsoever of the Purchaser into or to the property hereby conveyed and every part thereof; to HOLD the same absolutely by the Purchaser, his successors-in-interest, executors, administrators and/or assigns.
3. That the Vendor do hereby declare and covenant with the Purchaser that she is the absolute owner of the property and presently lawfully seized and possessed of the said property and the Vendor has the full power and absolute authority to dispose of and sell the said property in manner stated in this Deed.
4. That the Purchaser has taken over the possession of the property aforesaid and henceforth the Purchaser shall hold, use and enjoy the property as its prudent owner without any interference from the Vendor in respect of the property or any part thereof, with heritable and transferable right of use and occupation.
5. That the Vendor hereby agrees for herself, her heirs, successors, executors, representatives and assigns to save harmless and keep indemnified the Purchaser, his successors-in-interest, executors, administrators and assigns from and against all losses, damages, costs and expenses which it or they may sustain or incur by reasons any Claim being made by anybody whatsoever to the Property hereby conveyed or in respect of any arrears due thereof.
6. That the Vendor do hereby declare and covenant with the Purchaser that the vendor are the absolute owner of the property, and lawfully seized and

Mirsha Khongwir

Mirsha Khongwir

Certified to be true Copy
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Sub-Registrar,
Shillong.

possessed of the said property and is free from all encumbrances or defects of any manner and in future if any defect either in respect of ownership of the Vendor or any other defect in the property be found for which the Purchaser is deprived of peaceful use and enjoyment of the property or any part thereof the Vendor or her successors-in-interest shall indemnify the Purchaser of successors-in-interest.

SCHEDULE- A OF THE PROPERTY REFERRED HERETO

A vacant plot of land known as "Syllai Madan" lying situated at Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District, Meghalaya situated at boundaries of which is butted and bounded as under:-

Plot No. 3

- North - Themlatyrnuit
- South - lakhap ka Bri Mawthoh (299 ft)
- East - lakhap ka jaka ka trai nongdie ka Mirsha Khongwir (3164 ft)
- West - lakhap ka jaka ka trai nongdie ka Mirsha Khongwir (2968 ft)

Total area of this land is 16.925 acres.



SCHEDULE- B OF THE PROPERTY REFERRED HERETO

A vacant plot of land known as "Syllai Madan" lying situated at Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District, Meghalaya with an area of 16.925 Acres which is butted and bounded as under:-

Plot No. 3

- North - lakhap ka jaka Khongstia (239 ft)
- South - lakhap ka Bri Mawthoh (299 ft)
- East - lakhap ka jaka ka trai nongdie ka Mirsha Khongwir (3164 ft)
- West - lakhap ka jaka ka trai nongdie ka Mirsha Khongwir (2968 ft)



IN WITNESS WHEREOF THE PARTIES HERE ONTO HAVE PUT AND SUBSCRIBED THEIR RESPECTIVE HANDS AFTER HAVING FULLY UNDERSTOOD THE CONTENTS OF THIS SALE DEED ON THE DAY, MONTH AND YEAR HEREIN FIRST MENTIONED ABOVE, IN PRESENCE OF THE FOLLWING WITNESSES.

Certified to be true Co

WITNESSES

1. Baidakun Khongwir
 2. S. M. Boin Khongstia
 3. Baidakun Khongwir
 4. B. K. Malai
Secretary Shnong
Laitkynsew Raid Mawlieh
- B. K. Khongwir*
Rangbah Shnong
Laitkynsew Raid Mawlieh

VENDOR

Mirsha Khongwir
(Smt. Mirsha Khongwir)

Sub - Registr: Shillong.

PURCHASER

Shri. Khrikshon Lyngkhai
(Shri. Khrikshon Lyngkhai)



भारतीय गैर न्यायिक

एक सौ रुपये

Rs. 100

₹. 100



ONE HUNDRED RUPEES

सत्यमेव जयते

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मेघालय MEGHALAYA

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THIS DEED OF CONVEYANCE IS MADE ON THIS THE 26th DAY OF June 2017 AT SHILLONG

BY AND BETWEEN (Plot. No.. 3) APPROVED

Smt. Mirsha Khongwir, daughter of Shri. Peacely Ksing, aged about 60 years, resident of Laitlyngkot, Khyrim Syiemship, East Khasi Hills District, Meghalaya 793110, hereinafter together called the "First Party" the **VENDOR** which terms, shall unless repugnant to the context, mean and include their respective heirs, successors, executors, administrators, legal representatives and assigns of the One Part;

AND

Shri Khrikshon Lyngkholi, son of Late S. Khardewsaw, aged about 65, resident of K.L. Complex, Demseiniong, Maccabe Road, Shillong- 793011, East Khasi Hills District, Meghalaya hereinafter called the "Second Party", the **PURCHASER** which term shall, unless it be repugnant to the context, means and include his heirs successors, administrators, representatives and assigns of the Other Part.

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Director of Mineral Resources,
Meghalaya, Shillong

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APPROVED

WHEREAS the Vendor is the absolute owner in possession of a vacant plot of land known as "Syllai Madan" and lying situated at Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District, Meghalaya and more specifically mentioned in the Schedule- A below at the end of this indenture.

AND WHEREAS the Purchaser offered to purchase a part of the said plot of land measuring about 16.925 Acres more or less of the said vacant plot of land and more specifically mentioned in the Schedule- B below at the end of this indenture and the Vendor agreed to the offer of the Purchaser and decided to sell the aforesaid vacant plot of land to the Purchaser for a consideration amount of Rs. 6,77,000/- (Rupees Six Lakh Seventy Seven Thousand) only.

AND WHEREAS upon payment of full consideration money to the Vendor both the parties thought it convenient to execute the sale and thus the VENDOR hereby executes this Deed of Sale on the following terms and conditions as set forth herein below in favour of the PURCHASER:-

NOW THIS DEED OF SALE WITNESSES AS FOLLOWS:

1. That the Purchaser had paid in full consideration of the said vacant plot of land amounting to Rs. 6,77,000/- (Rupees Six Lakh Seventy Seven Thousand Only) vide Cheque No. pay Mirsha Khongwir A/C No - 30685429027 dated and drawn on SBI, Laitumkhrah, and the receipt of which the vendor hereby acknowledges on being fully satisfied.

[Signature]

Director of Mineral Resources
Meghalaya, Shillong

Mirsha Khongwir

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भारतीय गैर न्यायिक

एक सौ रुपये

Rs. 100

₹. 100



ONE HUNDRED RUPEES

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- 2. That the Vendor hereby agrees to convey and transfer by way of sale unto the Purchaser the said Property description of which is more fully given in the annexed Schedule herein below together with the fences hedged, ways, water courses, liberties easements, privileges and appurtenances whatsoever to the said land or usually held, or occupied therewith or purported to belong or appurtenant thereto; and all the estate, rights, title, interest, claim and demand whatsoever of the Purchaser into or to the property hereby conveyed and every part thereof; to HOLD the same absolutely by the Purchaser, his successors-in-interest, executors, administrators and/or assigns.
- 3. That the Vendor do hereby declare and covenant with the Purchaser that she is the absolute owner of the property and presently lawfully seized and possessed of the said property and the Vendor has the full power and absolute authority to dispose of and sell the said property in manner stated in this Deed.
- 4. That the Purchaser has taken over the possession of the property aforesaid and henceforth the Purchaser shall hold, use and enjoy the property as its prudent

APPROVED

Signature
Director of Mineral Resources
Meghalaya, Shillong



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एक सौ रुपये

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APPROVED

owner without any interference from the Vendor in respect of the property or any part thereof, with heritable and transferable right of use and occupation.

- That the Vendor hereby agrees for herself, her heirs, successors, executors, representatives and assigns to save harmless and keep indemnified the Purchaser, his successors-in-interest, executors, administrators and assigns from and against all losses, damages, costs and expenses which it or they may sustain or incur by reasons any claim being made by anybody whatsoever to the Property hereby conveyed or in respect of any arrears due thereof.
- That the Vendor do hereby declare and covenant with the Purchaser that the vendor are the absolute owner of the property, and lawfully seized and possessed of the said property and is free from all encumbrances or defects of any manner and in future if any defect either in respect of ownership of the Vendor or any other defect in the property be found for which the Purchaser is deprived of peaceful use and enjoyment of the property or any part thereof the Vendor or her successors-in-interest shall indemnify the Purchaser of successors-in-interest.

[Signature]
Director of Mineral Resources
Meghalaya, Shillong

Mitshankh...

[Handwritten notes on the left margin]



भारतीय गैर न्यायिक

एक सौ रुपये

Rs. 100

₹. 100



ONE HUNDRED RUPEES

सत्यमेव जयते

भारत INDIA
INDIA NON JUDICIAL

मालय MEGHALAYA

092731

SCHEDULE- A OF THE PROPERTY REFERRED HERETO

A vacant plot of land known as "Syllai Madan" lying situated at Laitkynsew, Raid, Mawlieh, Khyrim Syiemship, East Khasi Hills District, Meghalaya situated at boundaries of which is butted and bounded as under:-

Plot No. 3

- North - Themlatyrnuit
- South - lakhap ka Bri Mawthoh (299 ft)
- East - lakhap ka jaka ka trai nongdie ka Mirsha Khongwir (3164 ft)
- West - lakhap ka jaka ka trai nongdie ka Mirsha Khongwir (2968 ft)

Total area of this land is 16.925 acres.

APPROVED

M. J. S. ha Khongwir

SCHEDULE- B OF THE PROPERTY REFERRED HERETO

A vacant plot of land known as "Syllai Madan" lying situated at Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District, Meghalaya with an area of 16.925 Acres which is butted and bounded as under:-

[Signature]
Director of Mineral Resources
Meghalaya, Shillong



भारतीय गैर न्यायिक

एक सौ रुपये

Rs. 100

रु. 100



ONE HUNDRED RUPEES

सत्यमेव जयते

भारत INDIA

INDIA NON JUDICIAL

घालय MEGHALAYA

092732

Plot No. 3

North - lakhap ka jaka Khongstia (239 ft)

South - lakhap ka Bri Mawthoh (299 ft)

East - lakhap ka jaka ka trai nongdie ka Mirsha Khongwir (3164 ft)

West - lakhap ka jaka ka trai nongdie ka Mirsha Khongwir (2968 ft)

APPROVED

IN WITNESS WHEREOF THE PARTIES HERE ONTO HAVE PUT AND SUBSCRIBED THEIR RESPECTIVE HANDS AFTER HAVING FULLY UNDERSTOOD THE CONTENTS OF THIS SALE DEED ON THE DAY, MONTH AND YEAR HEREIN FIRST MENTIONED ABOVE, IN PRESENCE OF THE FOLLWING WITNESSES.

WITNESSES

1. Badamun Khongwir
2. Eri bomkho nasti
3. Bamfota Khongwir
4. B. K. Malai
Secretary Shong
Laityrsaw Road Mawthoh
Bain Mawthoh
Bamfota Khongwir
Bamfota Khongwir
Bamfota Khongwir

VENDOR

Mirsha Khongwir
(Smt. Mirsha Khongwir)

PURCHASER

Shri. Khrikshon Lyngkhai
(Shri. Khrikshon Lyngkhai)

Director of Mineral Resources
Chillong



OFFICE OF THE EXECUTIVE COMMITTEE
KHASI HILLS AUTONOMOUS DISTRICT COUNCIL
SHILLONG.



N0.DC XIV(N)145/2017/3/HH1

Dated, Shillong the 20th December 2017.

To,
Shri.Khrikshon Lyngkhoi
Demseiniong
Shillong, East Khasi Hills.

Subject : Non Forest Land Certificate for Boulder Stone Quarry at " Syllai Madan " Laitkynsew Raid Mawlieh Khyriem Syiemship in respect of Shri.Khrikshon Lyngkhoi.

Ref : Your letter No. dated Nil.

With reference to the above, I am to inform you that the land measuring 4.99 Hec. at at "Syllai Madan " Laitkynsew Raid Mawlieh Khyriem Syiemship East Khasi Hills is a Non-Forest Land as per definition of Forest Hence, this Office Issue Non-Forest Land Certificate for Boulder Stone Quarrying subject to the following condition.

1. That you shall obtain Mining Lease/quarry permit under Meghalaya Minor Mineral Concession Rules, 2016.
2. That your Boulder Stone Quarry is subjected to inspection by the Staff/Official of this Office.
3. That Non-Forest-Land Certificate is liable for cancellation for violating any Act and Rules of the District Council and State Government.

This Certificate is valid for up to 31st March, 2018 and is subject to renewal.

APPROVED

Yours faithfully,

Chief Forest Officer
Khasi Hills Autonomous District Council
Shillong.

Memo N0.DC XIV (N)145/2017/3(a)

Dated, Shillong the December 2017.

Copy to:

1. The Executive Committee I/c. Forest, KHADC Shillong for favour of information.
2. The ACFO I/c. Shillong Range, for information & necessary action. He instructed to monitor/inspection for any violation of any Acts & Rules of the State Government and the District Council.

Director of Mineral Resources
Meghalaya, Shillong

Chief Forest Officer
Khasi Hills Autonomous District Council
Shillong.



GOVERNMENT OF MEGHALAYA
THE DEPARTMENT OF FORESTS AND ENVIRONMENT
OFFICE OF



THE DIVISIONAL FOREST OFFICER:: KHASI HILLS (T) DIVISION:: SHILLONG

NO. KH/9/NOC/STONE/41/PI/IV: 16/

Dated Shillong, the 13/04/2018

To,

Shri. Khrikshon Lyngkhor
K L Complex, Maccabe Road,
Demseiniang,
East Khasi Hills District

Subj Non Forest land certificate for stone quarry located at Syllai Madan, Laitkynsew, Raid Mawlieh, Khyrim Syiemship, East Khasi Hills District in respect of Shri. Khrikshon Lyngkhor.

Ref Your letter No dated -nil-

Sir,

With reference to the above I am to inform you that the land measuring 4.99 hectares at Syllai Madan, Laitkynsew, Raid Mawlieh, Khyrim Syiemship East Khasi Hills District is not part of RF/PF under this office and it is 'Non Forest' land as per definition of 'Forest'. Hence, this office issue Non- Forest land certificate for stone quarrying subject to the following conditions :-

1. That you shall obtain Mining lease / quarry permit under Meghalaya Minor Mineral Concession Rules, 2016
2. That your Stone Quarry is subjected to inspection by the staff/official of this office
3. This Non Forest Land Certificate is liable for cancellation for violating any Act and Rules of the State Government and District Council
4. The G P S Co-ordinates of Stone Quarry is

| | |
|----------------------|-------------------|
| A. N 25° 24' 12.636" | E 91° 51' 40.788" |
| B. N 25° 24' 13.356" | E 91° 51' 40.246" |
| C. N 25° 24' 14.292" | E 91° 51' 39.384" |
| D. N 25° 24' 14.976" | E 91° 51' 39.132" |
| E. N 25° 24' 17.424" | E 91° 51' 40.716" |
| F. N 25° 24' 14.292" | E 91° 51' 52.164" |
| G. N 25° 24' 12.708" | E 91° 51' 55.008" |
| H. N 25° 24' 10.584" | E 91° 51' 52.164" |

APPROVED

Yours faithfully,



(Shri. T. Wanniang, I.F.S)
Divisional Forest Officer,
Khasi Hills (T) Division,
Shillong

Memo NO KH/9/NOC/STONE/41/PI/IV: 16/ Dated Shillong, the 13/04/2018
Copy to:

1. The Conservator of Forests (T) Khasi & Jaintia Hills, Shillong, Meghalaya This has a reference to his letter No MFG 16/17/KL/250 dated Shillong, 5th April 2018
2. The Member Secretary, State Environmental Impact Assessment Authority, Meghalaya for information
3. The Member Secretary, Meghalaya State Pollution Control Board for information.
4. The Range Forest Officer, i/c Southern Range, for information and necessary action. He is instructed to monitor/inspection for any violation of any Acts, & Rules of the State Government and District Council

Divisional Forest Officer,
Khasi Hills (T) Division,
Shillong

selm
Director of Mineral Resources
Meghalaya, Shillong



GOVERNMENT OF MEGHALAYA
THE DEPARTMENT OF FORESTS AND ENVIRONMENT
OFFICE OF



THE DIVISIONAL FOREST OFFICER:: KHASI HILLS (T) DIVISION SHILLONG

No KH/8/ML/Stone/69/10515-B

Dated Shillong the 29/1/2018

To

Shri. Khinkshon Lyngkhor
K L Complex, Damseiniang
Shillong, East Khasi Hills District

Subj

Letter Of Intent (LOI) for granting of mining lease under Meghalaya Minor Mineral Concession Rules 2016 for Boulder stone mining at Syllai Madan Lalkynsew Raid Mawlieh Khyrim Syiemship East Khasi Hills District

Ref

Your application dated 19th 1 2018

Sir,

With reference to the above mentioned subject I do hereby issue Letter of Intent (LOI) for granting mining lease under Meghalaya Minor Mineral Concession Rules 2016 for Boulder stone mining on area of 4.99 hectares, at Syllai Madan Lalkynsew, Raid Mawlieh Khyrim Syiemship East Khasi Hills District. On receipt of this Letter of Intent, you shall within a period of six months furnish the following documents for grant of mining lease

- 1) Mining Plan duly approved by Director of Mineral Resources
- 2) Environmental clearance under the Environmental (Protection) Act, 1986
- 3) Consent to establish under the Water (Prevention & Control of Pollution) Act, 1974 and Air (Prevention & Control of Pollution) Act, 1981
- 4) Clearance from Revenue and Disaster Management Department
- 5) Clearance from Labour Department for occupational Health and Labour Laws including Child Labour.

APPROVED

This is for your information and necessary action

Yours faithfully

(Shri. T. Wanniang, M.F.S)
Divisional Forest Officer,
Khasi Hills (T) Division,
Shillong

Director of Mineral Resources
Meghalaya, Shillong

भारत सरकार / GOVERNMENT OF INDIA
खान मंत्रालय / MINISTRY OF MINES
भारतीय खान ब्यूरो / INDIAN BUREAU OF MINES



Jaipal Singh

अर्हताप्राप्त व्यक्ति के रूप में मान्यता प्रमाण पत्र

(खनिज रियायत नियमावली, 1960 के नियम 22सी के तहत)

CERTIFICATE OF RECOGNITION AS QUALIFIED PERSON

(Under Rule 22C of Mineral Concession Rules, 1960)

श्री जयपाल सिंह पुत्र स्व. श्री गोरुराम निवासी सी-47, रघु मार्ग, हनुमान नगर, पोस्ट- वैशाली, जयपुर - 302021 (राजस्थान), जिनका फोटो और हस्ताक्षर ऊपर दिया हुआ है, तथा जिन्होंने अपनी अर्हता और अनुभव का संतोषजनक साक्ष्य दिया है, को खनन योजना तैयार करने हेतु खनिज रियायत नियमावली 1960 के नियम 22सी के तहत अर्हताप्राप्त व्यक्ति के रूप में मान्यता प्रदान की जाती है।

Shri Jaipal Singh S/o Late Shri Goru Ram R/o C-47, Raghu Marg, Hanuman Nagar, P.O- Vaishali Nagar Jaipur-302 021 (Rajasthan), whose photograph and signature is affixed herein above, having given satisfactory evidence of his qualifications & experience is hereby RECOGNISED under Rule 22C of the Mineral Concession Rules, 1960 as a Qualified Person to prepare Mining Plans.

उनकी पंजीयन संख्या है

RQP/AJM/378/2015/A APPROVED

इस registration number is

यह मान्यता दस वर्षों की अवधि के लिए मान्य है जो दिनांक 05.08.2025 को समाप्त होगी।

This recognition is valid for a period of ten years ending on

उनके द्वारा प्रस्तुत खनन योजना में गलत जानकारी/दस्तावेज पाए जाने की स्थिति में यह प्रमाण पत्र वापस लिया जाएगा/निरस्त किया जाएगा।

This certificate will liable to be withdrawn/cancelled in the event of furnishing the wrong information/documents in the Mining Plan submitted by him.

स्थान / Place : Ajmer

दिनांक / Date : 6.8.2015

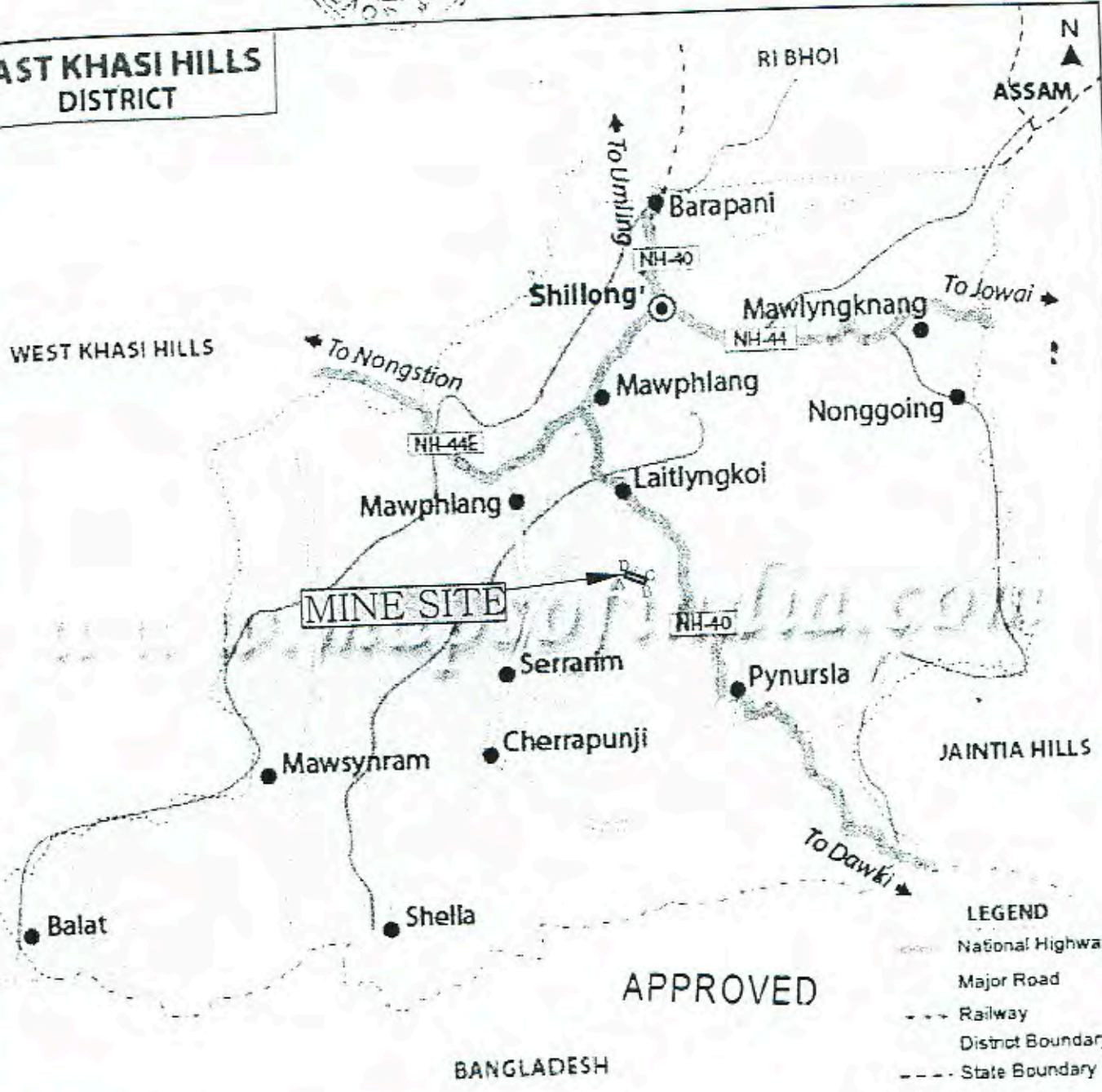
Director of Mineral Resources
Meghalaya, Shillong

क्षेत्रीय खान नियंत्रक / Regional Controller of Mines
भारतीय खान ब्यूरो / Indian Bureau of Mines
अजमेर क्षेत्र / Ajmer Region
भारतीय खान ब्यूरो
Indian Bureau of Mines
अजमेर AJMER



LOCATION MAP PLATE NO.- 1

**EAST KHASI HILLS
DISTRICT**



MINE SITE

APPROVED

LEGEND

- National Highway
- Major Road
- Railway
- District Boundary
- State Boundary
- River
- District HQ
- Other Town
- Major Town

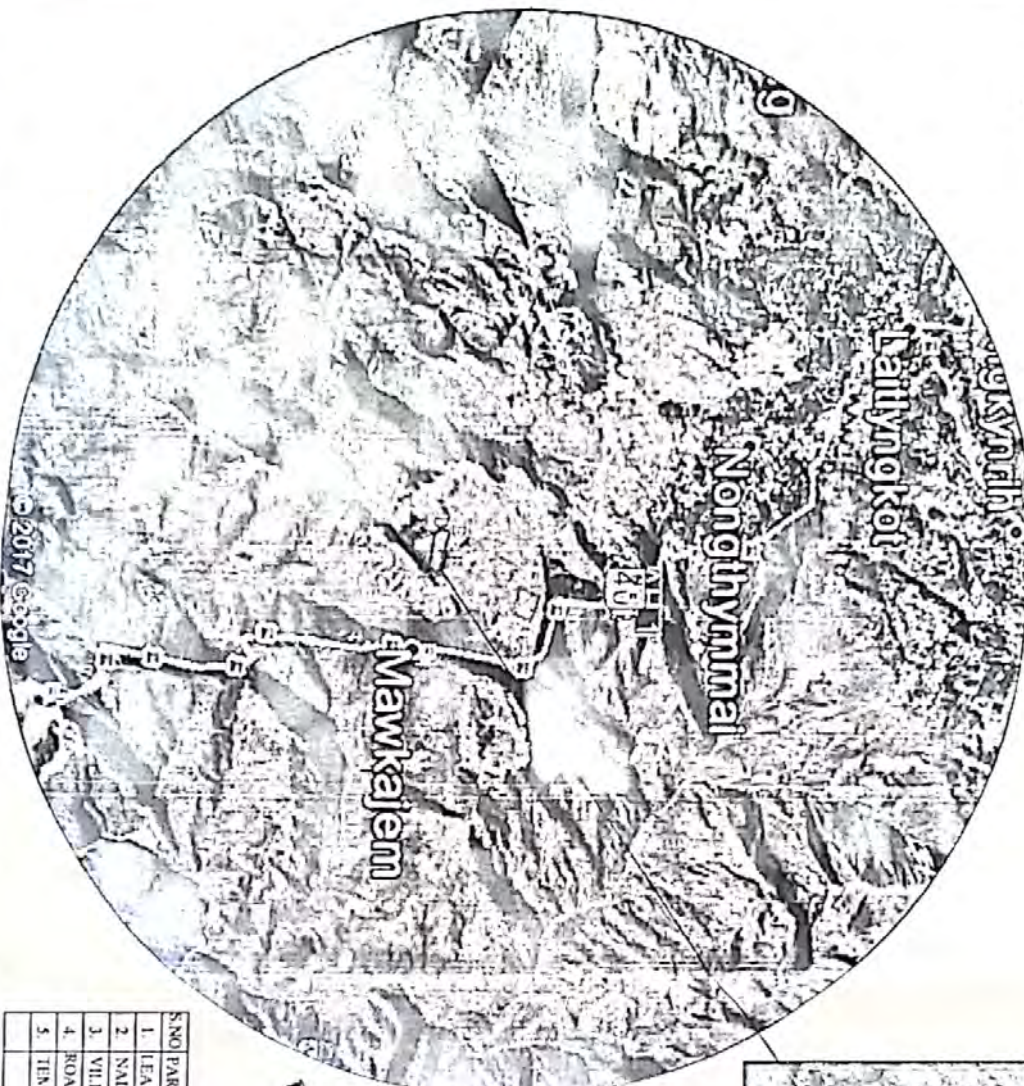
Map not to Scale

Copyright © 2012 www.mapsofindia.com
(Updated on 7th June 2012)

[Signature]
 Director of Mineral Resources
 Meghalaya, Shillong

[Signature]
 JAIPAL SINGH
 RQ/IAJM/378/2012/A

[Signature]

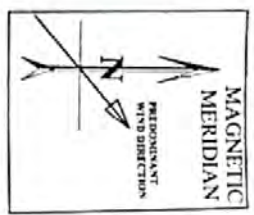


APPROVED

Director of Mineral Resources
Meghalaya, Shillong

| S.NO | PARTICULARS | REFER |
|------|------------------|-------|
| 1 | LEASE AREA | |
| 2 | SALAH | |
| 3 | VILLAGE | |
| 4 | ROAD KACHIA ROAD | |
| 5 | TEMPLE CHITRI | |

| PILLER | Latitude | Longitude |
|--------|-----------------|-----------------|
| A | 25° 24' 12.63" | 91° 51' 40.788" |
| B | 25° 24' 13.356" | 91° 51' 40.248" |
| C | 25° 24' 14.292" | 91° 51' 39.384" |
| D | 25° 24' 14.976" | 91° 52' 39.132" |
| E | 25° 24' 17.424" | 91° 52' 40.716" |
| F | 25° 24' 14.292" | 91° 51' 52.164" |
| G | 25° 24' 12.708" | 91° 52' 55.008" |
| H | 25° 24' 10.584" | 91° 52' 52.02" |



KEY PLAN
OF SYLLAI MADAN BOULDER STONE MINE
IN VILLAGE - SYLLAI MADAN, LATKYNSEW, S.T.B DIVISION - PYNORSILA
DISTRICT - EAST KHASI HILLS, MEGHALAYA

MINERAL : BOULDER STONE

LESSEE : SHRI KHIRKISHON LYNGKHOI

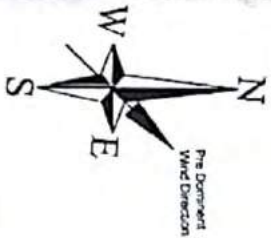
AREA : 4.99 Hect

LOCATION
NEAR VILL. : SYLLAI MADAN, LATKYNSEW
SUB DIVISION : PYNORSILA
DISTRICT : EAST KHASI HILLS
STATE : MEGHALAYA

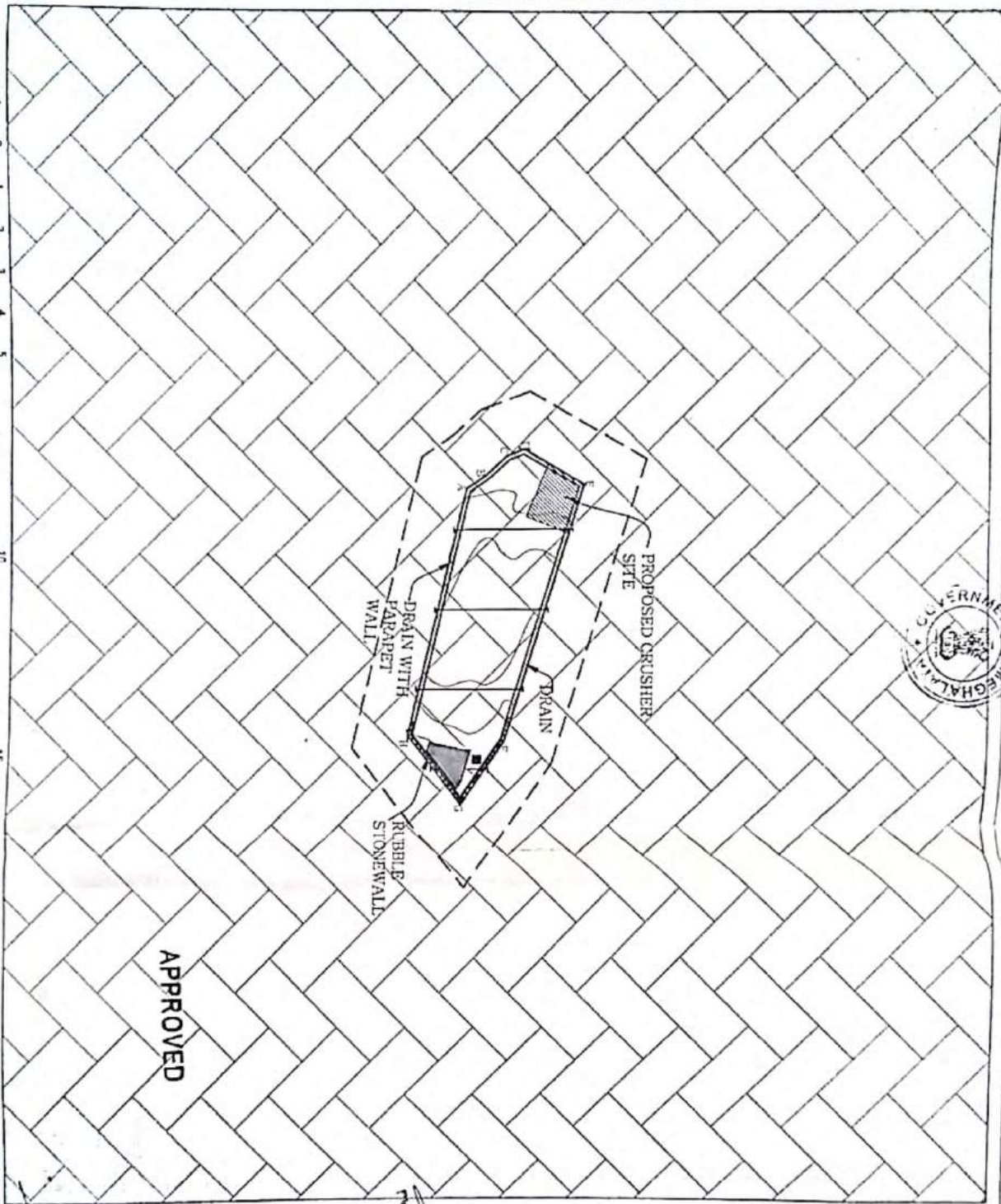
PREPARED BY : *[Signature]*
JAIPAL SINGH
RO/PA/JM/ST/12/2015/1A

LESSEE : *[Signature]*

PLATE No 2



| SNO | PARTICULARS | SYMBOL |
|-----|-----------------------|--------|
| 1. | LEASE BOUNDARY | — |
| 2. | CONTOUR | 1780 |
| 3. | PRIVATE LAND | — |
| 4. | 65 M. BARRIER LINE | — |
| 5. | 500 M. BARRIER LINE | — |
| 6. | SOIL STACK | — |
| 7. | DUMP | — |
| 8. | PLANTATION | — |
| 9. | PROPOSED CRUSHER SITE | — |



APPROVED



Special Mineral Resources
Exploration Plan

OF SYLLAI MADAN BOULDER STONE MINE IN VILLAGE- SYLLAI MADAN, LAITKYNSEW, SUB DIVISION- PYNURSILA, DISTRICT- EAST KHASI HILLS (MEGHALAYA)

MINERAL : BOULDER STONE

LESSEE : SHRI KHIRKSHON LYNGKHOI

AREA : 4.99 Hect.

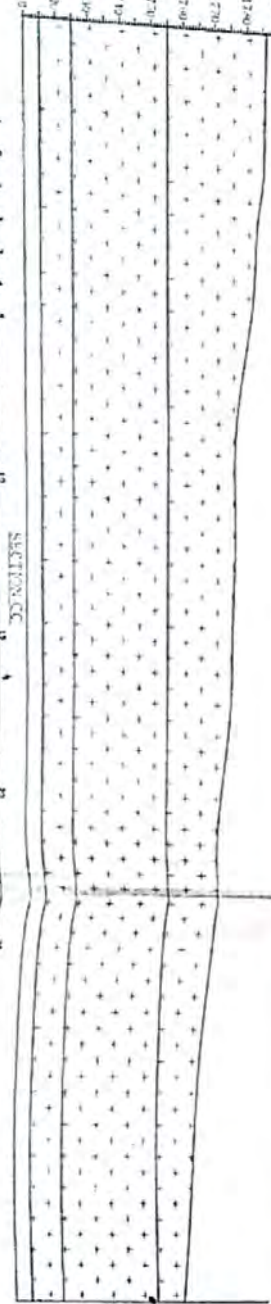
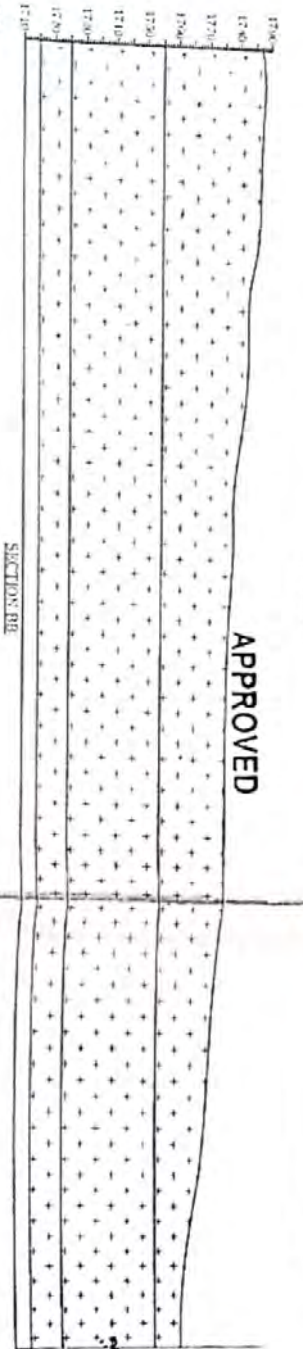
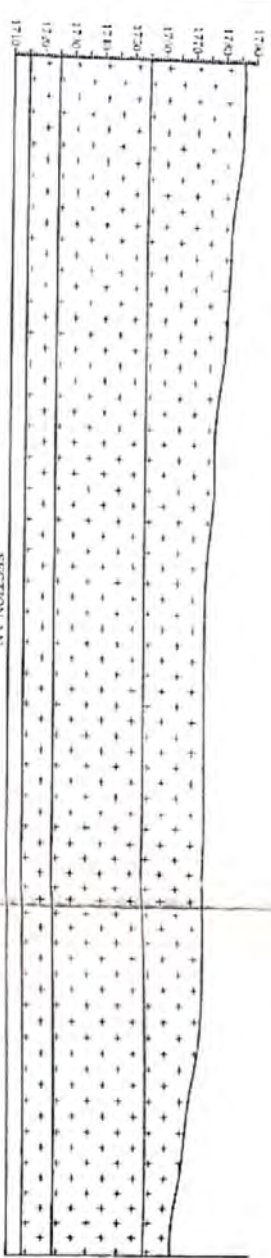
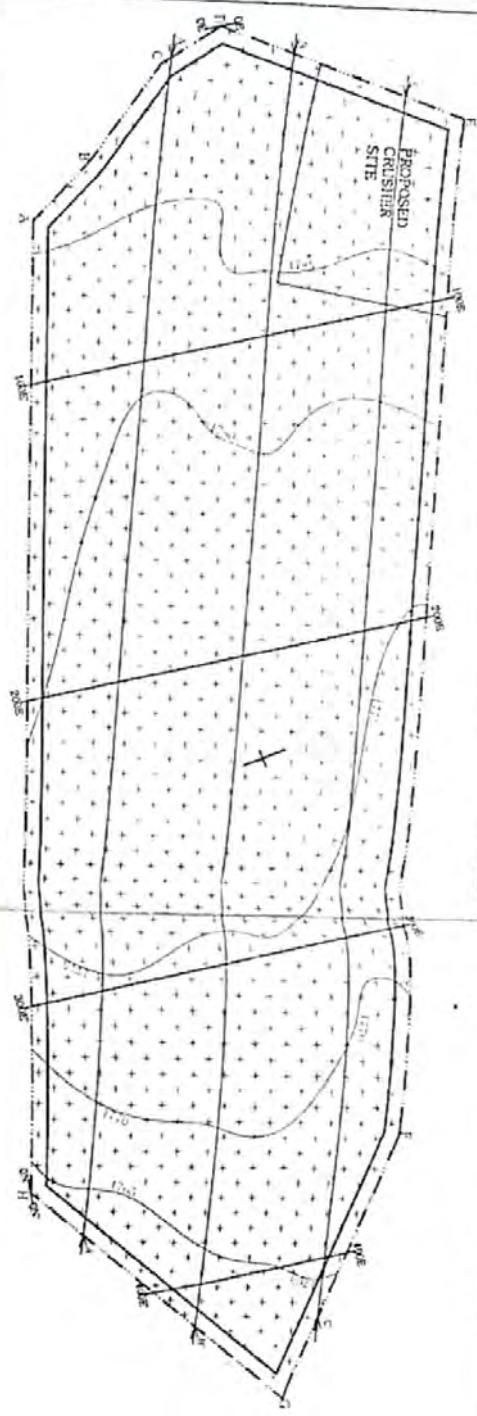
LOCATION : NEAR VILL., SYLLAI MADAN, LAITKYNSEW
SUB DIVISION : PYNURSILA
DISTRICT : EAST KHASI HILLS
STATE : MEGHALAYA

[Signature]
JAPAL SINGH
PROPRIETOR/LESSEE

[Signature]
KHIRKSHON LYNGKHOI

LESSEE

PLATE NO
3



| SINO PARTICLE CLASS | SYMBOL |
|---------------------|--------|
| 1. LEAD SANDWATER | |
| 2. LOESS | |
| 3. SP. A. FINE | |
| 4. TENUITE PER LIMB | |
| 5. BOULD. STONE | |

*Director of Mineral Resources
Shillong, Shillong*

SURFACE GEOLOGICAL PLAN & SECTIONS
 OF THE AREA SHILLONG EAST DIVISION - PINEHILL
 DISTRICT - EAST KHASI HILLS MEGHALAYA

NO. OF SHEETS: 4

LESSEE: **SHRI KIRIKSHON LYNGKHOI**

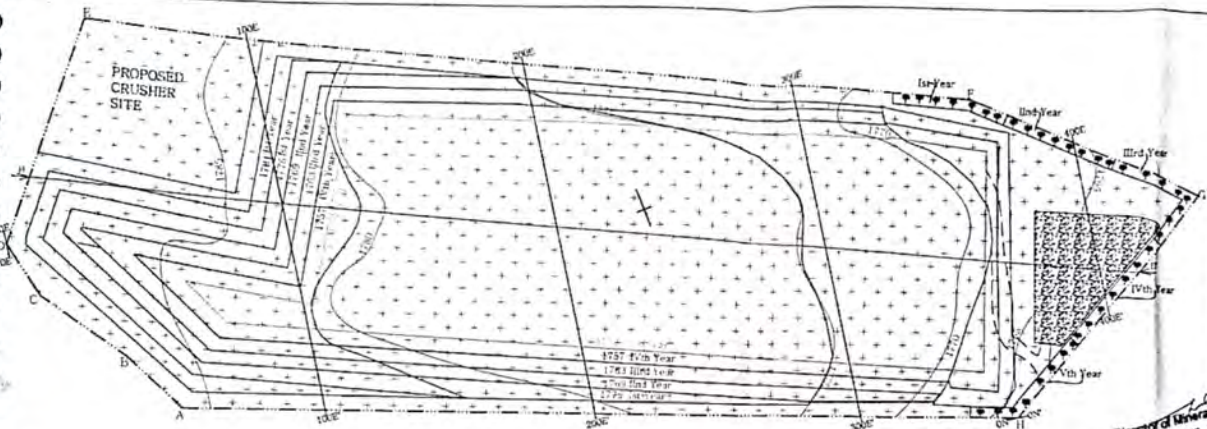
AREA: 1.99 Hect

LOCATION:
 NEAR VILL. SYLLAI MANDALATRESSEW
 SUB DIVISION: PINEHILL
 DISTRICT: EAST KHASI HILLS
 STATE: MEGHALAYA

DATE: 17/11/2015

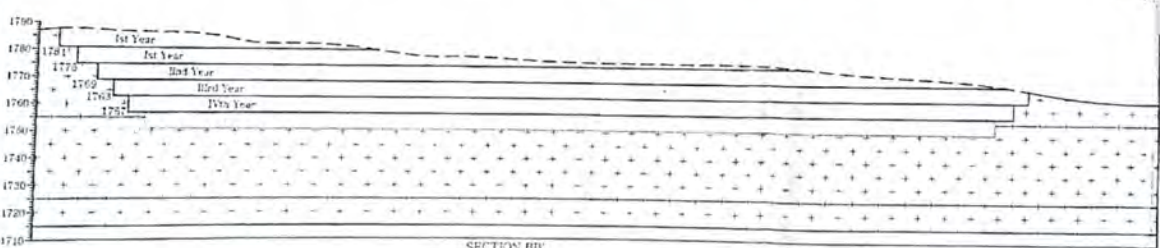
APPROVED BY: *[Signature]*
 JPMV GVT
 APPAL SINGH
 Regional Director

LESSEE: *[Signature]*
 KPH KIRIKSHON LYNGKHOI



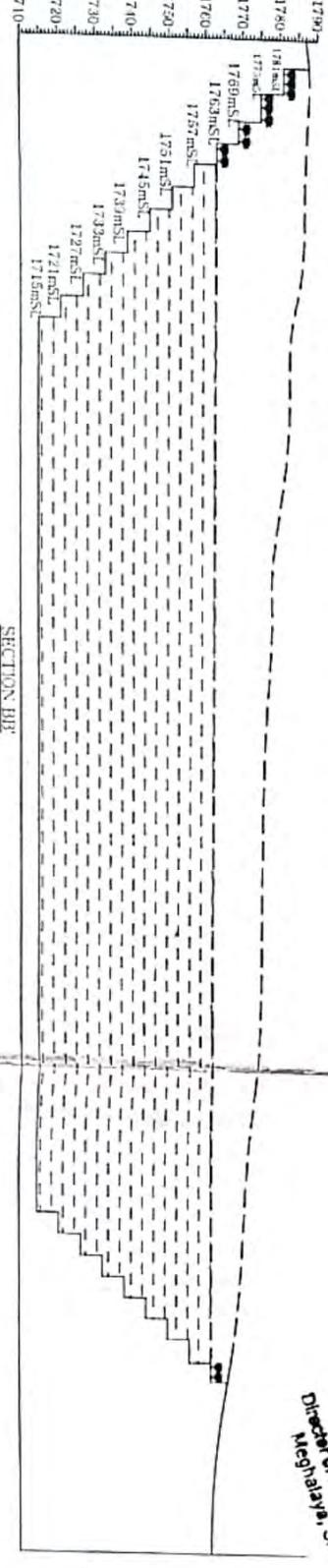
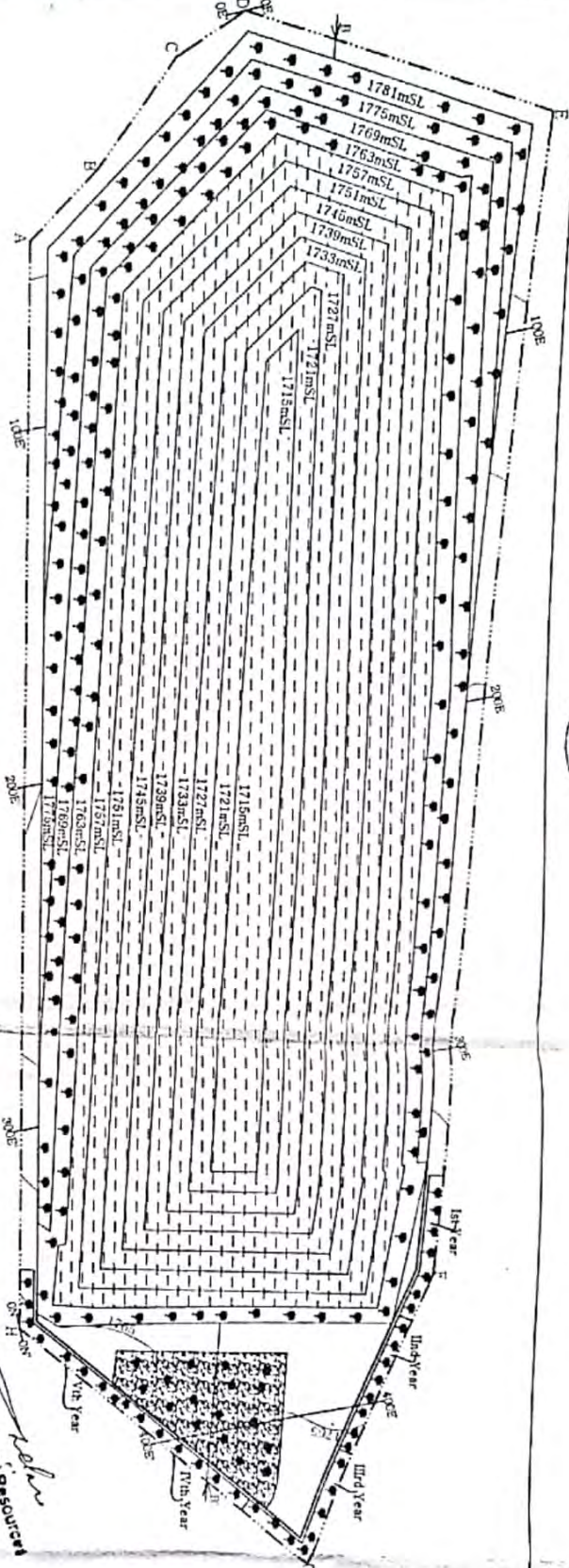
| S. NO | PARTICULARS | SYMBOL |
|-------|---------------------|--------|
| 1 | LEASE BOUNDARY | --- |
| 2 | CONTOUR | |
| 3 | OP & STRIP | ---- |
| 4 | BOULDER STONE | |
| 5 | PROPOSED WASTE DUMP | |
| 6 | PROPOSED PLANTATION | |

Director of Mineral Resources
Meghalaya, Shillong



| | | |
|---|---------------------------|----------|
| COMPOSITE PLAN & YEAR WISE SECTIONS | | PLATE No |
| OF JILLAI MADAN BOULDER STONE MINE IN RELIAGE SYLLAI MADAN LAITKYNSEW SUB DIVISION - PYNURSLA DISTRICT - EAST KHASI HILLS (MEGHALAYA) | | 5 |
| MINERAL - BOULDER STONE | | |
| LESSEE - SHRI KHRIKSHON LYNGKHOI | | |
| AREA : 4.99 Hect. | | |
| LOCATION | | |
| NEAR VILL | : SYLLAI MADAN LAITKYNSEW | |
| SUB DIVISION | : PYNURSLA | |
| DISTRICT | : EAST KHASI HILLS | |
| STATE | : MEGHALAYA | |
| <p>JAIPAL SINGH RDP/AM/318/2013/A</p> <p>LESSEE</p> | | |

APPROVED



Director of Mineral Rights
Meghalaya, Shillong



| S.NO | PARTICULARS | SYMBOL |
|------|---------------------|--------|
| 1 | LEASE BOUNDARY | --- |
| 2 | SPOT LEVEL | 171mSL |
| 3 | CONTOUR | 1:20 |
| 4 | ULTIMATE SETTLEMENT | --- |
| 5 | WATER RESERVOIR | --- |
| 6 | ROAD OR PAVEMENT | --- |
| 7 | PROPOSED PLANTATION | --- |

APPROVED

CONCEPTUAL PLAN
 OF MINERAL RIGHTS TO BE USED FOR
 BY SILLAI MADAN LALITRINSEW
 NEAR VILL. PYNUSILA
 DISTRICT - EAST KHASI HILLS (MEGHALAYA)
 STREET - EAST ROAD HILLS (MEGHALAYA)

MINERAL - BOULDER STONE

LESSEE : SHRI KHIRKSHON LYNGKHOI

AREA : 4.99 Hect

LOCATION : SILLAI MADAN, LALITRINSEW
 NEAR VILL. PYNUSILA
 DISTRICT - EAST KHASI HILLS
 STATE : MEGHALAYA

DATE No 6

LESSEE
 JAIPAL SINGH

Project:- Boulder Stone Mine

Applicant:- Shri Khrikshon Lyngkhoi

ANNEXURE – V

COPY OF CLUSTER CERTIFICATE



Gaurang Environmental Solutions Pvt. Ltd.

Report Ref: GESPL_ /EIA/2022-23/

Rev. No. 00

(07)

**GOVERNMENT OF MEGHALAYA
DIRECTORATE OF MINERAL RESOURCES
SHILLONG**

No. DMR/MM/169/2018/130


Dated Shillong, the ~~13~~²⁵ September 2019

TO WHOM IT MAY CONCERN

It is hereby certified that as on date, the approved mining plans indicated below are located within a distance of 500 meters from the periphery of the approved mining plan on Boulder stone over an area 4.99 hectares located at Syllai Madan, Laitkynsew, Raid Mawlieh, Khyrim Syiemship, District- East Khasi Hills, Meghalaya, of Shri Khrikshon Lyngkhoi, r/o KL Complex, Maccabe Road, Demseiniong, Shillong, District- East Khasi Hills Meghalaya:

| S. No. | Approved mining plan | Area (hectares) | Mineral | Distance from the approved mining plan of Shri Khrikshon Lyngkhoi (metres) |
|--------|-------------------------|-----------------|---------------|--|
| 1 | Shri Khrikshon Lyngkhoi | 4.23 | Boulder stone | 10 |

Yours faithfully,


(P. Ch. Marak)
Mining Engineer,
Directorate of Mineral Resources
Meghalaya::Shillong

6/2

| |
|-------------------------------------|
| Project:- Boulder Stone Mine |
|-------------------------------------|

| |
|--|
| Applicant:- Shri Khrikshon Lyngkhoi |
|--|

ANNEXURE – VI

ENVIRONMENTAL MONITORING

REPORT



| | |
|--|--|
| Gaurang Environmental Solutions Pvt. Ltd. | |
|--|--|

| | |
|---|--|
| Report Ref: GESPL_ /EIA/2022-23/ | |
|---|--|

| |
|--------------------|
| Rev. No. 00 |
|--------------------|



NOIDA TESTING LABORATORIES

(A Government Approved Testing Laboratory)

(An ISO : 9001 : 2015, 14001 : 2015 & ISO 45001 : 2018 & NABL Accredited Laboratory)

MoEF & CC (Ministry of Environment, Forest & Climate Change), UPPCB & HSPCB Recognized Laboratory

+91-9313611642, 8510081921, 7503031145, 8527870572, 7503031146, 9999794369

Analyzing for an Assured Future

| | | |
|------------------------------|---------------|---------------|
| Test Report of | Report Code | Date of Issue |
| Ambient Air Quality Analysis | AAQ-011222-01 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhai
 Project Name: Boulder Stone Mine, 4.99 Hect.
 Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
 District – Meghalaya

Sampling & Analysis Data

Sample Drawn By: NTL Laboratory : Monitoring Period: Dec 2022 – Feb 2023
 Sampling Location: Mine Site : Protocol Used: CPCB Guidelines
 Sampling Plan & Procedure: SOP-AAQ/08 : Sampling Instrument Used: Respirable Dust Sampler (PM₁₀),
 Fine Particulate (PM_{2.5}) Sampler

| S. No. | Monitoring Date | PM10 | PM2.5 | SO ₂ | NO ₂ | CO |
|--------|-----------------|------------------|------------------|-----------------|-----------------|------------------|
| | | IS:5182(Part-23) | IS:5182(Part-24) | IS:5182(Part-2) | IS:5182(Part-6) | IS:5182(Part-10) |
| 1 | 01.12.2022 | 40.6 | 13.78 | 5.82 | 6.18 | 0.57 |
| 2 | 04.12.2022 | 45.74 | 16.69 | 5.89 | 7.26 | 0.52 |
| 3 | 08.12.2022 | 40.8 | 14.73 | 4.91 | 6.38 | 0.51 |
| 4 | 11.12.2022 | 46.7 | 13.76 | 3.93 | 8.29 | 0.49 |
| 5 | 15.12.2022 | 45.75 | 16.82 | 4.97 | 6.64 | 0.54 |
| 6 | 18.12.2022 | 42.63 | 13.84 | 6.02 | 7.83 | 0.57 |
| 7 | 22.12.2022 | 43.52 | 17.92 | 5.97 | 6.28 | 0.51 |
| 8 | 25.12.2022 | 44.14 | 15.69 | 4.88 | 6.32 | 0.58 |
| 9 | 05.01.2023 | 53.25 | 20.16 | 4.89 | 7.34 | 0.5 |
| 10 | 06.01.2023 | 41.36 | 18.25 | 5.86 | 6.52 | 0.53 |
| 11 | 14.01.2023 | 57.14 | 14.11 | 4.92 | 7.39 | 0.48 |
| 12 | 15.01.2023 | 45.5 | 13.88 | 5.93 | 7.46 | 0.51 |
| 13 | 21.01.2023 | 40.29 | 18.83 | 5.01 | 6.46 | 0.54 |
| 14 | 22.01.2023 | 43.69 | 19.86 | 4.96 | 7.48 | 0.54 |
| 15 | 27.01.2023 | 46.77 | 14.02 | 5.85 | 6.43 | 0.55 |
| 16 | 28.01.2023 | 41.25 | 18.98 | 5.86 | 5.31 | 0.51 |
| 17 | 03.02.2023 | 42.63 | 14.09 | 4.83 | 6.29 | 0.47 |
| 18 | 04.02.2023 | 42.25 | 13.86 | 6.02 | 7.39 | 0.55 |
| 19 | 09.02.2023 | 45.75 | 14.72 | 4.82 | 8.22 | 0.52 |
| 20 | 10.02.2023 | 45.21 | 15.28 | 4.83 | 6.33 | 0.52 |
| 21 | 17.02.2023 | 44.15 | 13.68 | 4.87 | 6.35 | 0.52 |
| 22 | 18.02.2023 | 41.245 | 18.13 | 6.18 | 5.25 | 0.59 |
| 23 | 25.02.2023 | 41.63 | 19.84 | 4.86 | 7.39 | 0.49 |
| 24 | 28.02.2023 | 40.38 | 20.92 | 5.97 | 6.42 | 0.54 |
| | Min | 40.29 | 13.68 | 3.93 | 5.25 | 0.47 |

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Laboratory : GT-20, Sector-117, Noida Gautam Budh Nagar - 201301

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Future

| | | | | | |
|--|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|
| Max | 57.14 | 20.92 | 6.18 | 8.29 | 0.59 |
| Avg. | 44.27 | 16.33 | 5.34 | 6.80 | 0.53 |
| 98 percentile | 55.35 | 20.57 | 6.11 | 8.26 | 0.59 |
| NAAQS, For 24 hourly monitoring (except CO for Eight hour) | 100 $\mu\text{g}/\text{m}^3$ | 60 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 2 mg/m^3 |

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Analyzing for an Assured Future

| | | |
|------------------------------|---------------|---------------|
| Test Report of | Report Code | Date of Issue |
| Ambient Air Quality Analysis | AAQ-011222-02 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhai
 Project Name: Boulder Stone Mine, 4.99 Hect.
 Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
 District – Meghalaya

Sampling & Analysis Data

Sample Drawn By: NTL Laboratory : Monitoring Period: Dec 2022 – Feb 2023
 Sampling Location: Pomlum : Protocol Used: CPCB Guidelines
 Sampling Plan & Procedure: SOP-AAQ/08 : Sampling Instrument Used: Respirable Dust Sampler (PM₁₀),
 Fine Particulate (PM_{2.5}) Sampler

| S. No. | Monitoring Date | PM10 | PM2.5 | SO ₂ | NO ₂ | CO |
|--------|-----------------|------------------|------------------|-----------------|-----------------|------------------|
| | | IS:5182(Part-23) | IS:5182(Part-24) | IS:5182(Part-2) | IS:5182(Part-6) | IS:5182(Part-10) |
| 1 | 01.12.2022 | 43.28 | 15.43 | 7.36 | 8.52 | 0.36 |
| 2 | 04.12.2022 | 45.7 | 16.48 | 6.39 | 8.59 | 0.65 |
| 3 | 08.12.2022 | 46.29 | 18.6 | 7.37 | 7.66 | 0.32 |
| 4 | 11.12.2022 | 41.25 | 15.6 | 7.6 | 7.8 | 0.42 |
| 5 | 15.12.2022 | 42.3 | 18.49 | 5.42 | 7.55 | 0.52 |
| 6 | 18.12.2022 | 40.32 | 15.69 | 6.39 | 8.58 | 0.62 |
| 7 | 22.12.2022 | 40.26 | 17.62 | 5.37 | 7.64 | 0.42 |
| 8 | 25.12.2022 | 43.39 | 16.47 | 6.42 | 8.69 | 0.62 |
| 9 | 05.01.2023 | 52.24 | 15.67 | 5.41 | 6.55 | 0.47 |
| 10 | 06.01.2023 | 54.36 | 17.62 | 6.32 | 8.5 | 0.52 |
| 11 | 14.01.2023 | 48.38 | 15.53 | 6.38 | 7.58 | 0.42 |
| 12 | 15.01.2023 | 49.39 | 19.67 | 5.46 | 6.62 | 0.62 |
| 13 | 21.01.2023 | 47.82 | 15.43 | 5.37 | 7.56 | 0.52 |
| 14 | 22.01.2023 | 41.79 | 18.63 | 5.42 | 7.52 | 0.56 |
| 15 | 27.01.2023 | 42.88 | 15.52 | 6.39 | 7.53 | 0.62 |
| 16 | 28.01.2023 | 48.69 | 18.46 | 5.47 | 6.63 | 0.7 |
| 17 | 03.02.2023 | 49.55 | 18.43 | 6.42 | 7.55 | 0.72 |
| 18 | 04.02.2023 | 48.68 | 15.61 | 7.67 | 6.69 | 0.52 |
| 19 | 09.02.2023 | 42.74 | 21.6 | 5.37 | 6.74 | 0.62 |
| 20 | 10.02.2023 | 48.53 | 22.43 | 5.46 | 7.68 | 0.88 |
| 21 | 17.02.2023 | 41.67 | 15.58 | 6.41 | 6.75 | 0.92 |
| 22 | 18.02.2023 | 45.81 | 20.46 | 5.52 | 6.55 | 0.62 |
| 23 | 25.02.2023 | 48.02 | 19.57 | 5.49 | 6.65 | 0.66 |
| 24 | 28.02.2023 | 42.36 | 21.63 | 5.46 | 6.69 | 0.42 |
| Min | | 40.26 | 15.43 | 5.37 | 6.55 | 0.32 |

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|--|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|
| Max | 54.36 | 22.43 | 7.67 | 8.69 | 0.92 |
| Avg. | 45.65 | 17.76 | 6.10 | 7.45 | 0.57 |
| 98 percentile | 53.38 | 22.06 | 7.64 | 8.64 | 0.90 |
| NAAQS, For 24 hourly monitoring (except CO for Eight hour) | 100 $\mu\text{g}/\text{m}^3$ | 60 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 2 mg/m^3 |

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Analyzing for an Assured Future

| | | |
|------------------------------|---------------|---------------|
| Test Report of | Report Code | Date of Issue |
| Ambient Air Quality Analysis | AAQ-011222-03 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhai
 Project Name: Boulder Stone Mine, 4.99 Hect.
 Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
 District – Meghalaya

Sampling & Analysis Data

Sample Drawn By: NTL Laboratory : Monitoring Period: Dec 2022 – Feb 2023
 Sampling Location: Mawkajem : Protocol Used: CPCB Guidelines
 Sampling Plan & Procedure: SOP-AAQ/08 : Sampling Instrument Used: Respirable Dust Sampler (PM₁₀),
 Fine Particulate (PM_{2.5}) Sampler

| S. No. | Monitoring Date | PM10 | PM2.5 | SO ₂ | NO ₂ | CO |
|--------|-----------------|------------------|------------------|-----------------|-----------------|------------------|
| | | IS:5182(Part-23) | IS:5182(Part-24) | IS:5182(Part-2) | IS:5182(Part-6) | IS:5182(Part-10) |
| 1 | 01.12.2022 | 36.63 | 16.52 | 5.21 | 6.53 | 0.55 |
| 2 | 04.12.2022 | 42.58 | 14.78 | 4.93 | 7.48 | 0.46 |
| 3 | 08.12.2022 | 36.02 | 22.4 | 6.5 | 7.09 | 0.49 |
| 4 | 11.12.2022 | 40.63 | 14.63 | 5.32 | 8.11 | 0.52 |
| 5 | 15.12.2022 | 45.63 | 15.63 | 6.25 | 8.2 | 0.47 |
| 6 | 18.12.2022 | 32.58 | 15.24 | 5.48 | 6.23 | 0.5 |
| 7 | 22.12.2022 | 49.5 | 22.33 | 5.96 | 6.78 | 0.55 |
| 8 | 25.12.2022 | 50.75 | 15.24 | 5.47 | 8.86 | 0.53 |
| 9 | 05.01.2023 | 42.5 | 14.25 | 5.66 | 6.58 | 0.51 |
| 10 | 06.01.2023 | 41.17 | 18.44 | 6.12 | 7.52 | 0.47 |
| 11 | 14.01.2023 | 36.52 | 13.89 | 4.8 | 7.45 | 0.45 |
| 12 | 15.01.2023 | 42.35 | 15.6 | 6.3 | 6.14 | 0.53 |
| 13 | 21.01.2023 | 40.63 | 13.79 | 6.25 | 8.5 | 0.51 |
| 14 | 22.01.2023 | 41.06 | 14.65 | 5.89 | 6.9 | 0.55 |
| 15 | 27.01.2023 | 40.2 | 19.78 | 5.74 | 7.52 | 0.49 |
| 16 | 28.01.2023 | 38.35 | 16.24 | 5.23 | 7.63 | 0.54 |
| 17 | 03.02.2023 | 42.41 | 14.85 | 5.24 | 6.58 | 0.52 |
| 18 | 04.02.2023 | 46.52 | 20.54 | 4.96 | 6.93 | 0.49 |
| 19 | 09.02.2023 | 39.52 | 16.53 | 4.99 | 7.96 | 0.48 |
| 20 | 10.02.2023 | 40.8 | 19.56 | 5.63 | 8.12 | 0.45 |
| 21 | 17.02.2023 | 42.63 | 21.74 | 5.78 | 8.14 | 0.54 |
| 22 | 18.02.2023 | 40.58 | 17.65 | 5.47 | 7.65 | 0.52 |
| 23 | 25.02.2023 | 38.42 | 20.12 | 5.89 | 7.43 | 0.52 |
| 24 | 28.02.2023 | 43.52 | 20.63 | 6.11 | 8.42 | 0.5 |
| Min | | 32.58 | 13.79 | 4.8 | 6.14 | 0.45 |

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Branch Office : IP-2, Haridwar, Uttarakhand

Branch Office : Gayatri Nagar, Katgodam, Haldwani, Uttarakhand

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Analyzing for an Assured
Future

| | | | | | |
|--|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|
| Max | 50.75 | 22.4 | 6.5 | 8.86 | 0.55 |
| Avg. | 41.31 | 17.29 | 5.63 | 7.45 | 0.51 |
| 98 percentile | 50.18 | 22.37 | 6.41 | 8.69 | 0.55 |
| NAAQS, For 24 hourly monitoring (except CO for Eight hour) | 100 $\mu\text{g}/\text{m}^3$ | 60 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 2 mg/m^3 |

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Analyzing for an Assured
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| | | |
|------------------------------|---------------|---------------|
| Test Report of | Report Code | Date of Issue |
| Ambient Air Quality Analysis | AAQ-011222-04 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhoi
 Project Name: Boulder Stone Mine, 4.99 Hect.
 Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
 District – Meghalaya

Sampling & Analysis Data

Sample Drawn By: NTL Laboratory : Monitoring Period: Dec 2022 – Feb 2023
 Sampling Location: Dymmiew : Protocol Used: CPCB Guidelines
 Sampling Plan & Procedure: SOP-AAQ/08 : Sampling Instrument Used: Respirable Dust Sampler (PM₁₀),
 Fine Particulate (PM_{2.5}) Sampler

| S. No. | Monitoring Date | PM10 | PM2.5 | SO ₂ | NO ₂ | CO |
|--------|-----------------|------------------|------------------|-----------------|-----------------|------------------|
| | | IS:5182(Part-23) | IS:5182(Part-24) | IS:5182(Part-2) | IS:5182(Part-6) | IS:5182(Part-10) |
| 1 | 01.12.2022 | 48.63 | 16.52 | 5.21 | 8.53 | 0.55 |
| 2 | 04.12.2022 | 42.58 | 14.78 | 4.93 | 7.48 | 0.46 |
| 3 | 08.12.2022 | 36.02 | 19.4 | 6.5 | 7.09 | 0.49 |
| 4 | 11.12.2022 | 46.3 | 14.2 | 7.6 | 10.2 | 0.51 |
| 5 | 15.12.2022 | 38.21 | 19.75 | 6.22 | 9.65 | 0.79 |
| 6 | 18.12.2022 | 47.68 | 19.72 | 8.26 | 11.62 | 0.68 |
| 7 | 22.12.2022 | 48.66 | 17.74 | 8.3 | 8.63 | 0.63 |
| 8 | 25.12.2022 | 48.45 | 19.7 | 8.36 | 9.64 | 0.62 |
| 9 | 05.01.2023 | 47.62 | 17.78 | 5.31 | 9.63 | 0.59 |
| 10 | 06.01.2023 | 47.6 | 19.8 | 4.33 | 10.69 | 0.72 |
| 11 | 14.01.2023 | 47.69 | 18.85 | 6.34 | 9.74 | 0.75 |
| 12 | 15.01.2023 | 47.63 | 19.82 | 7.4 | 7.64 | 0.63 |
| 13 | 21.01.2023 | 45.65 | 13.88 | 8.32 | 7.66 | 0.56 |
| 14 | 22.01.2023 | 46.12 | 19.84 | 7.2 | 12.02 | 0.67 |
| 15 | 27.01.2023 | 48.24 | 13.76 | 7.38 | 9.64 | 0.53 |
| 16 | 28.01.2023 | 42.68 | 19.85 | 8.4 | 8.66 | 0.56 |
| 17 | 03.02.2023 | 39.73 | 16.88 | 8.39 | 11.85 | 0.75 |
| 18 | 04.02.2023 | 47.68 | 18.84 | 8.42 | 7.69 | 0.65 |
| 19 | 09.02.2023 | 48.35 | 19.76 | 7.46 | 12.63 | 0.54 |
| 20 | 10.02.2023 | 49.15 | 17.73 | 7.58 | 8.66 | 0.62 |
| 21 | 17.02.2023 | 47.71 | 16.84 | 8.44 | 12.64 | 0.59 |
| 22 | 18.02.2023 | 44.74 | 19.88 | 7.28 | 7.62 | 0.76 |
| 23 | 25.02.2023 | 47.71 | 20.84 | 7.33 | 8.67 | 0.52 |
| 24 | 28.02.2023 | 46.11 | 18.83 | 8.29 | 11.61 | 0.62 |
| Min | | 36.02 | 13.76 | 4.33 | 7.09 | 0.46 |
| Max | | 49.15 | 20.84 | 8.44 | 12.64 | 0.79 |

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Branch Office : Gayatri Nagar, Katgodam, Haldwani, Uttarakhand

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Analyzing for an Assured
Future

| | | | | | |
|--|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|
| Avg. | 45.87 | 18.12 | 7.22 | 9.58 | 0.62 |
| 98 percentile | 48.92 | 20.40 | 8.43 | 12.64 | 0.78 |
| NAAQS, For 24 hourly monitoring (except CO for Eight hour) | 100 $\mu\text{g}/\text{m}^3$ | 60 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 2 mg/m^3 |

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Branch Office : Gayatri Nagar, Katgodam, Haldwani, Uttrakhand

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| | | |
|------------------------------|---------------|---------------|
| Test Report of | Report Code | Date of Issue |
| Ambient Air Quality Analysis | AAQ-061222-05 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhai
 Project Name: Boulder Stone Mine, 4.99 Hect.
 Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
 District – Meghalaya

Sampling & Analysis Data

Sample Drawn By: NTL Laboratory : Monitoring Period: Dec 2022 – Feb 2023
 Sampling Location: Umktieh : Protocol Used: CPCB Guidelines
 Sampling Plan & Procedure: SOP-AAQ/08 : Sampling Instrument Used: Respirable Dust Sampler (PM₁₀),
 Fine Particulate (PM_{2.5}) Sampler

| S. No. | Monitoring Date | PM10 | PM2.5 | SO ₂ | NO ₂ | CO |
|--------|-----------------|------------------|------------------|-----------------|-----------------|------------------|
| | | IS:5182(Part-23) | IS:5182(Part-24) | IS:5182(Part-2) | IS:5182(Part-6) | IS:5182(Part-10) |
| 1 | 06.12.2022 | 32.69 | 25.8 | 5.46 | 8.44 | 0.79 |
| 2 | 07.12.2022 | 47.36 | 22.63 | 6.12 | 9.42 | 0.82 |
| 3 | 14.12.2022 | 45.11 | 23.12 | 6.15 | 10.46 | 0.73 |
| 4 | 15.12.2022 | 46.32 | 25.89 | 5.16 | 10.41 | 0.71 |
| 5 | 25.12.2022 | 46.39 | 23.46 | 7.17 | 9.46 | 0.67 |
| 6 | 26.12.2022 | 45.34 | 24.13 | 4.26 | 8.83 | 0.65 |
| 7 | 30.12.2022 | 46.4 | 24.91 | 4.26 | 9.5 | 0.61 |
| 8 | 31.12.2022 | 47.4 | 23.28 | 7.23 | 10.42 | 0.58 |
| 9 | 02.01.2023 | 48.37 | 24.67 | 7.17 | 9.46 | 0.59 |
| 10 | 03.01.2023 | 46.3 | 22.61 | 6.26 | 10.45 | 0.53 |
| 11 | 09.01.2023 | 48.33 | 27.54 | 5.12 | 10.4 | 0.48 |
| 12 | 10.01.2023 | 47.38 | 23.56 | 6.15 | 9.52 | 0.51 |
| 13 | 19.01.2023 | 46.31 | 24.34 | 6.19 | 8.58 | 0.54 |
| 14 | 20.01.2023 | 47.45 | 23.82 | 6.2 | 9.43 | 0.54 |
| 15 | 24.01.2023 | 45.42 | 22.69 | 5.24 | 8.44 | 0.55 |
| 16 | 25.01.2023 | 43.38 | 26.73 | 6.26 | 8.46 | 0.51 |
| 17 | 01.02.2023 | 48.69 | 22.7 | 4.24 | 9.49 | 0.47 |
| 18 | 02.02.2023 | 42.37 | 24.6 | 7.23 | 9.53 | 0.55 |
| 19 | 06.02.2023 | 45.42 | 22.63 | 7.16 | 9.47 | 0.52 |
| 20 | 07.02.2023 | 47.21 | 25.66 | 8.14 | 8.49 | 0.52 |
| 21 | 16.02.2023 | 48.46 | 24.72 | 6.19 | 8.43 | 0.52 |
| 22 | 17.02.2023 | 47.56 | 23.71 | 6.23 | 10.46 | 0.59 |
| 23 | 23.02.2023 | 46.35 | 26.73 | 5.14 | 9.47 | 0.49 |
| 24 | 24.02.2023 | 42.19 | 26.68 | 5.16 | 9.41 | 0.54 |
| | Min | 32.69 | 22.61 | 4.24 | 8.43 | 0.47 |

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| | | | | | |
|--|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|
| Max | 48.69 | 27.54 | 8.14 | 10.46 | 0.82 |
| Avg. | 45.76 | 24.44 | 6.00 | 9.43 | 0.58 |
| 98 percentile | 48.58 | 27.17 | 7.72 | 10.46 | 0.81 |
| NAAQS, For 24 hourly monitoring (except CO for Eight hour) | 100 $\mu\text{g}/\text{m}^3$ | 60 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 2 mg/m^3 |

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| | | |
|-------------------------------------|----------------------|----------------------|
| Test Report of | Report Code | Date of Issue |
| Ambient Air Quality Analysis | AAQ-061222-06 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhoi
Project Name: Boulder Stone Mine, 4.99 Hect.
Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
District – Meghalaya

Sampling & Analysis Data

Sample Drawn By NTL Laboratory : **Monitoring Period** Dec 2022 – Feb 2023
Sampling Location Lewmawiong : **Protocol Used** CPCB Guidelines
Sampling Plan & Procedure SOP-AAQ/08 : **Sampling Instrument Used** Respirable Dust Sampler (PM₁₀),
Fine Particulate (PM_{2.5}) Sampler

| S. No. | Monitoring Date | PM10 | PM2.5 | SO ₂ | NO ₂ | CO |
|------------|-----------------|------------------|------------------|-----------------|-----------------|------------------|
| | | IS:5182(Part-23) | IS:5182(Part-24) | IS:5182(Part-2) | IS:5182(Part-6) | IS:5182(Part-10) |
| 1 | 06.12.2022 | 40.22 | 16.4 | 5.35 | 8.54 | 0.72 |
| 2 | 07.12.2022 | 38.46 | 14.32 | 6.84 | 9.94 | 0.85 |
| 3 | 14.12.2022 | 41.45 | 15.36 | 7.82 | 10.97 | 0.75 |
| 4 | 15.12.2022 | 42.28 | 14.35 | 6.83 | 9.93 | 0.63 |
| 5 | 25.12.2022 | 35.41 | 18.37 | 7.81 | 8.94 | 0.78 |
| 6 | 26.12.2022 | 42.69 | 14.35 | 6.89 | 9.96 | 0.73 |
| 7 | 30.12.2022 | 43.11 | 19.39 | 7.83 | 10.24 | 0.67 |
| 8 | 31.12.2022 | 43.21 | 14.38 | 5.87 | 9.97 | 0.58 |
| 9 | 02.01.2023 | 38.58 | 21.38 | 7.8 | 9.93 | 0.69 |
| 10 | 03.01.2023 | 44.12 | 14.39 | 6.9 | 8.99 | 0.64 |
| 11 | 09.01.2023 | 42.4 | 15.37 | 7.87 | 8.97 | 0.59 |
| 12 | 10.01.2023 | 41.47 | 14.4 | 7.88 | 9.94 | 0.65 |
| 13 | 19.01.2023 | 38.46 | 15.39 | 7.89 | 10.93 | 0.51 |
| 14 | 20.01.2023 | 39.55 | 20.42 | 6.89 | 9.91 | 0.63 |
| 15 | 24.01.2023 | 37.05 | 16.35 | 7.24 | 10.96 | 0.52 |
| 16 | 25.01.2023 | 41.56 | 14.36 | 5.94 | 9.97 | 0.58 |
| 17 | 01.02.2023 | 36.04 | 16.43 | 7.83 | 10.98 | 0.57 |
| 18 | 02.02.2023 | 43.28 | 20.42 | 5.82 | 9.96 | 0.56 |
| 19 | 06.02.2023 | 43.16 | 18.39 | 6.84 | 9.99 | 0.58 |
| 20 | 07.02.2023 | 45.02 | 14.37 | 5.87 | 8.97 | 0.49 |
| 21 | 16.02.2023 | 41.47 | 21.03 | 6.83 | 8.96 | 0.54 |
| 22 | 17.02.2023 | 42.5 | 14.42 | 5.88 | 10.94 | 0.56 |
| 23 | 23.02.2023 | 41.44 | 20.48 | 6.87 | 10.93 | 0.55 |
| 24 | 24.02.2023 | 40.47 | 14.34 | 5.8 | 9.9 | 0.47 |
| Min | | 35.41 | 14.32 | 5.35 | 8.54 | 0.47 |
| Max | | 45.02 | 21.38 | 7.89 | 10.98 | 0.85 |

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| | | | | | |
|--|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|
| Avg. | 40.98 | 16.62 | 6.89 | 9.95 | 0.62 |
| 98 percentile | 44.61 | 21.22 | 7.89 | 10.98 | 0.82 |
| NAAQS, For 24 hourly monitoring (except CO for Eight hour) | 100 $\mu\text{g}/\text{m}^3$ | 60 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 2 mg/m^3 |

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| | | |
|-------------------------------------|----------------------|----------------------|
| Test Report of | Report Code | Date of Issue |
| Ambient Air Quality Analysis | AAQ-061222-07 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhoi
Project Name: Boulder Stone Mine, 4.99 Hect.
Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
District – Meghalaya

Sampling & Analysis Data

Sample Drawn By NTL Laboratory : **Monitoring Period** Dec 2022 – Feb 2023
Sampling Location Setthliew : **Protocol Used** CPCB Guidelines
Sampling Plan & Procedure SOP-AAQ/08 : **Sampling Instrument Used** Respirable Dust Sampler (PM₁₀),
Fine Particulate (PM_{2.5}) Sampler

| S. No. | Monitoring Date | PM10 | PM2.5 | SO ₂ | NO ₂ | CO |
|------------|-----------------|------------------|------------------|-----------------|-----------------|------------------|
| | | IS:5182(Part-23) | IS:5182(Part-24) | IS:5182(Part-2) | IS:5182(Part-6) | IS:5182(Part-10) |
| 1 | 06.12.2022 | 45.12 | 18.4 | 5.18 | 9.6 | 0.81 |
| 2 | 07.12.2022 | 44.98 | 16.78 | 6.48 | 8.84 | 0.78 |
| 3 | 14.12.2022 | 49.23 | 17.74 | 5.42 | 9.83 | 0.65 |
| 4 | 15.12.2022 | 44.86 | 16.72 | 7.45 | 8.88 | 0.56 |
| 5 | 25.12.2022 | 44.86 | 18.78 | 5.48 | 9.89 | 0.71 |
| 6 | 26.12.2022 | 45.01 | 20.77 | 6.49 | 10.87 | 0.74 |
| 7 | 30.12.2022 | 44.92 | 19.8 | 7.47 | 8.85 | 0.69 |
| 8 | 31.12.2022 | 44.89 | 16.74 | 5.03 | 9.82 | 0.55 |
| 9 | 02.01.2023 | 53.4 | 21.73 | 6.41 | 8.84 | 0.83 |
| 10 | 03.01.2023 | 44.88 | 16.8 | 5.42 | 9.83 | 0.85 |
| 11 | 09.01.2023 | 44.96 | 23.84 | 6.45 | 10.9 | 0.81 |
| 12 | 10.01.2023 | 40.92 | 16.82 | 5.5 | 10.88 | 0.76 |
| 13 | 19.01.2023 | 44.95 | 18.92 | 7.47 | 9.83 | 0.62 |
| 14 | 20.01.2023 | 45.03 | 16.93 | 6.53 | 8.84 | 0.85 |
| 15 | 24.01.2023 | 40.96 | 17.88 | 5.49 | 9.92 | 0.76 |
| 16 | 25.01.2023 | 45.08 | 18.79 | 7.54 | 10.85 | 0.69 |
| 17 | 01.02.2023 | 42.87 | 16.74 | 5.47 | 9.87 | 0.71 |
| 18 | 02.02.2023 | 44.86 | 18.78 | 7.42 | 9.83 | 0.62 |
| 19 | 06.02.2023 | 44.83 | 22.84 | 6.43 | 10.82 | 0.92 |
| 20 | 07.02.2023 | 42.91 | 18.89 | 5.59 | 9.92 | 0.81 |
| 21 | 16.02.2023 | 44.96 | 16.93 | 6.48 | 8.88 | 0.48 |
| 22 | 17.02.2023 | 45.03 | 21.78 | 5.47 | 8.85 | 0.61 |
| 23 | 23.02.2023 | 44.8 | 16.8 | 6.44 | 9.87 | 0.52 |
| 24 | 24.02.2023 | 44.86 | 20.7 | 5.25 | 10.8 | 0.48 |
| Min | | 40.92 | 16.72 | 5.03 | 8.84 | 0.48 |
| Max | | 53.4 | 23.84 | 7.54 | 10.9 | 0.92 |

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| | | | | | |
|--|------------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------|
| Avg. | 44.97 | 18.79 | 6.18 | 9.80 | 0.70 |
| 98 percentile | 51.48 | 23.38 | 7.51 | 10.89 | 0.89 |
| NAAQS, For 24 hourly monitoring (except CO for Eight hour) | 100 $\mu\text{g}/\text{m}^3$ | 60 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 80 $\mu\text{g}/\text{m}^3$ | 2 mg/m^3 |

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| | | |
|-----------------------|---------------------|----------------------|
| Test Report of | Report Code | Date of Issue |
| Water | W-180223-010 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhoi
Project Name: Boulder Stone Mine, 4.99 Hect.
Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
District – Meghalaya

SAMPLING & ANALYSIS DATA

Sample Received on : 17/02/2023
Sample Drawn By : NTL Representative
Sample Quantity : 2.0 lit. + 500 ml.
Analysis Duration : 18/02/2023 to 25/02/2023
Sample Description : Ground Water

TEST RESULTS

| S. No. | Parameter | Test method | Result | | | | Unit | Acceptable Limit | Permissible Limit |
|---|-------------------------------------|---------------------|-----------|-----------|-----------|-----------|------------|------------------|-------------------|
| | | | Mine Site | Pomlum | Mawkaj em | Dym miew | | | |
| Organoleptic & Physical Parameters | | | | | | | | | |
| 1. | Colour | IS-3025(P-04) | <1.0 | <1.0 | <1.0 | <1.0 | Hazen Unit | 5 | 15 |
| 2. | Odour | IS-3025(P-05) | Agreeable | Agreeable | Agreeable | Agreeable | - | Agreeable | Agreeable |
| 3. | Taste | IS-3025(P-07 & 08) | Agreeable | Agreeable | Agreeable | Agreeable | - | Agreeable | - |
| 4. | Turbidity | IS-3025(P-10) | <1.0 | <1.0 | <1 | <1 | NTU | 1 | 5 |
| 5. | pH value | IS-3025(P-04) | 7.54 | 7.16 | 7.35 | 6.98 | - | 6.5-8.5 | - |
| 6. | Total Dissolve Solid (TDS) | IS-3025(P-16) | 389.2 | 321.0 | 402.0 | 241.9 | mg/l | 500 | 2000 |
| General Properties | | | | | | | | | |
| 7. | Aluminum (as Al) | IS:3025 (P- 55) | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | 0.03 | 0.2 |
| 8. | Total Ammonia | IS:3025 (P- 34) | <0.10 | <0.10 | <0.10 | <0.10 | mg/l | 0.5 | No Relaxation |
| 9. | Anionic surface Detergents(as MBAS) | Annex K of IS-13428 | <0.10 | <0.10 | <0.10 | <0.10 | mg/l | 0.2 | 1.0 |
| 10. | Barium (as Ba) | IS: 15302 | <0.10 | <0.10 | <0.10 | <0.10 | mg/l | 0.7 | No Relaxation |
| 11. | Boron (as B) | IS:3025 (P- 57) | <0.10 | <0.10 | <0.10 | <0.10 | mg/l | 0.5 | 2.4 |
| 12. | Calcium(as Ca) | IS:3025 (P- 40) | 56.95 | 56.95 | 54.32 | 61.47 | mg/l | 75 | 200 |
| 13. | Chloramines (as Cl2) | IS:3025 (P- 26) | <1.0 | <1.0 | <1.0 | <1.0 | mg/l | 4.0 | No Relaxation |
| 14. | Chloride (as Cl) | IS:3025 (P- 32) | 15.73 | 14.62 | 14.69 | 13.95 | mg/l | 250 | 1000 |
| 15. | Copper (as Cu) | IS :3025 (P-42) | <0.05 | <0.05 | <0.05 | <0.05 | mg/l | 0.05 | 1.5 |
| 16. | Fluoride(as F) | IS: 3025 (P-60) | 0.38 | 0.31 | 0.28 | 0.32 | mg/l | 1.0 | 1.5 |
| 17. | Free Residual Chlorine | IS: 3025 (P-26) | <0.1 | <0.1 | <0.1 | <0.1 | mg/l | 0.2 | 1.0 |
| 18. | Iron (as Fe) | IS: 3025(P-53) | 0.129 | 0.124 | 0.132 | 0.129 | mg/l | 1.0 | No Relaxation |
| 19. | Magnesium (as mg) | IS: 3025 (P-46) | 3.84 | 3.79 | 4.10 | 4.18 | mg/l | 30 | 100 |
| 20. | Manganese (as Mn) | Clause 35 of IS | <0.1 | <0.1 | <0.1 | <0.1 | mg/l | 0.1 | 0.3 |

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| | | 3025 | | | | | | | |
|---|--|----------------------|---------|---------|---------|---------|------|--------------|---------------|
| 21. | Mineral Oil | Clause 6 of IS: 3025 | <0.50 | <0.50 | <0.50 | <0.50 | mg/l | 0.5 | No Relaxation |
| 22. | Nitrate (as NO ₃) | IS: 3025 (P- 34) | 0.32 | 0.31 | 0.30 | 0.32 | mg/l | 45 | No Relaxation |
| 23. | Selenium (as Se) | IS:3025 (P- 56) | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | 0.01 | No Relaxation |
| 24. | Silver (as Ag) | AnnexIS: 13428 | <0.05 | <0.05 | <0.05 | <0.05 | mg/l | 0.1 | No Relaxation |
| 25. | Sulphate (as SO ₄) | IS:3025 (P- 24) | 26.75 | 24.65 | 26.82 | 26.83 | mg/l | 200 | 400 |
| 26. | Sulphide(as H ₂ S) | IS-3025 (P-29) | <0.05 | <0.05 | <0.05 | <0.05 | mg/l | 0.05 | No Relaxation |
| 27. | Alkalinity(as Ca CO ₃) | IS:3025 (P- 23) | 201.0 | 194.0 | 187.0 | 187.0 | mg/l | 200 | 600 |
| 28. | Total Hardness (as CaCO ₃) | IS:3025 (P- 23) | 174.0 | 167.0 | 164.0 | 165.0 | mg/l | 200 | 600 |
| 29. | Zinc (as Zn) | IS:3025 (P- 49) | 0.162 | 0.159 | 0.151 | 0.148 | mg/l | 5 | 15 |
| Parameters Concerning Toxic Substances | | | | | | | | | |
| 30. | Cadmium (as Cd) | IS-3025(P-41) | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | 0.003 | No Relaxation |
| 31. | Cyanide (as CN) | IS-3025(P-27) | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | 0.05 | No Relaxation |
| 32. | Phenol | IS: 3025 (P- 43) | <0.001 | <0.001 | <0.001 | <0.001 | mg/l | 0.001 | 0.002 |
| 33. | Lead (as Pb) | IS-3025(P-47) | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | 0.01 | No Relaxation |
| 34. | Mercury (as Hg) | IS-3025(P-48) | <0.001 | <0.001 | <0.001 | <0.001 | mg/l | 0.001 | No Relaxation |
| 35. | Molybdenum (Mo) | IS-3025(P-2) | <0.05 | <0.05 | <0.05 | <0.05 | mg/l | 0.07 | No Relaxation |
| 36. | Nickel (as Ni) | Annex L of IS-13428 | <0.01 | <0.01 | <0.01 | <0.01 | mg/l | 0.02 | No Relaxation |
| 37. | Poly nuclear Aromatic | APHA 6440 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | mg/l | 0.0001 | No Relaxation |
| 38. | Poly chlorinated biphenyl | APHA 6630 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | mg/l | 0.0005 | No Relaxation |
| MICROBIOLOGICAL PARAMETERS | | | | | | | | | |
| 39. | <i>Escherichia coli</i> | IS-15185 | Absent | Absent | Absent | Absent | | Absent/100ml | |
| 40. | <i>Coliform Bacteria</i> | IS-15185 | Absent | Absent | Absent | Absent | | Absent/100ml | |

BDL- Below Detection Limit

Notes:-

1. The results given above are related to the tested sample, as received & mentioned parameters. The customer asked for the above tests only.
2. Responsibility of the Laboratory is limited to the invoiced amount only.
3. This test report will not be generated again, either wholly or in part, without prior written permission of the laboratory.
4. The test samples will be disposed off after two weeks from the date of issue of test report, unless until specified by the customer.

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| Test Report of | Report Code | Date of Issue |
|----------------|--------------|---------------|
| Water | W-180223-011 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhoi
Project Name: Boulder Stone Mine, 4.99 Hect.
Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
District – Meghalaya

SAMPLING & ANALYSIS DATA

Sample Received on : 17/02/2023
Sample Drawn By : NTL Representative
Sample Quantity : 2.0 lit. + 500 ml.
Analysis Duration : 18/02/2023 to 25/02/2023
Sample Description : Ground Water

| TEST RESULTS | | | | | | | | |
|---|----------------------------|--------------------|-----------|------------|-----------|------------|------------------|-------------------|
| S. No. | Parameter | Test method | Result | | | Unit | Acceptable Limit | Permissible Limit |
| | | | Umktich | Lewmawiong | Setthliew | | | |
| Organoleptic & Physical Parameters | | | | | | | | |
| 1. | Colour | IS-3025(P-04) | <1.0 | <1.0 | <1.0 | Hazen Unit | 5 | 15 |
| 2. | Odour | IS-3025(P-05) | Agreeable | Agreeable | Agreeable | - | Agreeable | Agreeable |
| 3. | Taste | IS-3025(P-07 & 08) | Agreeable | Agreeable | Agreeable | - | Agreeable | - |
| 4. | Turbidity | IS-3025(P-10) | <1.0 | <1.0 | <1 | NTU | 1 | 5 |
| 5. | pH value | IS-3025(P-04) | 7.48 | 7.18 | 6.93 | - | 6.5-8.5 | - |
| 6. | Total Dissolve Solid (TDS) | IS-3025(P-16) | 325.0 | 380.0 | 260.0 | mg/l | 500 | 2000 |

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| General Properties | | | | | | | | |
|--|--|----------------------|---------|---------|---------|------|--------------|---------------|
| 7. | Aluminum (as Al) | IS:3025 (P- 55) | <0.01 | <0.01 | <0.01 | mg/l | 0.03 | 0.2 |
| 8. | Total Ammonia | IS:3025 (P- 34) | <0.10 | <0.10 | <0.10 | mg/l | 0.5 | No Relaxation |
| 9. | Anionic surface Detergents(as MBAS) | Annex K of IS-13428 | <0.10 | <0.10 | <0.10 | mg/l | 0.2 | 1.0 |
| 10. | Barium (as Ba) | IS: 15302 | <0.10 | <0.10 | <0.10 | mg/l | 0.7 | No Relaxation |
| 11. | Boron (as B) | IS:3025 (P- 57) | <0.10 | <0.10 | <0.10 | mg/l | 0.5 | 2.4 |
| 12. | Calcium(as Ca) | IS:3025 (P- 40) | 65.27 | 56.82 | 52.39 | mg/l | 75 | 200 |
| 13. | Chloramines (as Cl ₂) | IS:3025 (P- 26) | <1.0 | <1.0 | <1.0 | mg/l | 4.0 | No Relaxation |
| 14. | Chloride (as Cl) | IS:3025 (P- 32) | 16.26 | 14.39 | 13.82 | mg/l | 250 | 1000 |
| 15. | Copper (as Cu) | IS :3025 (P-42) | <0.05 | <0.05 | <0.05 | mg/l | 0.05 | 1.5 |
| 16. | Fluoride(as F) | IS: 3025 (P-60) | 0.29 | 0.30 | 0.28 | mg/l | 1.0 | 1.5 |
| 17. | Free Residual Chlorine | IS: 3025 (P-26) | <0.1 | <0.1 | <0.1 | mg/l | 0.2 | 1.0 |
| 18. | Iron (as Fe) | IS: 3025(P-53) | 0.128 | 0.121 | 0.120 | mg/l | 1.0 | No Relaxation |
| 19. | Magnesium (as mg) | IS: 3025 (P-46) | 3.92 | 4.06 | 3.65 | mg/l | 30 | 100 |
| 20. | Manganese (as Mn) | Clause 35 of IS 3025 | <0.1 | <0.1 | <0.1 | mg/l | 0.1 | 0.3 |
| 21. | Mineral Oil | Clause 6 of IS: 3025 | <0.50 | <0.50 | <0.50 | mg/l | 0.5 | No Relaxation |
| 22. | Nitrate (as NO ₃) | IS: 3025 (P- 34) | 0.33 | 0.31 | 0.30 | mg/l | 45 | No Relaxation |
| 23. | Selenium (as Se) | IS:3025 (P- 56) | <0.01 | <0.01 | <0.01 | mg/l | 0.01 | No Relaxation |
| 24. | Silver (as Ag) | AnnexIS: 13428 | <0.05 | <0.05 | <0.05 | mg/l | 0.1 | No Relaxation |
| 25. | Sulphate (as SO ₄) | IS:3025 (P- 24) | 25.81 | 23.92 | 22.87 | mg/l | 200 | 400 |
| 26. | Sulphide(as H ₂ S) | IS-3025 (P-29) | <0.05 | <0.05 | <0.05 | mg/l | 0.05 | No Relaxation |
| 27. | Alkalinity(as Ca CO ₃) | IS:3025 (P- 23) | 189.0 | 176.0 | 179.0 | mg/l | 200 | 600 |
| 28. | Total Hardness (as CaCO ₃) | IS:3025 (P- 23) | 173.0 | 161.0 | 160.0 | mg/l | 200 | 600 |
| 29. | Zinc (as Zn) | IS:3025 (P- 49) | 0.162 | 0.154 | 0.152 | mg/l | 5 | 15 |
| Parameters Concerning Toxic Substances | | | | | | | | |
| 30. | Cadmium (as Cd) | IS-3025(P-41) | <0.01 | <0.01 | <0.01 | mg/l | 0.003 | No Relaxation |
| 31. | Cyanide (as CN) | IS-3025(P-27) | <0.01 | <0.01 | <0.01 | mg/l | 0.05 | No Relaxation |
| 32. | Phenol | IS: 3025 (P- 43) | <0.001 | <0.001 | <0.001 | mg/l | 0.001 | 0.002 |
| 33. | Lead (as Pb) | IS-3025(P-47) | <0.01 | <0.01 | <0.01 | mg/l | 0.01 | No Relaxation |
| 34. | Mercury (as Hg) | IS-3025(P-48) | <0.001 | <0.001 | <0.001 | mg/l | 0.001 | No Relaxation |
| 35. | Molybdenum (Mo) | IS-3025(P-2) | <0.05 | <0.05 | <0.05 | mg/l | 0.07 | No Relaxation |
| 36. | Nickel (as Ni) | Annex L of IS-13428 | <0.01 | <0.01 | <0.01 | mg/l | 0.02 | No Relaxation |
| 37. | Poly nuclear Aromatic | APHA 6440 | <0.0001 | <0.0001 | <0.0001 | mg/l | 0.0001 | No Relaxation |
| 38. | Poly chlorinated biphenyl | APHA 6630 | <0.0001 | <0.0001 | <0.0001 | mg/l | 0.0005 | No Relaxation |
| MICROBIOLOGICAL PARAMETERS | | | | | | | | |
| 39. | <i>Escherichia coli</i> | IS-15185 | Absent | Absent | Absent | | Absent/100ml | |
| 40. | <i>Coliform Bacteria</i> | IS-15185 | Absent | Absent | Absent | | Absent/100ml | |

BDL- Below Detection Limit

Notes:-

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4. The test samples will be disposed off after two weeks from the date of issue of test report, unless until specified by the customer.

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| | | |
|----------------|--------------|---------------|
| Test Report of | Report Code | Date of Issue |
| Ambient Noise | AN-081222-09 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhoh
Project Name: Boulder Stone Mine, 4.99 Hect.
Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills, District – Meghalaya

SAMPLING & ANALYSIS DATA

Sample Drawn By : Laboratory (N.T.L)
 Sample description : Ambient Noise
 Sampling Time : 24 hrs
 Sampling Instrument Used : Digital Noise Meter
 Weather Condition : Normal
 Monitoring Period : Dec 2022 –Feb 2023

| S. No. | Locations | Date of Monitoring | Results | | Units |
|---|------------|--------------------|-------------------|-------|-------|
| | | | Day | Night | |
| 1. | Mine Site | 08.12.2022 | 56.8 | 35.6 | dB(A) |
| 2. | Pomlum | 24.12.2022 | 51.4 | 38.1 | dB(A) |
| 3. | Mawkajem | 05.12.2022 | 52.6 | 40.5 | dB(A) |
| 4. | Dymmiew | 04.01.2023 | 50.0 | 35.2 | dB(A) |
| 5. | Umktieh | 18.01.2023 | 53.6 | 40.3 | dB(A) |
| 6. | Lewmawiong | 23.01.2023 | 54.8 | 42.0 | dB(A) |
| 7. | Sethliew | 01.02.2023 | 52.5 | 38.8 | dB(A) |
| Requirement (as per CPCB Guidelines Limits in dB (A) Leq | | | | | |
| Category of Area/ Zone | | Day Time | Night Time | | |
| Industrial Area | | 75 | 70 | | |
| Residential Area | | 55 | 45 | | |
| Commercial Area | | 65 | 55 | | |
| Silence Zone | | 50 | 40 | | |

Notes: -

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| | | |
|----------------|---------------|---------------|
| Test Report of | Report Code | Date of Issue |
| Soil Quality | SQ-180223-018 | 06/03/2023 |

Issued To: Sh. KhrikshonLyngkhoi
Project Name: Boulder Stone Mine, 4.99 Hect.
Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
 District – Meghalaya

Sampling & Analysis Data

Sample Received On : 17/02/2023
 Sample Description : Soil Sample
 Sample Quantity : 2.0 Kg
 Sample Drawn By : NTL Representative
 Analysis Duration : 18/02/2023 to 25/02/2023

| | | Location | Mine Site | Pomlum | Mawkajem | Dymmiew |
|---------|------------------------|--------------------|-----------|---------|----------|---------|
| Sr. No. | Parameters | Units | Results | Results | Results | Results |
| 1 | pH | - | 7.65 | 7.21 | 7.19 | 7.43 |
| 2 | Conductivity | µmhos/cm | 371.00 | 368.00 | 364.00 | 412.00 |
| 3 | Sodium (as Na) | mg/kg | 51.72 | 50.23 | 52.82 | 56.81 |
| 4 | Water holding capacity | % | 34.69 | 32.40 | 33.91 | 37.12 |
| 5 | Potassium (as K) | mg/kg | 280.0 | 280.0 | 278.5 | 285.9 |
| 6 | Sand | % | 68.00 | 67.00 | 69.00 | 68.00 |
| 7 | Clay | % | 19.00 | 19.00 | 16.00 | 17.00 |
| 8 | Silt | % | 13.00 | 14.00 | 15.00 | 15.00 |
| 9 | Calcium (as Ca) | mg/kg | 659.32 | 758.30 | 657.21 | 860.5 |
| 10 | Magnesium (as Mg) | mg/kg | 269.85 | 368.60 | 267.24 | 415.92 |
| 11 | SAR | - | 4.98 | 4.72 | 4.61 | 4.87 |
| 12 | Available Phosphorus | Kg/ Hectare | 58.0 | 58.0 | 57.0 | 59.0 |
| 13 | Organic carbon | % | 0.51 | 0.48 | 0.46 | 0.54 |
| 14 | Porosity | % | 43.36 | 40.50 | 42.38 | 42.37 |
| 15 | Bulk Density | kg/cm ³ | 1.43 | 1.40 | 1.45 | 1.32 |
| 16 | Available Nitrogen | Kg/ Hectare | 250 | 310 | 310 | 161 |
| 17 | Total alkalinity | mg/l | 2.1 | 2 | 1.8 | 2.4 |

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| Test Report of | | Report Code | | | Date of Issue | |
|----------------|---------------------|---------------|------|------|---------------|------|
| Soil Quality | | SQ-180223-019 | | | 06/03/2023 | |
| 18 | Chlorides | mg/l | 11 | 6.8 | 9.7 | 6.8 |
| 19 | Available Potassium | Kg/ Hectare | 260 | 180 | 210 | 193 |
| 20 | Salinity | dS/m | 0.20 | 0.18 | 0.12 | 0.13 |

Notes: -

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Issued To: Sh. KhrikshonLyngkhoi
Project Name: Boulder Stone Mine, 4.99 Hect.
Location: Syllai Madan, LaitkynsewLaitlyngkotKhyrimSyiemship, East Khasi Hills,
 District – Meghalaya

Sampling & Analysis Data

Sample Received On : 17/02/2023
 Sample Description : Soil Sample
 Sample Quantity : 2.0 Kg
 Sample Drawn By : NTL Representative
 Analysis Duration : 18/02/2023 to 25/02/2023

| | | Location | Umktieh | Lewmawiong | Setthliew |
|---------|------------------------|----------|---------|------------|-----------|
| Sr. No. | Parameters | Units | Results | Results | Results |
| 1 | pH | - | 7.25 | 7.12 | 7.29 |
| 2 | Conductivity | µmhos/cm | 363.00 | 397.00 | 427.00 |
| 3 | Sodium (as Na) | mg/kg | 52.72 | 51.86 | 55.74 |
| 4 | Water holding capacity | % | 31.98 | 32.95 | 36.29 |
| 5 | Potassium (as K) | mg/kg | 281.3 | 280.0 | 282.6 |

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| | | | | | |
|----|----------------------|--------------------|--------|--------|--------|
| 6 | Sand | % | 68.00 | 65.00 | 67.00 |
| 7 | Clay | % | 19.00 | 19.00 | 19.00 |
| 8 | Silt | % | 13.00 | 16.00 | 14.00 |
| 9 | Calcium (as Ca) | mg/kg | 756.49 | 657.93 | 560.5 |
| 10 | Magnesium (as Mg) | mg/kg | 412.28 | 367.35 | 264.83 |
| 11 | SAR | - | 4.56 | 4.67 | 4.72 |
| 12 | Available Phosphorus | Kg/ Hectare | 58.0 | 59.0 | 57.0 |
| 13 | Organic carbon | % | 0.49 | 0.54 | 0.53 |
| 14 | Porosity | % | 42.56 | 41.96 | 42.28 |
| 15 | Bulk Density | kg/cm ³ | 1.29 | 1.39 | 1.41 |
| 16 | Available Nitrogen | Kg/ Hectare | 149 | 296 | 360 |
| 17 | Total alkalinity | mg/l | 2.9 | 2 | 2 |
| 18 | Chlorides | mg/l | 8.67 | 3.8 | 3.2 |
| 19 | Available Potassium | Kg/ Hectare | 270 | 300 | 337 |
| 20 | Salinity | dS/m | 0.3 | 0.1 | 0.08 |

Notes: -

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Project:- Boulder Stone Mine

Applicant:- Shri Khrikshon Lyngkhoi

ANNEXURE – VIII

COPY OF ToR LETTER



Gaurang Environmental Solutions Pvt. Ltd.

Report Ref: GESPL_ /EIA/2022-23/

Rev. No. 00



STATE ENVIRONMENT IMPACT ASSESSMENT AUTHORITY

:: MEGHALAYA ::

'Silviculture Building' (Adjacent Sylvan House), Lower Lachumiere, Shillong - 793 001
Email : ms.seiaamegh@gmail.com.

No. ML/SEIAA/MIN/EKH/81/2020/4/1346 Dated, Shillong, the 15th Dec., 2020.

From : The Member Secretary,
State Environment Impact Assessment Authority
Meghalaya.

To ✓ Shri. Khrikshon Lyngkhai,
R/o- K.L.Complex, Demseiniong, Shillong, East Khasi Hills.

Subject : Grant of TOR to Proposal No.SIA/ML/MIN/48830/2019 submitted by Shri Khrikson Lyngkhai for mining of Boulder stone for an area of 4.99 hectares at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, East Khasi Hills District, Meghalaya.

Sir,

This has a reference to your online vide proposal above for grant of Term of Reference for for mining of Boulder stone for an area of 4.99 hectares at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, East Khasi Hills District, Meghalaya.

The proposed land belong to PP vide Deed of Conveyance made on 26/06/2017 at Shillong.

The applied area is a Non Forest Land which was confirmed by the Divisional Forest Officer, Khasi Hills Territorial Division, Shillong vide letter No.KH/9/NOC/STONE/41/Pt.V/161 dated Shillong, the 13th April, 2018.

The Cluster certificate from office of the Mining Engineer, Directorate Mineral Resources Government of Meghalaya vide letter No.DMR/MM/169/2018/1130 Dated Shillong the 25th September 2019, mentioned that there was only one approved mining plan located within 500 metres radius of the Mining lease area and the cluster area is 9.22 hectares.

As per the above 'Status of Land Certificate, the approved Mining Plan, the Kml file and duly examined by the SEAC, the site falls on toposheet Survey of India No.78 O/15 and within the following GPS Coordinates:

| Pillar No | GPS Coordinates | |
|-----------|-----------------|------------------|
| | Latitude | Longitude |
| 1 | N25°24'12.636"N | 91° 51' 40.788"E |
| 2 | N25°24'13.356"N | 91° 51' 40.248"E |
| 3 | N25°24'14.292"N | 91° 51' 39.384"E |
| 4 | N25°24'14.976"N | 91° 51' 39.132"E |

Handwritten signature

| | | |
|---|-----------------|------------------|
| 5 | N25°24'17.424"N | 91° 51' 40.716"E |
| 6 | N25°24'14.292"N | 91° 51' 52.164"E |
| 7 | N25°24'12.708"N | 91° 51' 55.008"E |
| 8 | N25°24'10.584"N | 91° 51' 52.02"E |

The project proponent submitted approved Mining Plan and Progressive Mine Closure Plan from Directorate of Mineral Resources, Meghalaya vide letter No.DMR/MM/169/2018/1101, dated Shillong, the 9th October, 2018.

After due screening and examination of all the documents submitted by PP and site cross checking by using kml file through Google earth and detailed deliberation, the SEAC in the Meeting held on 30th October, 2020, as per Agenda 7 unanimously recommended for grant of EC to this project, with the following additional condition –

- (i) PP to submit an undertaking along-with the EMP stating that all information mentioned in all related documents submitted are correct.

The State Environment Impact Assessment Authority, Meghalaya, in its meeting held on 26th November, 2020 noted the recommendation in the above said SEAC's Minutes relating to this project and accepted the recommendation of the SEAC. Then the SEIAA in the said meeting, unanimously resolved to grant Term of Reference (TOR) to this project.

Hence as per the EIA Notification- 2006 and its subsequent amendments and on recommendation of the SEAC, the SEIAA in the meeting unanimously grant Term of Reference (TOR) with the additional condition as stipulated by SEAC above and in standard format to this project, as follows:

- (i) PP to submit an undertaking along-with the EMP stating that all information mentioned in all related documents submitted are correct.
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.
 2. A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
 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.
 4. All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ Topo-sheet, Topographic sheet, Geomorphology and Geology of the area should be provided. Such an imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).

5. Information should be provided in Survey of India Topo-sheet 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.
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.
7. It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8. 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.
9. 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.
10. 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.
11. 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.
12. A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, *if any*, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.



13. 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.
14. 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.
15. 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.
16. A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, 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 along-with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.
17. 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.
18. 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. Sitespecific 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, should be given.

19. 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.
20. 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.
21. Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.
22. 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.
23. 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.
24. 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.
25. 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.
26. 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.
27. A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under



plantation and the species to be planted. The details of plantation already done should be given. 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.

28. 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.
29. Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.
30. 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.
31. 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.
32. 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.
33. 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.
34. 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, occupational health impacts besides other impacts specific to the proposed Project.
35. 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.
36. Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.



37. The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
38. A Disaster management Plan shall be prepared and included in the EIA/EMP Report.
39. 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.
40. The Action Plan on the compliance of the recommendations of the CAG as per Ministry's circular No. J-11013/71/2016-IA. I (M) dated 25.10.2017 need to be submitted at the time of appraisal of the project and included in the EIA/EMP Report.
41. Compliance of the Ministry's Office Notification No. GSR-94(E) dated 25.01.2018 – mandatory implementation of Dust mitigation measures for construction and demolishing activities.
42. The activities and budget earmarked for Corporate Environmental Responsibility (CER) shall be as per Ministry's O.M. No.22-65/2017-IA.II (M) dated 01.05.2018 and the action plan on the activities proposed under CER shall be submitted at the time of the project included in the EIA/EMP Report.
43. Compliance of the Ministry's Office Memorandum No.F: 3-50/2017-IA.III (Pt), dated 30.05.2018 on the Judgement of Hon'ble Supreme Court, dated the 2nd August,2017 in Writ Petition (Civil) No.114 of 2014 in the matter of Common Cause versus Union of India needs to be submitted and included in the EIA/EMP Report.
44. Besides the above, the below mentioned general points are also to be followed:-
- (i) All documents to be properly referenced with index and continuous page numbering.
 - (ii) Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.
 - (iii) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the Mo EF & CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
 - (iv) Where the documents provided are in a language other than English, an English translation should be provided.
 - (v) The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
 - (vi) While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
 - (vii) 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 the SEIAA, Meghalaya



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.

- (viii) 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.
- (ix) 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.

The PP should submit the EIA/EMP report as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006, after incorporating the details of public hearing already conducted and covering the above mentioned issues, to take further necessary action for obtaining environmental clearance in accordance with the procedures prescribed under EIA Notification, 2006 and its subsequent amendments.

The prescribed TOR shall be valid for a period of 4(four) years from the date of issue, for submission of the EIA/EMP reports, as per S.O. 751(E) dated 17.02.2020.



Member Secretary,
State Environment Impact Assessment Authority
Meghalaya, Shillong

Memo.No. ML/SEIAA/MIN/EKH/P-81/2020/4-A

Dated, Shillong, the Dec., 2020.

Copy to :-

1. The Principal Chief Conservator of Forests and HoFF, Meghalaya, Shillong for information.
2. The Principal Secretary to the Govt. of Meghalaya, Forests & Environment Department, Shillong for information.
3. The Principal Chief Conservator of Forests, Territorial, Forests & Environment Department, Meghalaya for information.
4. The Jt. Secretary, IA Division, MoEF&CC, Paryavaran Bhavan, CGO Complex, Lodhi Road, New Delhi – 110 003 for information.
5. The Dy. Director General of Forests (C), Regional Office, N.E.Z, Ministry of Environment, Forests & Climate Change (Mo EF & CC), Law-u-sib, Lumbatngen, Sawlad, Near M.T.C. workshop, Shillong- 793 021, for information.
6. The Secretary to the Govt. of Meghalaya, Mining and Geology Department, Shillong for information.
7. The Deputy Commissioner, East Khasi District, Shillong, Meghalaya for information.



8. The Divisional Forest Officer, East Khasi Hills & RiBhoi Territorial Division, Shillong for information and necessary action.
9. The Member Secretary, State Expert Appraisal Committee, Meghalaya for information.
10. The Director, Mineral Resources, Govt. Meghalaya, Shillong for information.
11. The Member Secretary, Meghalaya State Pollution Control Board, 'Arden', Lumpynggad, Shillong – 793 014 for information and necessary action.
12. Guard File.

Member Secretary
SEIAA, Meghalaya

Project:- Boulder Stone Mine

Applicant:- Shri Khrikshon Lyngkhoi

ANNEXURE – IX

LAND USE MAP

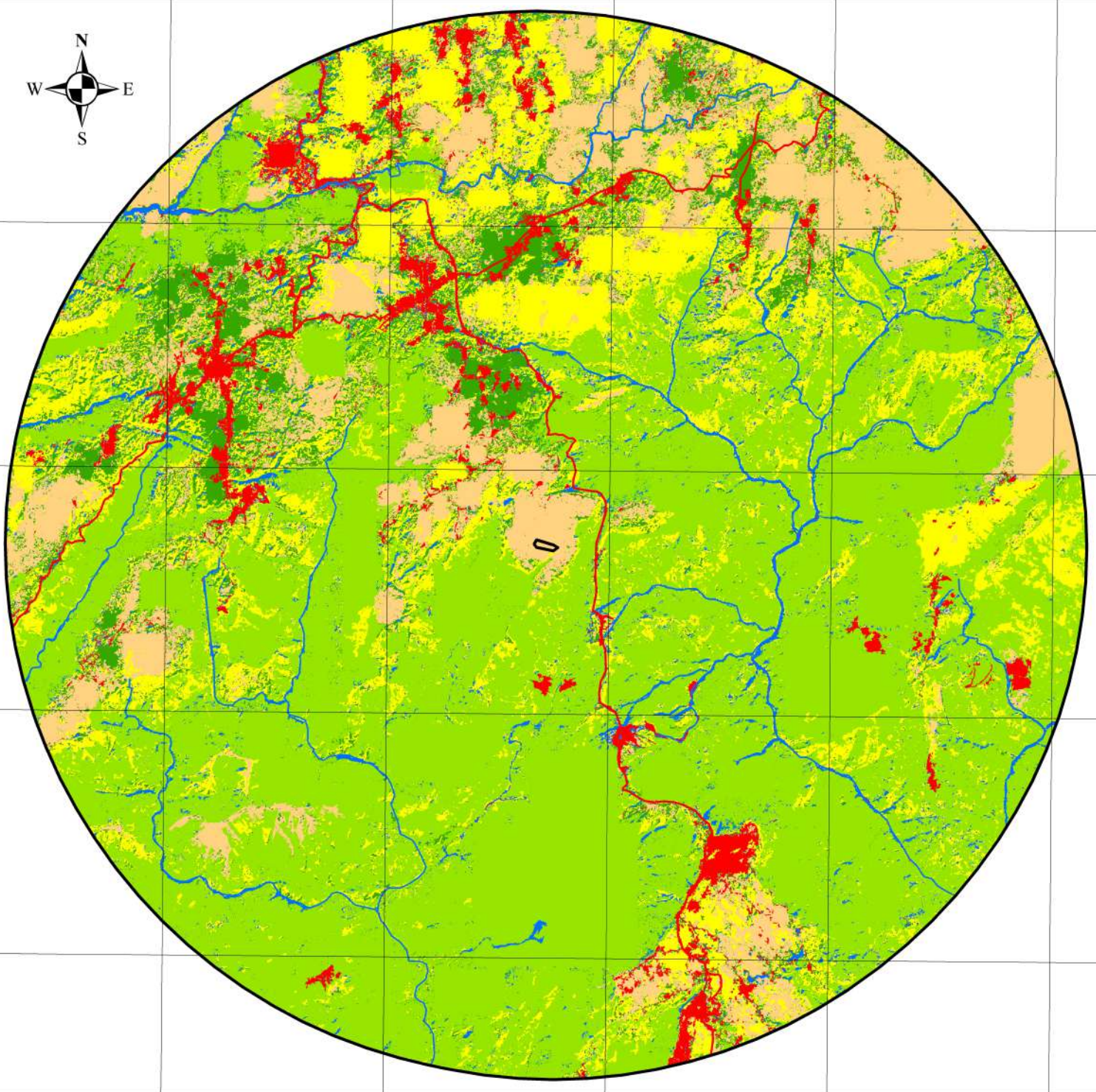


Gaurang Environmental Solutions Pvt. Ltd.

Report Ref: GESPL_ /EIA/2022-23/

Rev. No. 00

91°47'30"E 91°50'0"E 91°52'30"E 91°55'0"E 91°57'30"E



25°27'30"N
25°25'0"N
25°22'30"N
25°20'0"N

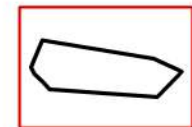
91°47'30"E 91°50'0"E 91°52'30"E 91°55'0"E 91°57'30"E

LULC MAP (10 KM RADIUS)

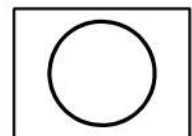
"BOULDER STONE MINE"

Location: Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, Meghalaya
Plot Area: 4.99 ha
Promoter: Sh. Khrikshon Lyngkhoi

Legend



Project Site



10 km from Project Site

LULC Classes

| S. No. | Level I Classes | Level II Classes | Level III Classes | Colour Code | Area (sq.km) | Area (%) |
|--------------|-----------------|------------------|--------------------------|-------------|-----------------------|-------------|
| 1 | Forest | Evergreen Forest | Dense Evergreen Forest | | 166.728 | 51.42 |
| | | Scrub Land | Dense Scrub | | 61.885 | 19.09 |
| 2 | Wasteland | Barren | Barren Rocky | | 42.129 | 12.99 |
| 3 | Agriculture | Cultivation | Shifting Cultivation | | 31.24 | 9.63 |
| 4 | Built-up | Urban & Rural | Compact & Sparse | | 11.896 | 3.67 |
| 5 | Waterbodies | River & Stream | Perennial & Nonperennial | | 10.379 | 3.2 |
| TOTAL | | | | | 324.256 sq. km | 100% |



EXECUTIVE SUMMARY

FOR OBTAINING ENVIRONMENTAL CLEARANCE

(Category - B1, under item 1 (a), as per EIA Notification 14th September' 2006 and its subsequent amendments till date)

FOR

“Boulder Stone Mine”

Location: Village- Village-Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship,
District- East Khasi Hills, State: Meghalaya

Production Capacity: - 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690TPA &

Waste/Subgrade: 99,420TPA)

Area: - 4.99Ha; LOI issued in 2018

Lease Validity: - 30 Years



- Details of ToR** : Issued by SEIAA, Meghalaya vide letter no.
ML/SEIAA/MIN/EKH/81/2020/4/1346 dated 15th Dec, 2020
- Baseline data Generation** : December 2022 to February 2023(Winter Season)
- Project Cost** : Rs. 463.6804Lacs

PROMOTER

Shri Khrikshon Lyngkhoi

R/o: K.L.Complex, Demseiniong, Shillong,
East Khasi Hills, Meghalaya

ENVIRONMENTAL CONSULTANT

Gaurang Environmental Solutions Pvt. Ltd.

#102, SNG, Shree Ratna Apartment, Peetal Factory, Jhotwara
Road, Bani Park, Jaipur-302016

E-mail: gaurangenviro@gmail.com

NABET Accreditation: NABET/EIA/2023/ RA0192

(Rev.02)

May, 2023

| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XI –Summary and Conclusion |

EXECUTIVE SUMMARY

1.1 INTRODUCTION

The proposed project “Boulder Stone Mine” is situated at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya. The total lease area of the project is 4.99 Ha. The mining activity will be carried out by open cast semi-mechanized method.

The Letter of Intent has been sanctioned in favour of Shri Khrikshon Lyngkhoi vide letter no.KH/8/ML/Stone/69/ Dated 2018 by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. The proposed mine is spread over an area of 4.99 ha. with mineable reserves of about 35,82,600Tonnes to produce 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA).

1.1.1 LOCATION OF LEASE AREA

The proposed project “Boulder Stone Mine” is situated at Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya.

1.1.2 DETAIL OF MINING LEASE

| S. No. | Particulars | Details |
|---------------|--------------------|--|
| 1. | Name of Project | Boulder Stone Mine |
| 2. | Location | Syllai Madan, Laitkynsew, Laitlyngkot Khyrim Syiemship, District- East Khasi Hills, State: Meghalaya |
| 3. | Lease Area | 4.99 Ha. |
| 4. | Land Type | Private Land |
| 5. | Seismic Zone | Zone – V |

1.2 PROJECT DESCRIPTION

The Letter of Intent has been sanctioned in favour of Shri Khrikshon Lyngkhoi vide letter no.KH/8/ML/Stone/69/ Dated 2018 by the Department of Forest and Environment, Office of the Divisional Forest Officer, Khasi Hills (T) Division, Shillong. The proposed mine is spread over an area of 4.99 ha. with mineable reserves of about 35,82,600Tonnes

| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XI –Summary and Conclusion |

to produce 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA).

The proposed mining operations will be carried out by open cast semi - mechanized method.

1.2.1 GEOLOGY

1.2.1.1 Local Geology

The succession of rocks in the lease area is as given below:-

Table 1.1: Local Geology

| Geological Age | Group Name | Formation Name | Rock Type |
|------------------------|----------------|------------------|---------------------------|
| Recent | Newer Alluvium | Unclassified | Sand, Silt and Clay |
| -----UNCONFIRMITY----- | | | |
| Eocene | Jaintia Group | Shella Formation | Calcareous Boulder Stonee |

1.2.1.2 Physiography

The topography of the lease area is hilly terrain. Highest elevation is 1785 mRL and lowest is 1765 mRL.

1.2.2 GEOLOGICAL AND MINEABLE RESERVES

| | | |
|-------------------------------------|------------------|-------------------------------|
| A) Total Mineral Reserves | UNFC Code | Boulder Stone (Tonnes) |
| Proved Mineral Reserves | 111 | 16,44,400 |
| Probable Mineral Reserves | 121 & 122 | 19,38,200 |
| Total Mineable Reserves | | |
| B) Total Remaining Resources | | |
| Feasibility Mineral Resources | 211 | 2,90,190 |
| Pre-Feasible Mineral Resources | 221+222 | 8,30,630 |
| Measured mineral resources | 331 | |
| Indicated Mineral resources | 332 | |
| Inferred Mineral Resources | 333 | 9,22,940 |
| Reconnaissance mineral resource | 334 | |



| | |
|-------------------------------------|--------------------------------------|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XI –Summary and Conclusion |

1.2.3 MINING

The mining will be done by open cast semi-mechanized method of mining. The salient features of mode of working as per approved Mining Plan with PMCP are:-

- The mining will be carried out by open – cast semi-mechanized method.
- The bench height and width will be kept 6m.
- Total seven benches will be developed i.e. from Bench levels 1781 mRL (Top Bench), 1775 mRL, 1769 mRL, 1763 mRL, 1757 mRL, 1751mRL, 1745 mRL (lowest bench).
- The bench slope will be providing 85°.
- The loading will be from pits or from stocks.

1.2.4 PRODUCTION DETAILS

The year wise development of mines for five year will progress as per the table below:-

Table 1.2: Production Details

| Year | ROM (T) | Mineral Boulder Stone(T) | Waste/ sub-grade (T) |
|-----------------|------------------|--------------------------|----------------------|
| 1 st | 430320 | 344260 | 86060 |
| 2 nd | 430320 | 344260 | 86060 |
| 3 rd | 437580 | 350060 | 87520 |
| 4 th | 442200 | 353760 | 88440 |
| 5 th | 497110 | 397690 | 99420 |
| Total | 22,37,530 | 17,90,030 | 4,47,500 |

**Source:- Approved Mining Plan with PMCP*

1.2.5 LAND USE PATTERN

Land use plan of the mine lease area to encompass pre-operational, operational and post-operational phases is given below:-

Table 1.3(a): Land Use Pattern

| S. No. | Land Use Category | Pre-Operational (Ha.) | Operational (Ha.) | Post-Operational (Ha.) |
|--------|-------------------|-----------------------|-------------------|------------------------|
| 1 | Top Soil Dump | -- | 0.01 | -- |
| 2 | Overburden Dump | -- | 0.15 | 0.15 |

| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XI –Summary and Conclusion |

| | | | | |
|------------------------------------|------------------------------|-------------|-------------|-------------|
| 3 | Pit & Quarry Area | -- | 3.95 | 4.35 |
| 4 | Road | -- | 0.05 | -- |
| 5 | Infrastructure/Plant/Crusher | -- | 0.40 | -- |
| 6 | Afforestation | -- | 0.30 | 0.40 |
| 7 | Mineral Storage | -- | -- | -- |
| 8 | Waste/Sub – grade stack yard | -- | -- | -- |
| 9 | Reclamation* | -- | -- | * |
| 10 | Undisturbed Area | 4.99 | 0.13 | 0.09 |
| Total | | 4.99 | 4.99 | 4.99 |
| <i>*Shown at table no. 2.6 (b)</i> | | | | |

Table 1.3 (b) : Reclamation

| Conceptual Land Degradation | Proposed Reclamation | |
|------------------------------------|-----------------------------|--|
| Area in Ha. | Area in Ha. | Measures |
| 4.90 | 0.55 | Green belt and afforestation of waste dump by plantation |
| | 3.45 | Bottom benches shall be converted for water storage |
| | 0.20 | Back-filling with waste & rejects and subsequent afforestation |

1.3 DESCRIPTION OF THE ENVIRONMENT

For monitoring the environmental parameters like meteorology, air, water, soil and noise quality, the monitoring stations have been established at seven locations in the study area. The baseline data has been collected in the summer season (December, 2022 to February, 2023). The detail of the sampling locations is given in below:-

Table 1.4: Sampling Location

| Sampling Location | Distance (Km) | Direction | Components |
|--------------------------|----------------------|------------------|-------------------------|
| Mine Site | -- | -- | Air, Water, Noise, Soil |
| Pomlum | 1.3 | ENE | Air, Water, Noise, Soil |
| Mawkajem | 1.1 | ESE | Air, Water, Noise, Soil |
| Dymmlaw | 2.7 | SSE | Air, Water, Noise, Soil |
| Umtieh | 2.7 | S | Air, Water, Noise, Soil |
| Lewmawlong | 2.0 | WNW | Air, Water, Noise, Soil |

| | |
|--|---|
| Project:- Boulder Stone Mine | |
| Applicant:- Shri Khrikshon Lyngkhoi | Chapter – XI –Summary and Conclusion |

| | | | |
|-----------|------|-----|-------------------------|
| Setthliew | 5.15 | NNW | Air, Water, Noise, Soil |
|-----------|------|-----|-------------------------|

1.3.1 LAND ENVIRONMENT

1.3.1.1 Soil Quality

Soil samples were collected at seven representative sampling locations. The soil analysis results are given below:-

| | | |
|--------------------|---|--------------------------|
| pH | : | 7.12 to 7.65 |
| Soil Conductivity | : | 364 to 427 μ mhos/cm |
| Total Nitrogen (N) | : | 161 kg/ha. to 360 kg/ha. |
| Phosphorus as P | : | 56 kg/ha to 59 kg/ha. |
| Potassium as K | : | 236.00-248.50 (mg/kg) |

1.3.2 WATER ENVIRONMENT

Seven ground water samples have been considered in the study area. The analysis results are presented below:-

Table 1.6: Water Quality Status

Project:- Boulder Stone Mine

Applicant:- Shri Khrikshon Lyngkhoi

Chapter – XI –Summary and Conclusion

| S.No. | Parameter | Units | Requirement (Desirable Limits). | Permissible Limits in the Absence of Alternate Source. | Mine Site | Pomlum | Mawkajem | Dymmiew | Umktieh | Lewmawiong | Setthliew |
|---|-------------------------------------|------------|---------------------------------|--|-----------|-----------|-----------|-----------|-----------|------------|-----------|
| Organoleptic & Physical Parameters | | | | | | | | | | | |
| 1. | Colour | Hazen Unit | 5 | 15 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 2. | Odour | - | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable |
| 3. | Taste | - | Agreeable | - | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable | Agreeable |
| 4. | Turbidity | NTU | 1 | 5 | <1.0 | <1.0 | <1 | <1 | <1.0 | <1.0 | <1 |
| 5. | pH value | - | 6.5-8.5 | - | 7.54 | 7.16 | 7.35 | 6.98 | 7.48 | 7.18 | 6.93 |
| 6 | Total Dissolve Solid (TDS) | mg/l | 500 | 2000 | 389.2 | 321.0 | 402.0 | 241.9 | 325.0 | 380.0 | 260.0 |
| General Properties | | | | | | | | | | | |
| 7 | Aluminum (as Al) | mg/l | 0.03 | 0.2 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 8 | Total Ammonia | mg/l | 0.5 | No Relaxation | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 9 | Anionic surface Detergents(as MBAS) | mg/l | 0.2 | 1.0 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 10 | Barium (as Ba) | mg/l | 0.7 | No Relaxation | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 11 | Boron (as B) | mg/l | 0.5 | 2.4 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| 12 | Calcium(as Ca) | mg/l | 75 | 200 | 56.95 | 56.95 | 54.32 | 61.47 | 65.27 | 56.82 | 52.39 |
| 13 | Chloramines (as Cl ₂) | mg/l | 4.0 | No Relaxation | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| 14 | Chloride (as Cl) | mg/l | 250 | 1000 | 15.73 | 14.62 | 14.69 | 13.95 | 16.26 | 14.39 | 13.82 |
| 15 | Copper (as Cu) | mg/l | 0.05 | 1.5 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 16 | Fluoride(as F) | mg/l | 1.0 | 1.5 | 0.38 | 0.31 | 0.28 | 0.32 | 0.29 | 0.30 | 0.28 |
| 17 | Free Residual Chlorine | mg/l | 0.2 | 1.0 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 18 | Iron (as Fe) | mg/l | 1.0 | No Relaxation | 0.129 | 0.124 | 0.132 | 0.129 | 0.128 | 0.121 | 0.120 |
| 19 | Magnesium (as mg) | mg/l | 30 | 100 | 3.84 | 3.79 | 4.10 | 4.18 | 3.92 | 4.06 | 3.65 |
| 20 | Manganese (as Mn) | mg/l | 0.1 | 0.3 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| 21 | Mineral Oil | mg/l | 0.5 | No Relaxation | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 | <0.50 |
| 22 | Nitrate (as NO ₃) | mg/l | 45 | No Relaxation | 0.32 | 0.31 | 0.30 | 0.32 | 0.33 | 0.31 | 0.30 |
| 23 | Selenium (as Se) | mg/l | 0.01 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 24 | Silver (as Ag) | mg/l | 0.1 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 25 | Sulphate (as SO ₄) | mg/l | 200 | 400 | 26.75 | 24.65 | 26.82 | 26.83 | 25.81 | 23.92 | 22.87 |
| 26 | Sulphide(as H ₂ S) | mg/l | 0.05 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |



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Chapter – XI –Summary and Conclusion

| | | | | | | | | | | | |
|---|--|--------------|--------|---------------|---------|---------|---------|---------|---------|---------|---------|
| 27 | Alkalinity(as Ca CO ₃) | mg/l | 200 | 600 | 201.0 | 194.0 | 187.0 | 187.0 | 189.0 | 176.0 | 179.0 |
| 28 | Total Hardness (as CaCO ₃) | mg/l | 200 | 600 | 174.0 | 167.0 | 164.0 | 165.0 | 173.0 | 161.0 | 160.0 |
| 29 | Zinc (as Zn) | mg/l | 5 | 15 | 0.162 | 0.159 | 0.151 | 0.148 | | | |
| Parameters Concerning Toxic Substances | | | | | | | | | | | |
| 30 | Cadmium (as Cd) | mg/l | 0.003 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 31 | Cyanide (as CN) | mg/l | 0.05 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 32 | Phenol | mg/l | 0.001 | 0.002 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 33 | Lead (as Pb) | mg/l | 0.01 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 34 | Mercury (as Hg) | mg/l | 0.001 | No Relaxation | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| 35 | Molybdenum (Mo) | mg/l | 0.07 | No Relaxation | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 36 | Nickel (as Ni) | mg/l | 0.02 | No Relaxation | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| 37 | Poly nuclear Aromatic | mg/l | 0.0001 | No Relaxation | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| 38 | Poly chlorinated biphenyl | mg/l | 0.0005 | No Relaxation | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Microbiological Parameter | | | | | | | | | | | |
| 39 | Escherichia coli | Absent/100ml | | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |
| 40 | Coliform Bacteria | Absent/100ml | | Absent | Absent | Absent | Absent | Absent | Absent | Absent | Absent |



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1.3.3 AIR ENVIRONMENT

To assess the baseline status of the air quality in the study area systematic ambient air quality monitoring has been carried out for criteria pollutants (PM₁₀, PM_{2.5}, NO_x, SO₂ and CO) at seven representative ambient air quality monitoring stations.

1.3.3.1 Ambient Air Quality

Ambient air quality monitoring has been carried out with a frequency of two days a week at seven locations covering one complete season i.e. December 2022 to February 2023. The summary of these results for all the locations is given below. These are compared with the standards prescribed by Central Pollution Control Board (CPCB) for rural and residential zone.

Table 1.7: Ambient Air Quality Status

| S. No | Sampling Location | | Parameters | | | | |
|-------|-------------------|-----------|--|---|---|---|----------------------------|
| | | | PM ₁₀ (µg/m ³) | PM _{2.5} (µg/m ³) | SO ₂ (µg/m ³) | NO _x (µg/m ³) | CO (mg/m ³) |
| 1. | Mine Site | Min | 40.29 | 13.68 | 3.93 | 5.25 | 0.47 |
| | | Max | 57.14 | 20.92 | 6.18 | 8.29 | 0.59 |
| | | Avg. | 44.27 | 16.33 | 5.34 | 6.80 | 0.53 |
| | | 98th% ile | 55.35 | 20.57 | 6.11 | 8.26 | 0.59 |
| 2. | Pomlum | Min | 40.26 | 15.43 | 5.37 | 6.55 | 0.32 |
| | | Max | 54.36 | 22.43 | 7.67 | 8.69 | 0.92 |
| | | Avg. | 45.65 | 17.76 | 6.10 | 7.45 | 0.57 |
| | | 98th% ile | 53.38 | 22.06 | 7.64 | 8.64 | 0.90 |
| 3. | Mawkajem | Min | 32.58 | 13.79 | 4.8 | 6.14 | 0.45 |
| | | Max | 50.75 | 22.4 | 6.5 | 8.86 | 0.55 |
| | | Avg. | 41.31 | 17.29 | 5.63 | 7.45 | 0.51 |
| | | 98th% ile | 50.18 | 22.37 | 6.41 | 8.69 | 0.55 |
| 4. | Dymmiew | Min | 36.02 | 13.76 | 4.33 | 7.09 | 0.46 |
| | | Max | 49.15 | 20.84 | 8.44 | 12.64 | 0.79 |
| | | Avg. | 45.87 | 18.12 | 7.22 | 9.58 | 0.62 |
| | | 98th% ile | 48.92 | 20.40 | 8.43 | 12.64 | 0.78 |
| 5. | Umkteih | Min | 32.69 | 22.61 | 4.24 | 8.43 | 0.47 |
| | | Max | 48.69 | 27.54 | 8.14 | 10.46 | 0.82 |
| | | Avg. | 45.76 | 24.44 | 6.00 | 9.43 | 0.58 |
| | | 98th% ile | 48.58 | 27.17 | 7.72 | 10.46 | 0.81 |
| 6. | Lewmawiong | Min | 35.41 | 14.32 | 5.35 | 8.54 | 0.47 |
| | | Max | 45.02 | 21.38 | 7.89 | 10.98 | 0.85 |

| |
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| | | | | | | | |
|-----------------------|-----------|-----------|------------|-----------|-----------|-----------|----------|
| | | Avg. | 40.98 | 16.62 | 6.89 | 9.95 | 0.62 |
| | | 98th% ile | 44.61 | 21.22 | 7.89 | 10.98 | 0.82 |
| 7. | Setthliew | Min | 40.92 | 16.72 | 5.03 | 8.84 | 0.48 |
| | | Max | 53.4 | 23.84 | 7.54 | 10.9 | 0.92 |
| | | Avg. | 44.97 | 18.79 | 6.18 | 9.80 | 0.70 |
| | | 98th% ile | 51.48 | 23.38 | 7.51 | 10.89 | 0.89 |
| NAAQ STANDARDS | | | 100 | 60 | 80 | 80 | 2 |

1.3.4 NOISE ENVIRONMENT

The noise monitoring has been conducted for determination of noise levels at seven locations in the study area. The noise levels at each location were recorded for 24 hrs. The results obtained were compared with the national standards and were found to be within the standards. The collected data are:-


Table 1.8: Ambient Noise Level Status

| Location | Date of Sampling | Day Time (6.00 AM to 10.0PM) | Night Time (10.00 PM to 6.00 AM) |
|------------------------|------------------|---------------------------------|-------------------------------------|
| Mine Site | 08.12.2022 | 56.8 | 35.5 |
| Pomlum | 24.12.2022 | 51.4 | 38.1 |
| Mawkajem | 05.12.2022 | 52.6 | 40.5 |
| Dymmiew | 04.01.2023 | 50.0 | 35.6 |
| Umktieh | 18.01.2023 | 53.6 | 40.3 |
| Lewmawiong | 23.01.2023 | 54.8 | 42.0 |
| Setthliew | 01.02.2023 | 52.5 | 38.5 |
| Standards | | | |
| Category of Area/ Zone | | Day Time | Night Time |
| Industrial Area | | 75 | 70 |
| Commercial Area | | 65 | 55 |
| Residential Area | | 55 | 45 |
| Silence Zone | | 50 | 40 |

1.3.5 SOCIO-ECONOMIC ENVIRONMENT

The study area includes the 39 Villages SyllaiMadan, Laitkynsew, Sub Division- Pynursla, District- East Khasi Hills, Meghalaya within 10 km of area from mine periphery.

Table 1.9: Demography Profile of the Study Area

| | | |
|---|---|-------------|
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| S. No. | Particulars | Details |
|--------|-------------------|---------|
| 1. | No. of Villages | 37 |
| 2. | Total Population | 20767 |
| | a. Male | 10224 |
| | b. Female | 10543 |
| 3. | No. of Households | 4037 |
| 4. | No. of Literates | 12984 |
| | a. Male | 6180 |
| | b. Female | 6804 |
| 5. | Main Workers | 8908 |
| | a. Male | 4942 |
| | b. Female | 3966 |
| 6. | Marginal Workers | 815 |
| | a. Male | 322 |
| | b. Female | 493 |
| 7. | Non-workers | 11044 |
| | a. Male | 4960 |
| | b. Female | 6084 |

(Source: Census, 2011)

1.3.6 BIOLOGICAL ENVIRONMENT

| Buffer Zone |
|---------------------------------|
| Flora |
| Climber – 19 Specie |
| Herb – 40 Species |
| Shrubs - 70 Species |
| Tree – 74 Species |
| Fauna |
| Amphibian – 17 Species |
| Fish - 16 Species |
| Avifauna – 92 Species |
| Butterflies – 28 Species |
| Mammals – 27 Species |



1.4 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

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

| Impact | Mitigation Measures |
|---|---|
| Land Environment | |
| Land will be degraded due to mining and dumping of waste | ➤ The total excavated area 4.35 ha. out of which 3.45 ha. area (bottom benches) will be converted into water reservoir and rest 0.20 ha. (upper benches) will be backfilled and reclaimed and rehabilitated by plantation. The extent of impact will however; be confined within lease area only. |
| Water Environment | |
| Discharge of effluents water from the mine. Intersection of ground water table during mining operations. | There will be no discharge of effluent from the mine. As per the approved Mining Plan along with PMCP, ultimate pit level (1715 mRL) will be above the ground water table and hence it will not be intersected. |
| Air Environment | |
| ➤ Dust will be generated mainly during excavation, loading & unloading activities. ➤ Gaseous pollutants will be generated mostly by the traffic. | ➤ It will be ensured that all the vehicles plying in the working zone are properly tuned and maintained to keep emissions within the permissible limits. ➤ At loading & unloading points and transportation routes, arrangement for water sprinkling will be made to minimize dust generation. ➤ In order to predict changes in the air quality, AERMOD version 8.8.0 model was used. The maximum ground level concentrations of particulate matter PM ₁₀ & PM _{2.5} , NO _x , CO from the different mining activities for the study period (Winter Season) were observed to be in permissible limit. ➤ The resultant will remain within the National Ambient Air Quality Standards for industrial/ residential areas. |
| Noise Environment | |
| ➤ Noise due to mining activities. | ➤ The noise levels from all these sources are periodical and restricted to particular operation. |



| | |
|------------------------------------|--|
| ➤ Noise due to vehicular movement. | ➤ The noise measurement data indicated that present noise levels in the study area is within the permissible limits of National Ambient Noise Quality Standards. ➤ Thus, due to natural attenuation effects by proper green belt/ maintenance of machines etc., the impact of noise levels will be minimal. |
|------------------------------------|--|

Socio-Economic Environment

| | |
|---|---|
| ➤ Employment generation ➤ Health impacts ➤ Education Facilities | ➤ The mining activity puts negligible change in the socio economic profile. ➤ No displacement (0) is proposed due to proposed mine. ➤ Approx. 67 local workers will get employment opportunities along with periodical training to generate local skills. ➤ New patterns of indirect employment/ income will generate. ➤ Regular health Check up camp. ➤ Assistance to schools and scholarship to children will be provided. |
|---|---|

Biological Environment

| | |
|--|---|
| ➤ Impact on biodiversity ➤ Impact on threatened species | ➤ The mining activity will have insignificant effect on the existing flora and fauna. The purpose of the project itself is to save the flora around the project area. ➤ The existing vegetation within the mining area includes trees and shrubs vegetation. They will not be disturbed due to the mining activity. So, the impact on the vegetation is very less. ➤ The transportation of waste may create dust pollution which may create loss of biodiversity of the area. ➤ Dust in atmosphere, contributed by mining and associated activities, when deposited on the leaves of the plants in the surrounding areas may retard their growth. ➤ The growth of vegetation in and around the complexes. Noise and vibrations due to blasting and operation of the machines drive away the wild animals and birds from the nearby nests. ➤ The cluster area and its buffer zone are devoid of any eco sensitive area. So the impact on the biodiversity and wild life is minimal. ➤ Green belt will be developed along the individual lease boundary |
|--|---|



- which will act as a pollution barrier for the biological environment.
- There is the proposal for plantation along the haul road of individual lease and also along the connecting road.
 - The blasting, drilling and transportation will be carried out during the day time only minimizing the impact on the wild fauna movement.
 - All the necessary pollution control measures will be undertaken by the lessee to minimize the impact on the surrounding environment.

1.5 ENVIRONMENTAL MONITORING PROGRAMME

1.5.1 AIR

Air quality monitoring will be carried out as per norms of SPCB and CPCB.

1.5.2 WATER

Regular monitoring of ground water quality will be carried out at suitable locations. Water samples will be collected four times in a year i.e. Pre - Monsoon, Monsoon, Post - Monsoon and Winter.

1.5.3 NOISE

Noise level will be recorded periodically at mine site near operating machines during day and night time.

1.5.4 HEALTH AND SANITATION

Periodical medical checkup of workers is being done and medical facility provided. Toilets and urinals will be provided near the mine site. Drinking water will be made available to the workers.

1.6 ADDITIONAL STUDIES

1.6.1 PUBLIC HEARING

Public hearing will be conducted as per the guidelines of EIA Notification 14th September, 2006 and its subsequent amendments.



1.6.2 RISK ASSESSMENT & MANAGEMENT

Risk analysis is the systematic study of uncertainties and risks encountered in various areas. Risk analysts seek to identify the risks involved in mining operations, to understand how and when they arise, and estimate the impact (financial or otherwise) of adverse outcomes. It also defines and analyzes the dangers to individuals, businesses and government agencies posed by potential natural and human-caused adverse events.

However, there are various factors, which can create unsafe working conditions/ hazards in mining of Boulder Stone (Minor minerals). The following types of hazards are identified during the Stone mining operations:-

1. Accident during mineral loading, transportation and dumping
2. Accident due to vehicular movement
3. Inundation/ Flooding

Following procedure will be followed for effective management of any disaster in the mine.

Step 1: Identification of Disaster risk.

Step 2: Identification of persons at risk

Step 3: Removal of Hazard

Step 4: Evaluation of the risk

Step 5: Control measures to be taken

Step 6: Maintain Assessment records

Step 7: Review

1.7 PROJECT BENEFITS

The demand of Boulder Stone has been rising in the state as a result of rising in industrial activities and development of the existing project aims to fulfill the supply of boulder Stone. The capacity of mine is 4, 97,110 TPA of ROM (Boulder stone: 3, 97,690 TPA & Waste/Subgrade: 99,420TPA) aiming to fill the demand – supply gap.

This boulder stone mining will generate direct and indirect employment. Economy of the area will get a boost and there will be overall growth of the region in terms of education, health, training, awareness, transport, automobile, industry, and infrastructure. The standard of living accordingly will also get an upliftment on the positive side. Plantation will be carried out as social forestry programme in villages, school and the areas



allocated by the Panchayat/ State authorities to improve environment of its surrounding area.

1.8 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) aims at the reservation of ecological system by considering in – built pollution abatement facilities at the mine site. Some of the major criteria governing the environmental measures will be adopted.

1.8.1 LAND USE MANAGEMENT

The following reclamation plan will be adopted in this mine.

- 1) At the end of life of mine, total excavated area will be of 4.35 ha.
- 2) Plantation is proposed over an area of 0.75 ha. out of which plantation will be done on backfilled area (0.20 ha.), Dump area (0.15 ha.) and un-worked area (0.40 ha.).

1.8.2 WATER POLLUTION MANAGEMENT

Some of the control measures adopted for controlling water pollution are as follows:-

- Based on results from monitoring corrective regulatory measures will be taken.
- Measurement of water level fluctuations to assess impact of mining activity on the water table depletion in close proximity of dug wells and bore wells.
- Regular monitoring and analysis of water samples at strategic locations will be carried out to monitor the water quality.
- Domestic waste water will be channelized into septic tank followed by soak pit.

1.8.3 AIR POLLUTION MANAGEMENT

Following mitigation measures are envisaged:-

- The speed of the vehicles will be maintained uniform.
- Regular pollution checks and certification of vehicles will be done.
- Limited number of mine-related vehicle will be maintained on the public roadways to reduce the traffic to minimize impacts on local people.
- The loaded vehicles will be covered with tarpaulin.
- Over loading will be avoided and free board will be left in the loaded trucks to prevent spillage.
- The roads will be maintained.
- Regular cleaning will be done to reduce the chances of road dust to become airborne.



- Water sprinkling will be done on a fixed stretch of paved road.
- Natural barriers will be developed along the roadside to control the dispersion of dust particles.
- Speed breakers will be constructed to restrict the speed of transporting vehicles. However, limiting of vehicular speed will be adopted.
- Regular monitoring and analysis will be carried out through collection of air samples from strategic monitoring sites. If the parameters go beyond the permissible tolerance limits, corrective regulation measure will be taken.

1.8.4 NOISE POLLUTION MANAGEMENT

The following control measures are to be undertaken to bring down the noise levels:-

- Noisy activities will be scheduled at normal working hours (daytime hours) to the extent possible when the environment is least sensitive to noise impact.
- Regular inspection and maintenance of vehicles and equipment will be performed to ensure efficiency and worn parts will be replaced.
- The vehicles will be maintained in good condition and overloading will not be done.
- Speed limits will be enforced in relation to road conditions and on-route communities.
- Noise monitoring will be conducted on a regular basis to determine compliance with noise criteria.
- Personal Protective Equipments i.e., earmuffs and earplugs will be provided to workers, working in high noise areas.
- Periodical medical checkup will be organized for all workers to check any noise related health problems.
- Operational noise level status will be displayed on machines to identify the extent of noise level and to control the exposure times at which worker are exposed to higher noise levels.

1.8.5 OCCUPATIONAL HEALTH AND SAFETY

- To avoid any adverse effect on the health of the workers due to dust, noise etc. extensive measures has to be adapted related to safety aspect.
- Regular maintenance and testing all the tools & equipments as per manufacturer's guidelines.



- Provision of personal protective equipment to the workers working in the mine.
- Periodical Medical Examination of all workers by medical specialists will be conducted.
- Awareness program will be organized for workers.

1.8.6 SOCIO-ECONOMIC MANAGEMENT

- Environmental Officer will be responsible to take care the performance of mine on environmental issues.
- Approx. 33 local workers will be directly and about 5-10 will be indirectly employed.
- Employment opportunities along with periodical training to generate local skills.
- Local employment will be ensured. On the job training to local people will be given and periodically upgraded.
- Regular health camps will be carried out.

1.8.7 BIOLOGICAL MANAGEMENT

No adverse impact & no genetic diversity loss are anticipated from the mining activity. However due care & extensive plantation activity will be undertaken to reduce impact from the activity.

1.9 CONCLUSION

EIA study was performed as per the approved ToR. Various environmental attributes were studied relating with aspects of mining activities. The related impacts were identified and evaluated. Considering all the possible ways to mitigate the environmental concerns Environmental Management Plan was prepared and accordingly fund was allocated. The EMP has been dynamic, flexible and subject to periodic review.

The project will increase the revenue of the State Govt. as well as it will help in the social upliftment of the local people. The greenbelt development programme will help in increasing the green cover in the nearby areas. Thus, the project is not likely to affect the environment or adjacent ecosystem adversely. The Management will be responsible for the project review of EMP and its implementation to ensure that the EMP remains effective and appropriate. Thus, the proper steps will be taken to accomplish all the goals mentioned in the EMP and the project will bring the positive impact in the study area.

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