ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

For

LUMSHNONG LIMESTONE MINES
LUMSHNONG, JAINTIA HILLS DISTRICT
MEGHALAYA
(OVER ML AREA OF 70.00 Ha.)

Prepared For

CEMENT MANUFACTURING COMPANY LIMITED
LUMSHNONG, JAINTIA HILLS DISTRICT
MEGHALAYA

Prepared By

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CHAPTER – 1

INTRODUCTION

1.0 INTRODUCTION

Mineral resources of the nation reflects in terms of potential economic growth of the country at large. Our natural mineral wealth has been exploited considerably during the past 50 years. With increase in industrialization coupled with population growth, the demand for different minerals has increased and is likely to grow further in years to come. This has resulted in irreversible impacts on diminishing reserves, with simultaneous generation of solid wastes and effluents causing environmental degradation. It is therefore important to tackle the problem for control of pollution and mining of minerals in a cost- effective method causing least damage to the ecosystem.

In order to commence/enhance production/ renewal of any mines, it is necessary to obtain Environmental Clearances from the Ministry of Environment and Forests, Govt. of India as per EIA Notification 2006. Mining Operation Plan including method of mining in detail, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) etc. are some of the important requisites from investor for Environmental Clearance. Hence, the lessee has to prepare a Rapid Environmental Impact Assessment (REIA) and Environmental Management Plan (EMP) report for Environmental Clearance before commencement of mining activities.

To prepare an effective and sustainable EIA & EMP, it is necessary to conduct a baseline survey of the existing environmental attributes. It helps to evaluate anticipated environmental impacts to the proposed activities and in formulating a scientific Environmental Management Plan. Irrespective of magnitude of operation, attempts have been made to maintain ecological balance of the study area. The proposal is for the production in the Mining Lease area of Khub- III Limestone Mines of Cement Manufacturing Co. Ltd (CMCL) over 70.0 ha in village Lumshnong of District Jaintia hills, Meghalaya. CMCL has assigned M/s Geomin Consultants Pvt. Ltd., Bhubaneswar, to prepare Environmental Impact Assessment study and Environmental Management Plan as per the Terms of Reference (TOR) issued by EAC of MoEF.

Presentation for Scoping and TOR has been made before the EAC (Mining) on 23.02.2011 and TOR has been issued by MOEF, Govt. of India on 28th March, 2011(Annexure-1). As per the TOR baseline data for one summer season i.e. from March 2011 to May 2011 has been generated from the study area. The study area constitutes the core zone (lease area) and the buffer zone (10 kms around the core zone from the periphery). The detailed scope of the study is outlined as follows.

1.1 SCOPE OF STUDY

- Collection, generation and compilation of required baseline environmental data/information covering both core and buffer zones.

- Analysis of all relevant parameters to evaluate the existing air, water and soil quality, land use pattern and meteorological conditions.

- Study of prevalent ecological habitats, flora & fauna, socio-economic and demographic profile of the region.

- Study of the proposed project activities related to limestone mine.

- Study of impact assessment of the proposed mining and allied activities likely to affect the various environmental attributes.

- Formulation of a suitable Environmental Management Plan indicating the mitigation measures to be implemented for improving and maintaining the ecological balance of the project area even during and after commencement of mining and allied activities.

CHAPTER – 2

PROJECT PROFILE

2.0 INTRODUCTION

Mining Lease for Khub-III Lumshnong limestone project area of over 70 ha. was granted by Meghalaya state Govt. vide letter number MG/54/2009/190 dated 22.12.2009 to M/s Cement Manufacturing Company Limited which is a public limited company. The project area is of private land category. No forest area is involved.The mine will be in operation as per the Mining Plan approved for the period 2010-11 to 2014-15 by Indian Bureau of Mines Govt. of India vide letter No 314(3)/2010-MCCM9CZ)/MP-37 dated 10th June, 2011. This EIA report is for production capacity upto 9,00,450 MTPA as per the pre-feasibility report. This is a new mining proposal.The Limestone from the mines shall be utilised in the cement plant of the company. **C**ement Manufacturing Company Ltd. (CMCL) an ISO 9001:2000 certified company was incorporated as a Public Limited Company on 2nd November 2001 with registered office and works at Lumshnong, Jaintia Hills district, Meghalaya. CMCL was granted licence for setting up a 900 TPD cement plant at Lumshnong village; Jaintia Hills district Meghalaya by the Govt. of Meghalaya in the year 2002.

The company has installed a 900 TPD cement plant during 2004. The cement plant expanded its capacity from 900TPD to 1800TPD clinker production and in the 2nd phase expansion from 1800 TPD to 2400 TPD in the year 2010.

The cement plant consists of dry process coal fired kiln with 5 stage suspension pre-heater system. The main components of plant consist of Crusher (Primary, Secondary and tertiary) to reduce size of ROM limestone, Ball Mill for grinding raw mix, coal grinding mill, rotary kiln with grate cooler and cement mill of suitable capacities to manufacture 2400 tonnes of clinker/cement. The plant is provided with the latest state-of-the-art technology pollution control equipment. A full fledged laboratory, workshop, stores etc. are also provided. Township for the employees of CMCL along with social infrastructure like hospital, school, canteen, recreation centre, play ground etc. are provided at the plant site.

To supply limestone to the plant, CMCL obtained Prospecting License (P.L) over an area of 473.09 hectares in Lumshnong village. The P.L was granted vide letter no

MG/21/2003/163 dated 13th November 2003 and the P.L deed was executed on 24.01.2004.

Out of this, two mining leases over 4.96 hectares (M.L-I) & 4.70 hectares (M.L-II) were granted in favour of CMCL in 2004 and 2006 respectively. These mines are at a distance of about 3km from the cement plant. Since the requirement of limestone has increased for the cement plant due to expansion hence to sustain limestone requirement for the life of the plant, CMCL applied to the State Govt. for 70 hect area for M.L (M.L-III) within the aforesaid PL area and adjoining to company's mining lease Nos. I & II. Accordingly Govt of Meghalaya have decided in principle to grant M.L over 70 hectares area to CMCL vide their letter No-MG/54/2009/190 dated 22.12.2009 (Annexure-3).

Land Use Pattern

The present land use pattern is as follows.

Lumshnong M.L area over 70.00 hectares is coming under non-forest land i.e. Agricultural land & waste land etc.

Land use pattern as per the land schedule is as follows.

Classification of land	Village/District	Total area in Hects.
Total Private Land (non-forest)	Lumshnong/Jaintia hills	70.00 • Agricultural land – 46.809 • Waste land – 23.191

There is no permanent agricultural land. In some places ``Jhum Kheti'' ( Shiftig Cultivation ) was being done earlier. In some part ``Orange garden'' is planted. All these lands have been taken as agricultural land which is 46.809 hectares and waste land are unutilised due to rocky terrain is 23.191 hectares

Permission for drawl of water from nearby perennial nallas for CMCL was granted by the Irrigation Department of Govt, of Meghalaya.

The EIA/EMP is prepared as per the mining plan approved by IBM and prescribed TOR by MOEF, Govt. of India. The TOR letter and its clarification for reference appended to this report as Annexure-1.

2.1 LOCATION AND ACCESSIBILITY

The geographical location is given in Table - 2.1.

Table - 2.1
Geographical Location

State	Meghalaya
District	Jaintia hills
Village	Lumshnong
Lease Area	70 ha
Toposheet No.	83C/W
Latitude	$25^0$10’05” to $25^0$10’32”N
Longitude	$92^0$21’46.4” to $92^0$22’25.6”E
Altitude	498 m AMSL to 630m AMSL

The geographical location map is given in **Fig. 2.1**.

There is no public road or railway line within the M.L area. The lease area is situated at a distance of 1.5 km west of NH-44 connecting Shillong to Silchar. The nearest railway station at a distance of 80km from Lumshnong is Badarpur on Guwahati-Lumding-Silchar meter gauge section of N.E.F. Railway **Fig. 2.2.** The lease area map is given in **Fig. 2.3**.

2.2 TOPOGRAPHY AND DRAINAGE

Topography of the ML area and its surroundings are rugged and mountainous. Maximum and minimum contours passing through the area are 630m and 498m respectively. Northern part of the area is at a higher elevation with respect to southern and south-western part.

It is represented in lease plan and surface drainage plan (**Fig. 2.4)**. A seasonal nala flows from north to south in the southern part of the mining lease area. This nala joins a perennial nala running E-W at a distance of 700m towards south of the area.

No first order or second order stream is passing through the lease.

2.3 GEOLOGY

2.3.1 Regional Geology

The State of Meghalaya covers an area of approximately 23,000 sq.km and divided into seven administrative districts. The north and eastern borders are covered by Assam State and south and west by Bangladesh. Shillong, the State Capital is at an elevation of 1800m and located in the central part of Khasi hills. The rock formations of the area fall under Jaintia series of Eocene age.
The Regional Stratigraphy of the area is as follows:

Age	**Group/Series**	**Stage**	**Beds**
Oligocene	Barail Series	----	Sandstone & Shale
Upper Eocene	Garo Group	Kopili Formation	Grey shale with alternate layers of Sandstone & Siltstone
Lower to Middle Eocene	Jaintia Group	Sylhet Limestone	Shale Prang Limestone Narpuh Sandstone Umlatdoh Limestone Lakadong Sandstone Lakadong Limestone
Palaeocene	----	Therria Sandstone	Sandstone

The Lakadong sandstone and Narpuh sandstone distinctly and sequentially separate the Lakadong, Umlatdoh and Prang limestone bands in the area

2.3.2 Local Geology

The present area under report falls under Survey of India Toposheet No. 83 C/W and located near village Lumshnong (25°10'16'' north and 92°22'52'' East). The minimum and maximum elevation of the area varies from 498m to 630m above M.S.L. The different lithounits of the area belong to Jaintia series of Eocene age. The limestone unit belongs to sylhet stage of Jaintia series of middle Eocene age.

Three bands of limestone occur in the area which are known as Prang, Umlatdoh and Lakadong limestone bands. These are separated by Narpuh sandstone and Lakadong sandstone. The topmost limestone band i.e Prang limestone occurs further south of the prospect.

Based on surface and sub-surface data generated during the exploration work, the following rock formations are encountered in the area. **(Fig. 2.5)**

Overburden (sandstone with unconsolidated soil and limestone boulders)	Narpuh	1.00 to 13.50m
Grey coloured limestone	Umlatdoh	22.45 to 55.75m
Sandstone	Lakadong	Not fully explored
Limestone	Lakadong	Not fully explored

2.4 RESERVES AND GRADE

The estimated reserves are as follows (Table - 2.2)

Table - 2.2
Reserves

	Geological Reserve (Tonne)			**Mineable reserve (Tonne)**		
	Proved	**Probable**	**Total**	**Proved**	**Probable**	**Total**
Lime Stone	26,998,200	36,588,375	63,586,575	24,618,150	3,31,98,075	57,816,225

Sandstone overburden – 3.645 million CuM.
Limestone to overburden ratio – 1 : 0.13

2.5 MINING

2.5.1 Mining Method

Opencast fully mechanised method of mining will be adopted on two shift basis. Machineries/vehicles like crawler drill, air compressor, hydraulic excavators, dumpers/tipper tracks etc. will be used.The limestone and sandstone OB shall be dislodged by crawler drill and blasting. Limestone and Sandstone will be handled by dumpers/ tipper trucks and Excavators. Height and width of the mine benches would be 6 to 8 meters and 15 meters respectively. Slope of the benches will be 75 to 80^0 where as overall slope of the pit will be 45^o. Maximum production of limestone will be upto 9,00,000 TPA from 5^{th} year and onwards.Keeping the above production, the life of the mine will be 66 years, including 5 years of plan period and 61 years beyond plan period.The capital cost of the project is Rs 6.65 crores.The total amount of Sandstone OB generated will be 3.645 Million Cum during life of the mine including 3,21,453 cum of OB during first 5 years of plan period.70% of OB shall be used for backfilling and 30 % shall be utilised as an additive to make up the deficiency of Silica in the rawmix and road making.

Loose OB will be utilized for leveling in the plant and colony area mainly.Excess OB will be stacked in the earmarked ML area for backfilling of the worked out areas for plantation. An area of 2.25 ha has been earmarked for storage of sandstone. After removal of OB from temporary dump area, the area will be utilised for mining. The capacity of the dumps will be 2.25 lakh cum. The height & width of the terraces will be 2m and 5m respectively and maximum height of the dump will be 10m.The sandstone would be stacked in dump yard and will be utilized for backfilling of mined out area. Employment will be provided for 137 people in two shift basis.Ultimate working depth of the mine will be 480m AMSL where as ground water table is at 420m AMSL (in summer) and 425m AMSL (in rainy season). Hence mining will not touch ground water table. About 75 Cum/day of water shall be utilized in the mining activities. Surface water and treated water will be supplied from CMCL Plant site. **(Fig. 2.6 & Fig. 2.7)**

2.5.2 List of Equipments

The machineries will be deployed as per the following table. (**Table - 2.3**)

Table - 2.3
List of Equipments

Sl. No.	Equipments	Size	No. of Machinaries
1	Crawler drills	115 mm.	1
2	Compressor for Crawel drills XAH210 of ATLAS COPCO	9 cum./min	1
3	Excavator Volvo 290 BLC	1.5 cum	2
4	Excavator L&T PC200 with rock breaker and as standby excavator in emergencies	0.7 Cum	1
5	Dumper/Tipper (TATA 2516 or 18)	20T	15
6	Rock breaker HM 1200	--	1
7	Bull dozer D-50		1
8	Explosive van of 500 Kg	--	1
9	Ambulance	--	1
10	Maintenance Van	--	1
11	Jeeps	--	2
12	Water tanker		1
13	Portable tower light	--	1
14	Diesel bowser of 6000 ltrs capacity for filling track mounted equipments	--	1

2.5.3 Nature of Waste:

The waste materials include both intercalated waste lying within the limestone zone & overburden.

2.5.4 Selection of Dumping Site:

The OB waste will be initially utilized for levelling at plant and colony areas. The proposed waste dumping sites of 2.25 ha. have been located within the Limestone zone because there is no non-mineralised zone within the lease area to dump excess OB. So after five years of planned period, the proposed dump will be re-handled & backfilled in the mined out areas, after the proposed quarry is exhausted. The proposed dump site, which is temporary in nature, will be on the south-eastern side of the Mining Lease area.

2.5.5 Rate of yearly generation of wastes and proposals for disposal of waste for first five years plan period:

The generation of overburden to be excavated during five years is computed to be 3, 21,453m3. Out of this 30% i.e. 96435.6 M^3 will be utilized for approach road or additive & balance 70% i.e. 2, 25,017 M^3 waste will be dumped at south-eastern side of the M.L area. The total amount of Sandstone OB generated will be 3.645 Million M^3 during life of the mine including 3, 21,453 Cum of OB during first 5 years of plan period. 70% of the waste material shall be used for backfilling and 30 % shall be utilised as an additive to make up the deficiency of Silica in the rawmix and road making. Dumping shall be carried out temporarily and material shall be re-handled for back filling.There would be a dump over 2.25 ha. of land for storage of OB and it's subsequent use for back filling .The capacity of the dumps will be 2.25 lakh cum. The height & width of the terraces will be 2m and 5m respectively and maximum height of the dump will be 10m.

2.5.6 Maximum height & spread of dumps

- Total waste to be dumped = 2, 25,017 m^3
- Area of the proposed dumping site = 22,540 m^2
- Average height of the proposed dump = 10m

The dumping will be carried out in a retreating method starting from 1st year to 5th year. At the end of 5th year, five terraces will be developed. Height of the five

terraces will be of 2m each. Slope angle of the individual terrace will be maintained at 37^{o} while overall slope angle of the dump will be of 22^{o}.

2.5.7 Blasting

Blasting is one of the most critical activities of any mining operation. Blasting parameters have been optimized in the adjoining Mining Leases (Khub- I & II) of the company for efficient blasting and productivity, keeping the associated hazards to the minimum. It is however, proposed to adjust the same by carrying out a number of trial blasts with varying parameters before adopting them on a regular basis. Hard Limestone will be dislodged by drilling & blasting prior to excavation & loading. The quantity of materials likely to be blasted is 80% of total excavation. There is no proposal for construction of magazine within M.L area as there is an existing magazine about 4 Km from this M.L area. The capacity of magazine is 6MT which has valid license no i.e E/HQ/MG/22/22 (E21805). Secondary blasting which produces noise is totally eliminated by deploying Rock Breaker. Monitoring of Shock waves during blasting will be monitored by MINMATE. From our experience in existing Khub Mine, it was found that blasting by NONEL (Non Electric Detonators) both noise, vibration & shock waves are controlled. The same will be followed in this Mine also.

Broad Blasting Parameters

Average depth of Blast hole	6.0 to 8.0 m.
Burden	4.0 to 4.5 m
Spacing	5.5 to 6.0m
Diameter of hole	115 mm.
Diameter of cartridge	83mm
Powder factor of explosive	3.2 Cum/Kg.
Length of explosive cartridge	Depending on the blast hole design & nature of the strata
Volume yield per hole	BurdenxSpacingxDepth of hole 4.5x5.5x6m=148.5 cum.

2.5.8 Reclamation & Rehabilitation measures:

During Planned Period

During planned period limestone will not be exhausted within any part of the proposed quarry. So no reclamation proposal has been envisaged during this period. However, owing to certain land degradation a total of 1600 saplings are proposed to be planted over an area of 1.0 hectare near the south-western side of the M.L area during the plan period

During Conceptual Period

A total of 58.39 hectares will be degraded for mining during conceptual period. The Mining Lease area is explored in detail by Core drilling upto end of the Umlatdoh limestone unit. Further, detailed exploration through core drilling upto end of the mineralization has been suggested beyond planned period. The ultimate quarry depth may change. However, considering present situation, the total conceptual area over 58.24 hectares will be reclaimed by means of backfilling & plantation. Bench plantation will be carried out at slopes of ultimate quarry. Besides this, 18816 saplings are proposed to be planted at around the ML boundary over 11.26 hectares in the planned period.

2.6 EMPLOYMENT POTENTIAL

The mine requires 137 numbers of employees. Indirect employment will be almost 200.

2.7 MINERAL BENEFICIATION

USE OF MINERALS

The entire limestone raised from the mine will be utilized in Lessee's own cement plant situated at a distance of 3 kms from the lease area.

SIZE - The limestone is crushed and reduced to 0 - 25mm For the feeding the raw-mill and futher production of Clinker/cement

2.8 TRANSPORTATION AND INFRASTRUCTURE

Dumping grounds are closely located outside the proposed quarry to minimize transportation cost. On the same line, mineral conservation aspect has been taken into consideration by choosing the barren area. However, for calculation of number of dumpers requirement, since the amount of waste is on the lower side as compared to the limestone, the same lead is used for transportation of all materials including r.o.m limestone.

Rear dump trucks of 20 MT pay load capacity will be used for transport of limestone and overburden. The trucks will be loaded by excavators having bucket capacity of 1.3 to 1.5m^3.

As per the suggestion of EAC (Mining), coveyor option has been examined /worked out. In view of the terrain and involvement of crossing National Highway, it is not found to be feasible. However in future further expansion of cement plant takes place, conveyor transportation option shall be reviewed for implementation.

The working mines will be provided rest shed, first aid centre, ambulance facility. Besides this all infrastructural facilities available in the plant of CMCL will be made available to the employees. The protective equipment will also be provided to the employees such as Safety Shoe, helmet, ear muff and mask.

2.9 COST OF PROJECT

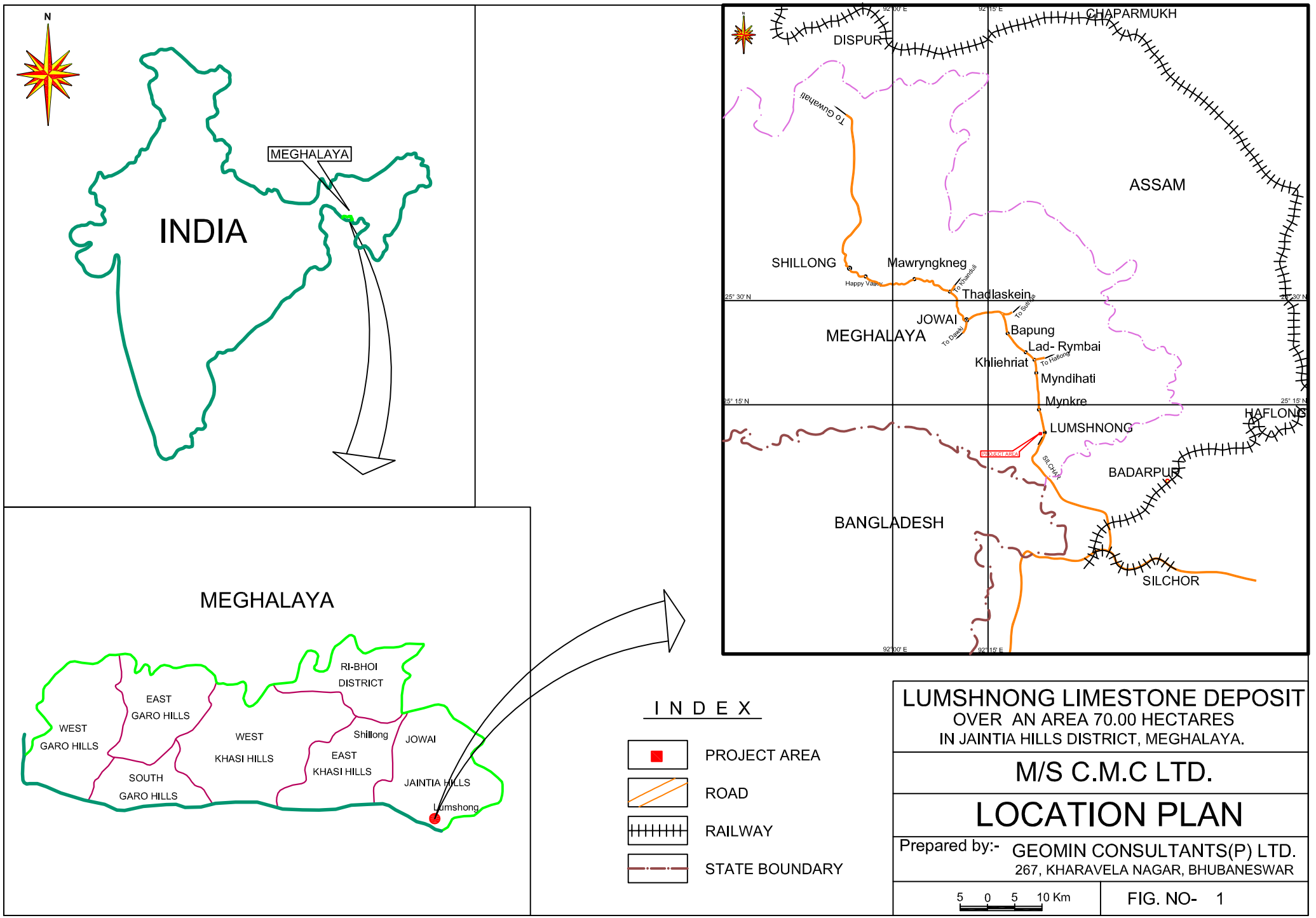
The excepted cost of the project is Rs 6.65 crores.

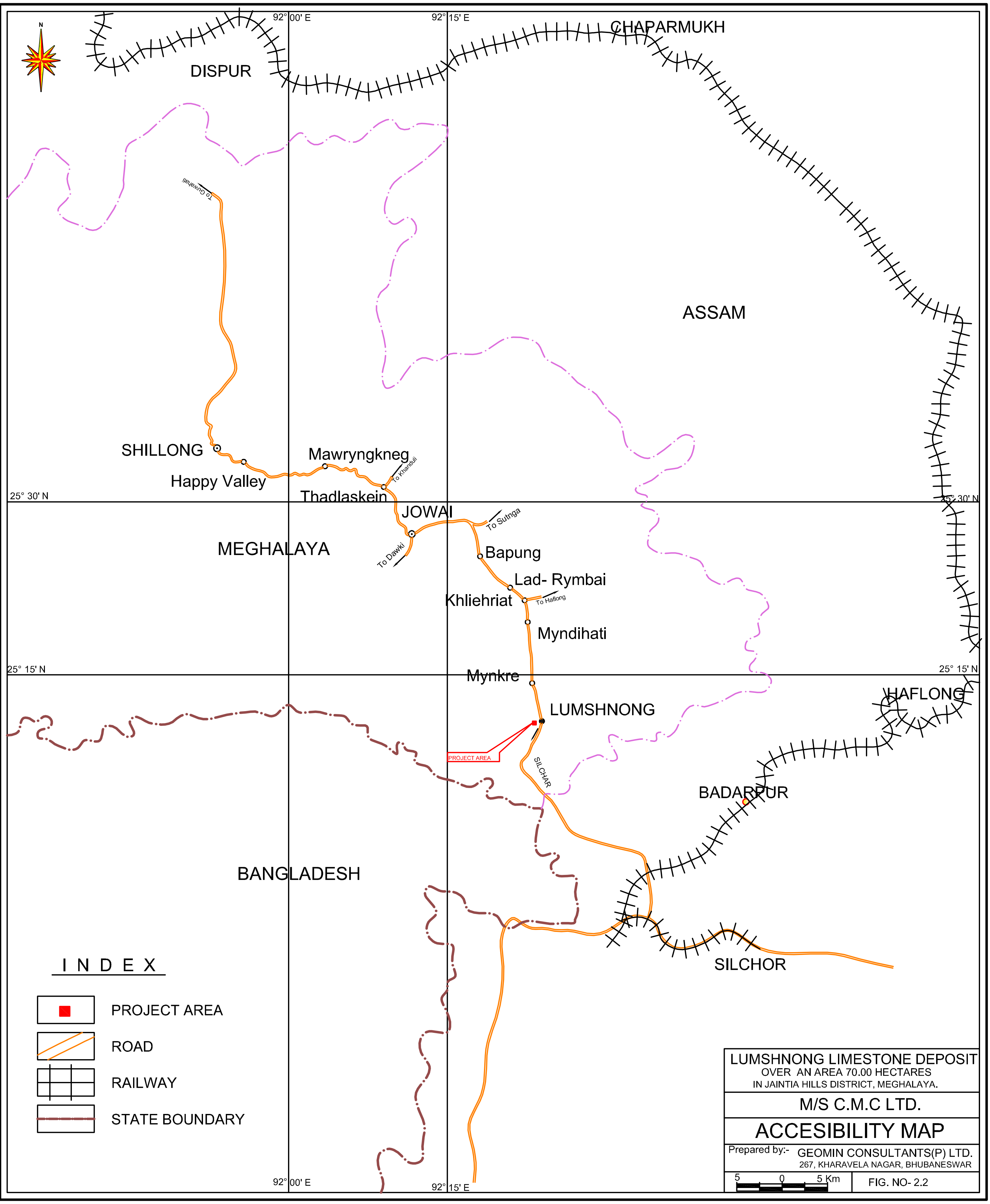
2.10 CONSERVATION OF MINERAL

For conservation of minerals, scientific mining has been planned which will be adhered to. As the quality of Limestone is of high grade variety, total utilization of the excavated limestone does not pose a problem. As there is clear-cut difference between top overburden from limestone, chances of mixing of overburden with limestone is also less.

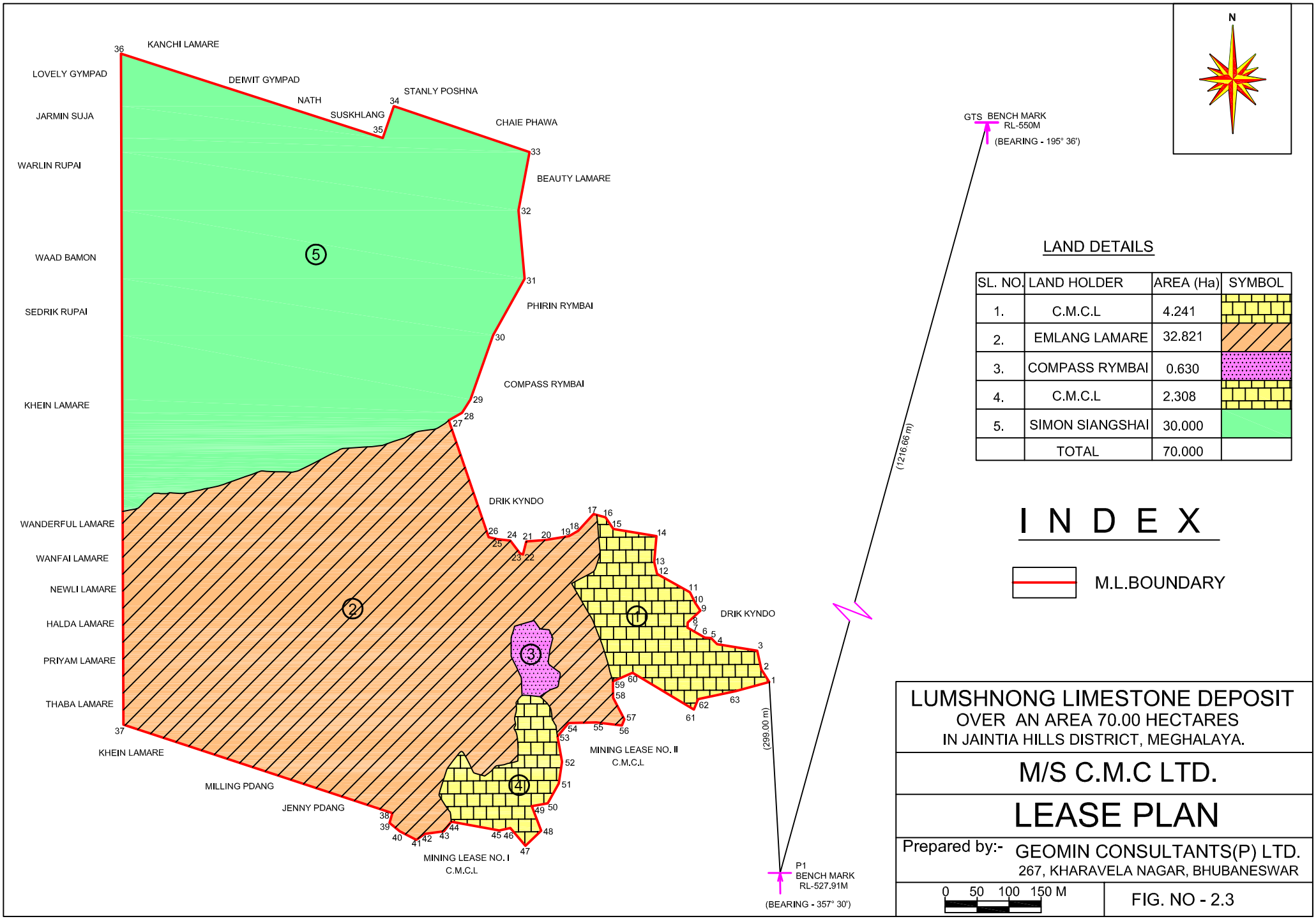
2.11 LITIGATION AGAINST THE PROJECT

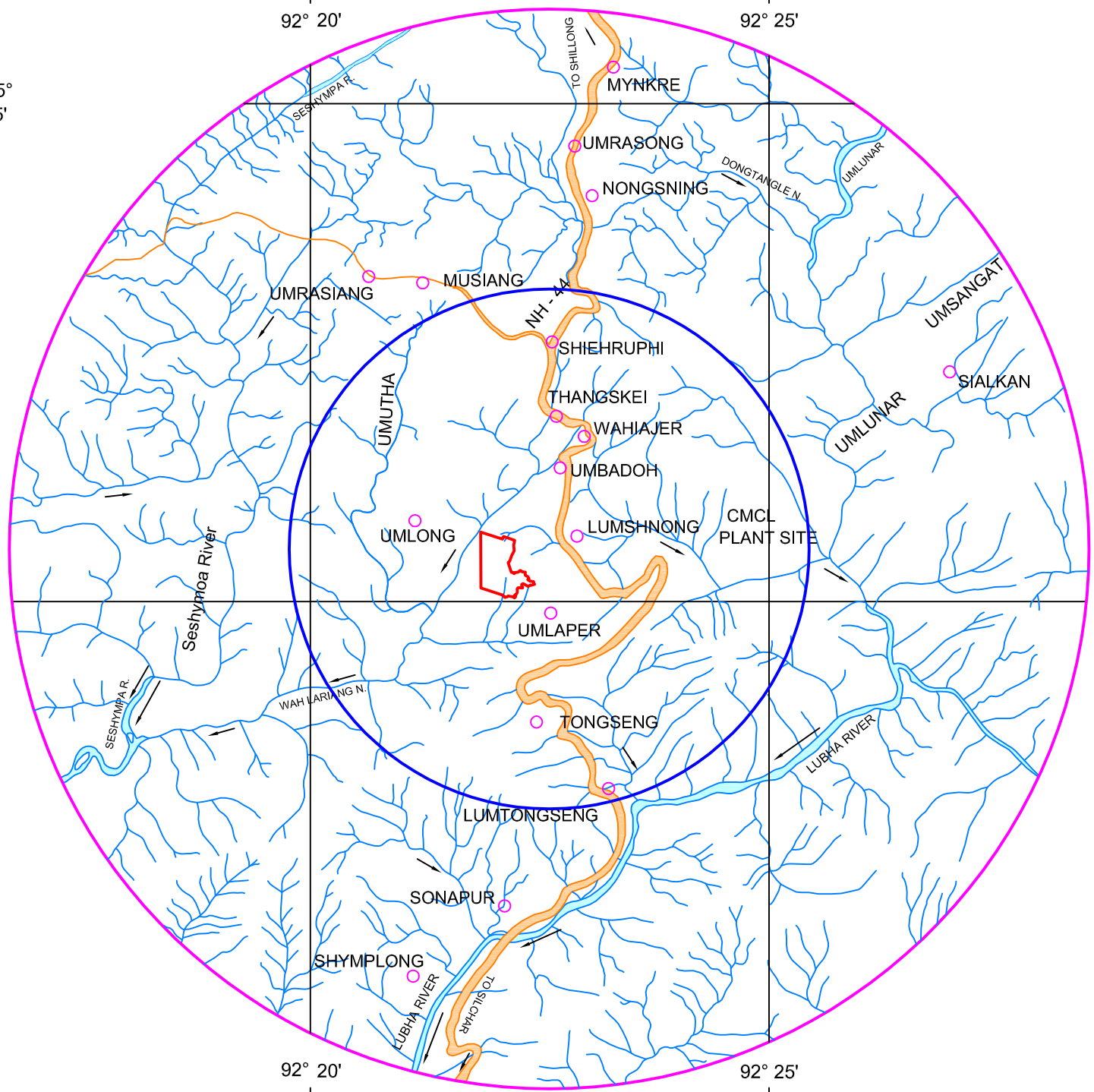
There are no litigation or court cases pending against the project.


N
INDIA
MEGHALAYA
MEGHALAYA
RI-BHOI DISTRICT
EAST GARO HILLS
WEST GARO HILLS
WEST KHASI HILLS
Shillong
EAST KHASI HILLS
JOWAI
JAINTIA HILLS
SOUTH GARO HILLS
Lumshong
DISPUR
CHAPARMUKH
ASSAM
To Guwahati
SHILLONG
Mawryngkneg
Happy Valley
To Thandalli
Thadlaskein
To Sutnga
JOWAI
To Dawki
Bapung
Lad- Rymbai
To Haflong
Khliehriat
Myndihati
Mynkre
LUMSHNONG
PROJECT AREA
SILCHAR
BADARPUR
HAFLONG
BANGLADESH
SILCHOR
92°00' E
92°15' E
25° 30' N
25° 15' N
I N D E X
PROJECT AREA
ROAD
RAILWAY
STATE BOUNDARY
LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.
M/S C.M.C LTD.
LOCATION PLAN
Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR
5 0 5 10 Km
FIG. NO- 1



92° 00' E
92° 15' E
CHAPARMUKH
DISPUR
ASSAM
To Guwahati
SHILLONG
Happy Valley
Mawryngkneg
To Khanduli
Thadlaskein
25° 30' N
JOWAI
To Sutnga
MEGHALAYA
To Dawki
Bapung
Lad- Rymbai
Khliehriat
To Haflong
Myndihati
25° 15' N
Mynkre
LUMSHNONG
HAFLONG
PROJECT AREA
SILCHAR
BADARPUR
BANGLADESH
SILCHOR
I N D E X
PROJECT AREA
ROAD
RAILWAY
STATE BOUNDARY
LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.
M/S C.M.C LTD.
ACCESIBILITY MAP
Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR
5 0 5 Km
FIG. NO- 2.2


N
KANCHI LAMARE
LOVELY GYMPAD
DEIWIT GYMPAD
NATH
STANLY POSHNA
JARMIN SUJA
SUSKHLANG
CHAIE PHAWA
WARLIN RUPAI
BEAUTY LAMARE
WAAD BAMON
SEDRIK RUPAI
PHIRIN RYMBAI
COMPASS RYMBAI
KHEIN LAMARE
DRIK KYNDO
WANDERFUL LAMARE
WANFAI LAMARE
NEWLI LAMARE
HALDA LAMARE
PRIYAM LAMARE
THABA LAMARE
KHEIN LAMARE
MILLING PDANG
JENNY PDANG
MINING LEASE NO. I
C.M.C.L
MINING LEASE NO. II
C.M.C.L
DRIK KYNDO
GTS BENCH MARK
RL-550M
(BEARING - 195° 36')
(1216.66 m)
(299.00 m)
P1
BENCH MARK
RL-527.91M
(BEARING - 357° 30')
LAND DETAILS
SL. NO. | LAND HOLDER | AREA (Ha) | SYMBOL
1. | C.M.C.L | 4.241
2. | EMLANG LAMARE | 32.821
3. | COMPASS RYMBAI | 0.630
4. | C.M.C.L | 2.308
5. | SIMON SIANGSHAI | 30.000
TOTAL | 70.000
INDEX
M.L.BOUNDARY
LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.
M/S C.M.C LTD.
LEASE PLAN
Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR
0 50 100 150 M
FIG. NO - 2.3


92° 20'
92° 25'
25° 15'
25° 10'
TO SHILLONG
MYNKRE
SESHYMPA R.
UMRASONG
NONGSNING
DONGTANGLE N.
UMLUNAR
UMRASIANG
MUSIANG
NH - 44
SHIEHRUPHI
UMSANGAT
SIALKAN
UMUTHA
THANGSKEI
WAHIAJER
UMBADOH
UMLUNAR
UMLONG
LUMSHNONG
CMCL PLANT SITE
Seshymoa River
UMLAPER
SESHYMPA R.
WAH LARIANG N.
TONGSENG
LUBHA RIVER
LUMTONGSENG
SONAPUR
SHYMPLONG
LUBHA RIVER
TO SILCHAR
92° 20'
92° 25'
N
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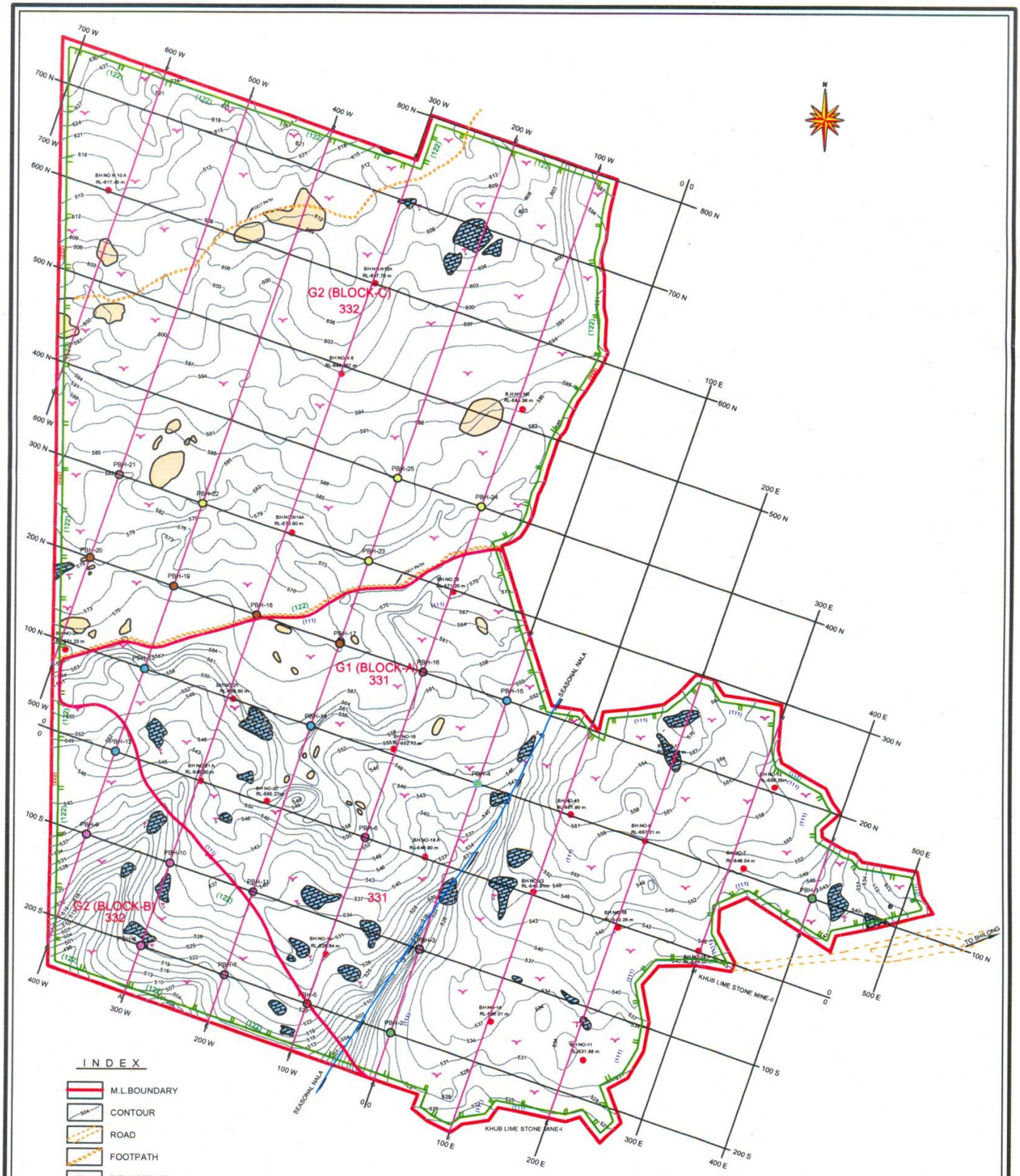
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.
M/S C.M.C LTD.
DRAINAGE PLAN
Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR
0 0.5 1 1.5 2 Km.
FIG. NO -2.4



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- LIME STONE
- SANDSTONE
- SANDY SOIL
- NALA
- ULTIMATE PIT LIMIT

PROPOSED YEAR WISE EXPLORATION SCHEDULE		
YEAR		PROPOSED BORE HOLES
1st Year		PBH-1 - PBH-5
2nd Year		PBH-6 - PBH-11
3rd Year		PBH-12 - MBH-15
4th Year		PBH-16 - PBH-20
5th Year		PBH-21 - PBH-25

LUMSHNONG LIMESTONE DEPOSIT

OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.

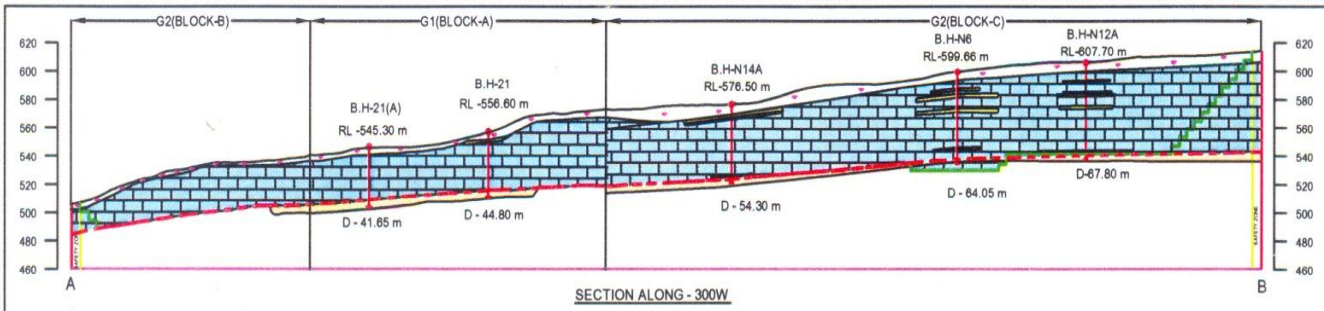
M/S C.M.C LTD.

GEOLOGICAL PLAN

Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR

0 40 80 120 M

FIG. NO -2.5



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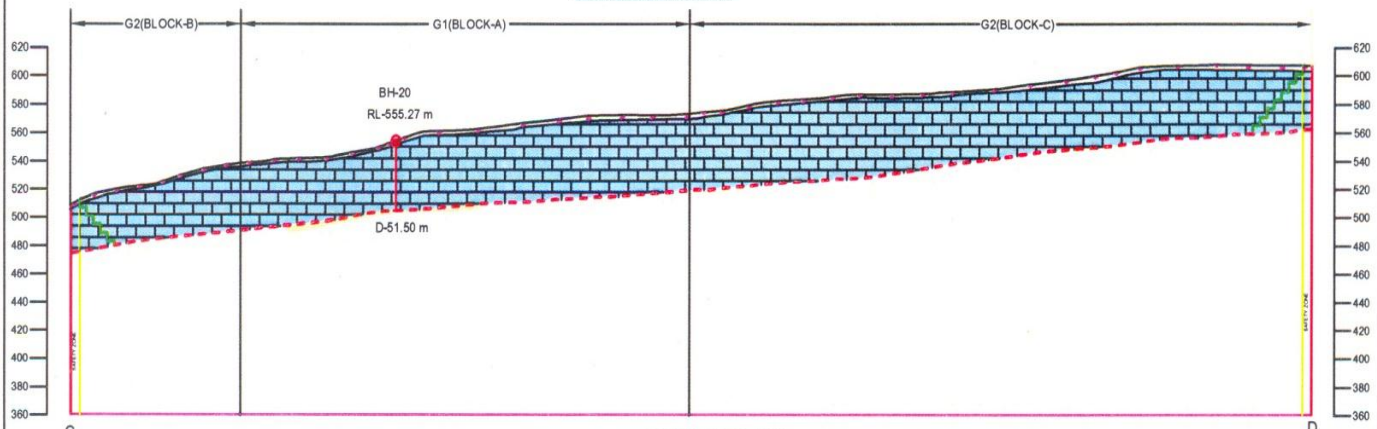

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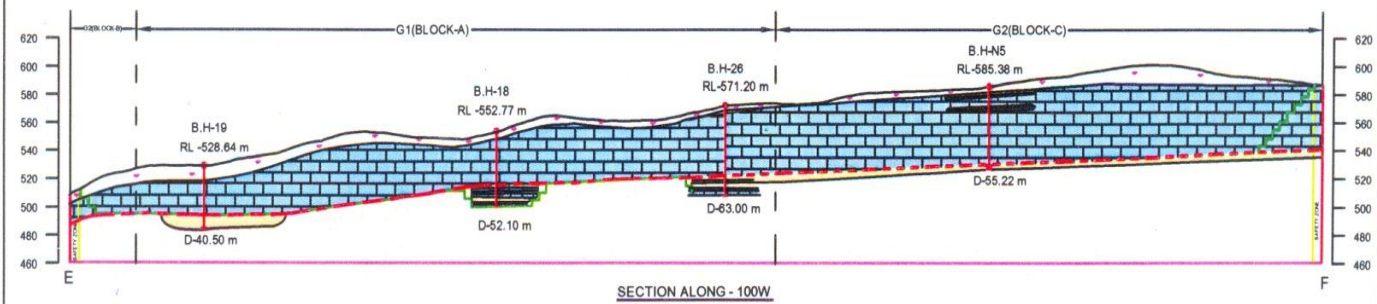

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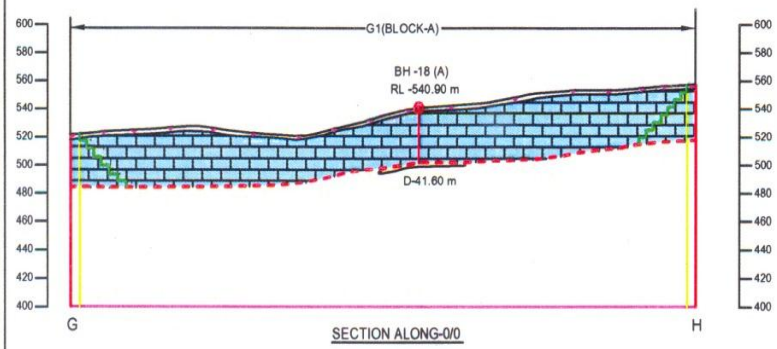

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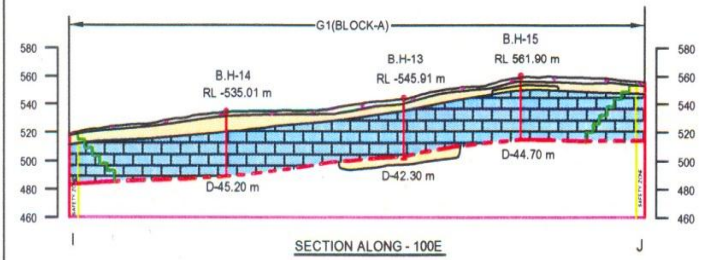

SECTION ALONG - 100E

INDEX

- BOUNDARY
- BORE HOLE (B.H-20)
- ULTIMATE PIT LIMIT (UPL)
- SANDY SOIL
- SANDSTONE
- LIMESTONE
- SILICEOUS LIMESTONE

LUMSHNONG LIMESTONE DEPOSIT

OVER AN AREA 70.00 HECTARES
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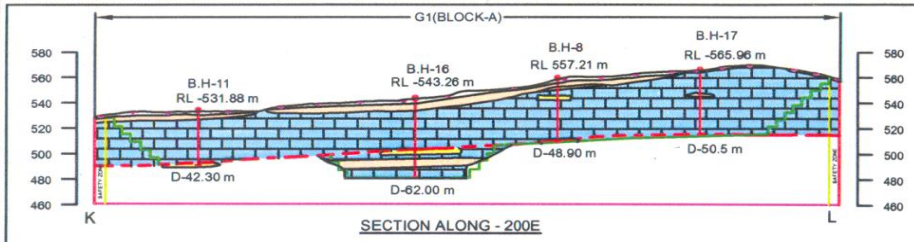
M/S C.M.C LTD.

GEOLOGICAL SECTIONS

Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR

0 40 80 120 M

FIG . NO- 2.5 (i)



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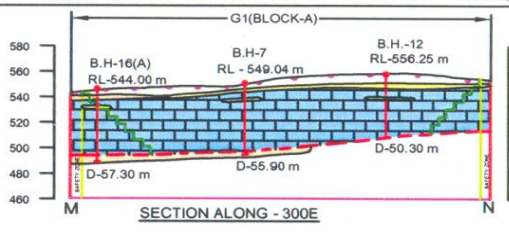

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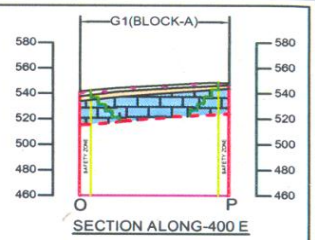

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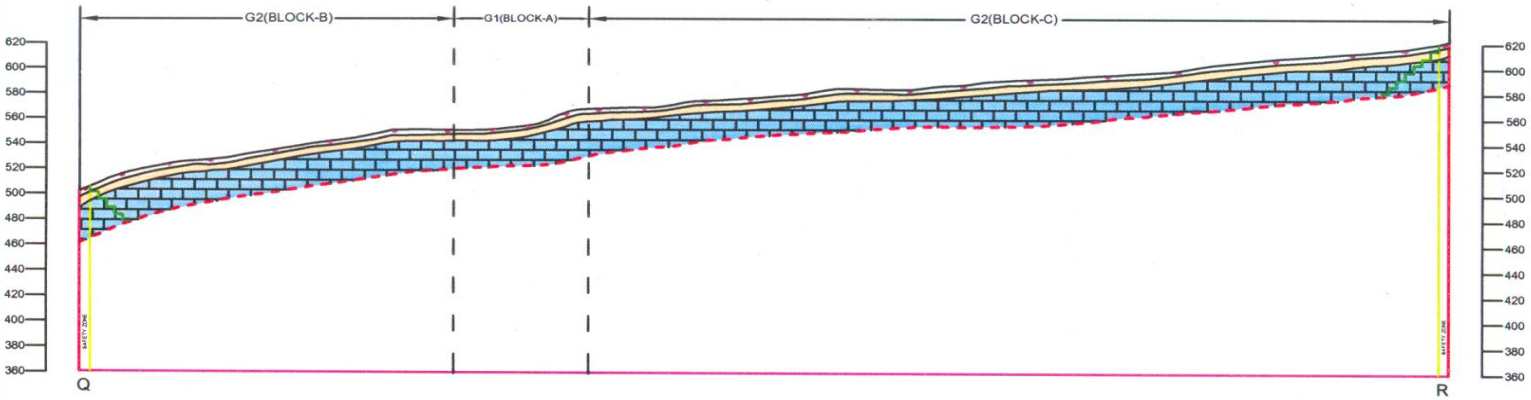

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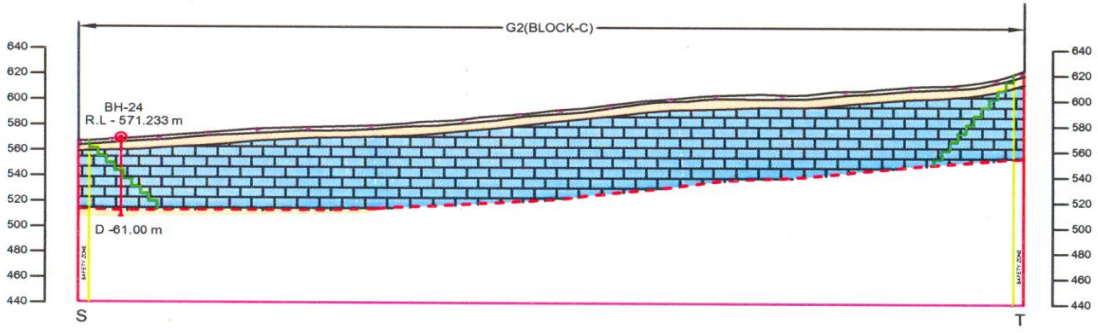

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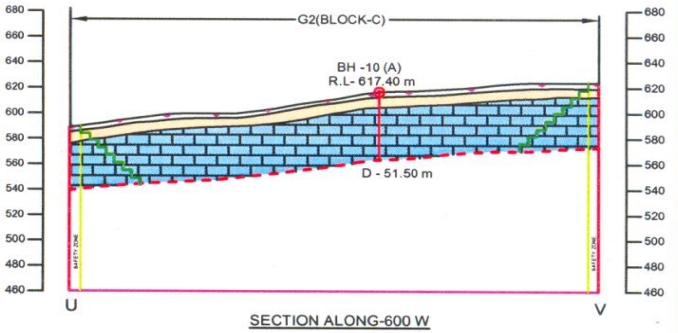

SECTION ALONG-600 W

INDEX

- BOUNDARY
- BORE HOLE (B.H-8)
- ULTIMATE PIT LIMIT (UPL)
- SANDY SOIL
- SANDSTONE
- LIMESTONE
- SILICEOUS LIMESTONE

LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.

M/S C.M.C LTD.

GEOLOGICAL SECTIONS

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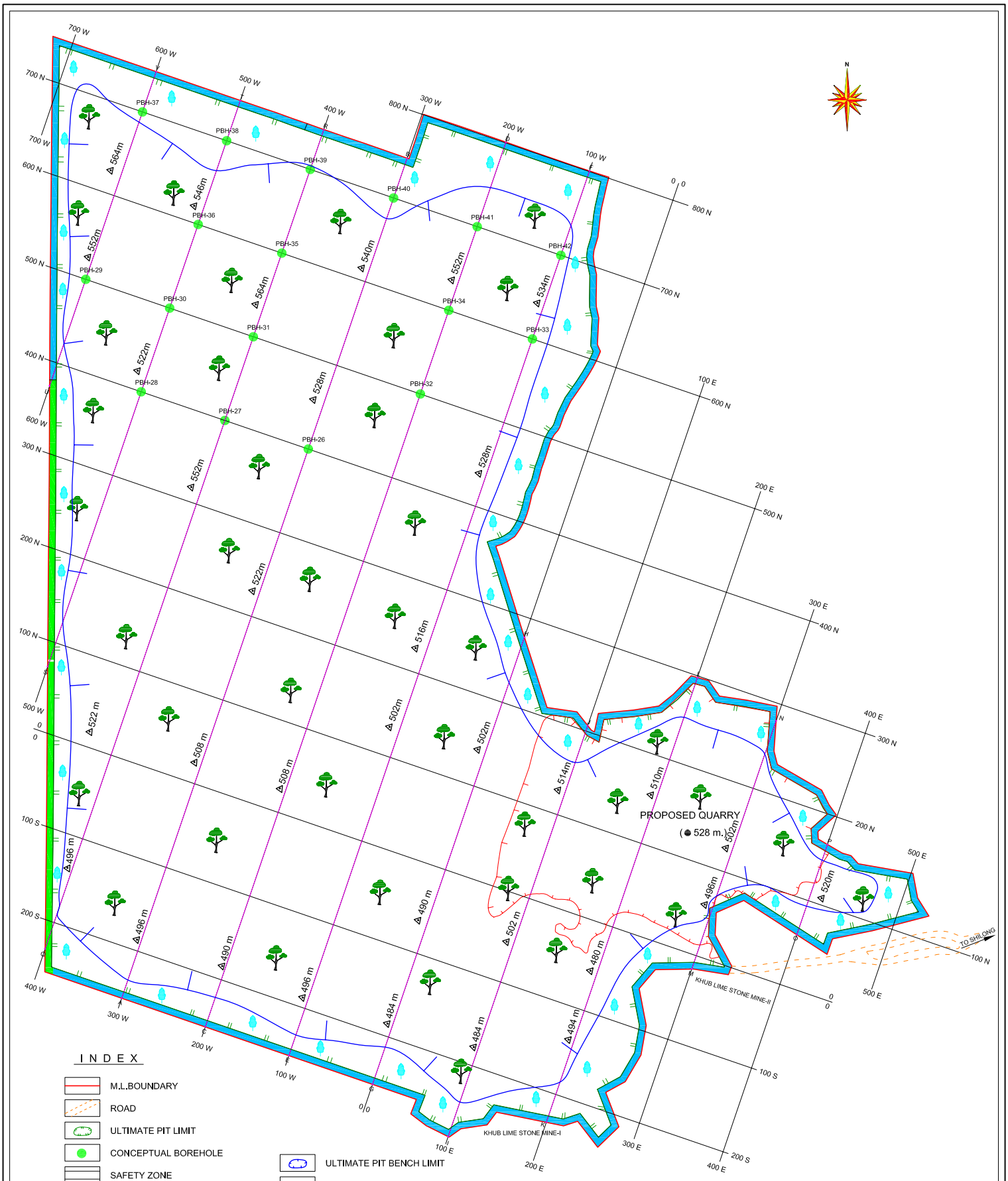
0 40 80 120 M

FIG . NO- 2.5 (ii)



LUMSHNONG LIMESTONE DEPOSIT

OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.

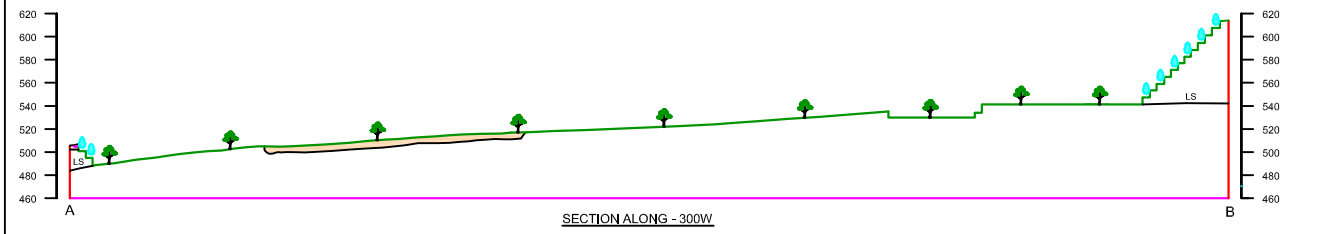
M/S C.M.C LTD.

CONCEPTUAL PLAN

Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR

0 40 80 120 M

FIG . NO- 2.6



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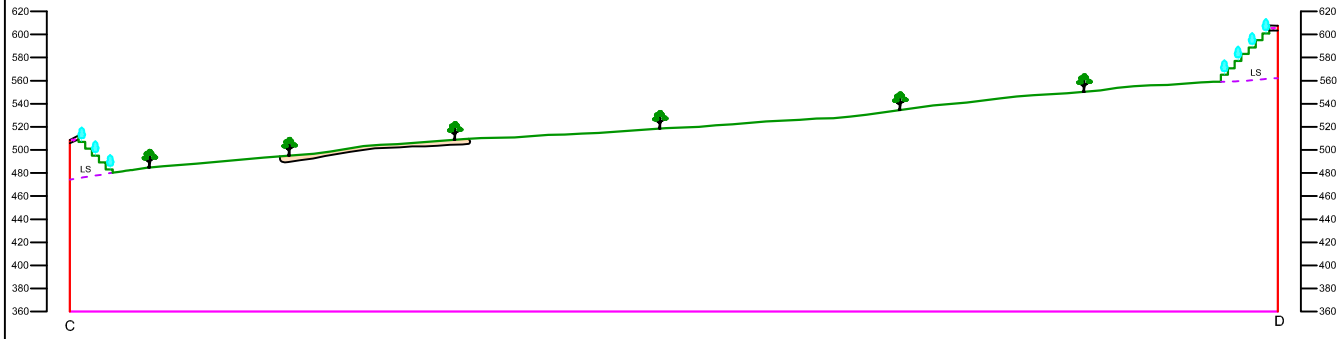

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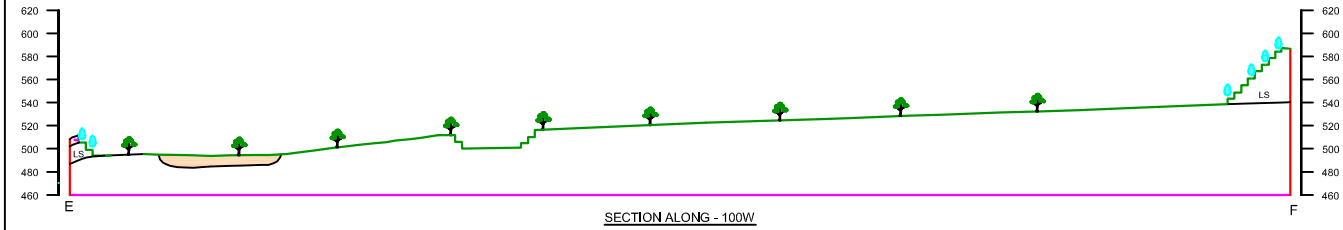

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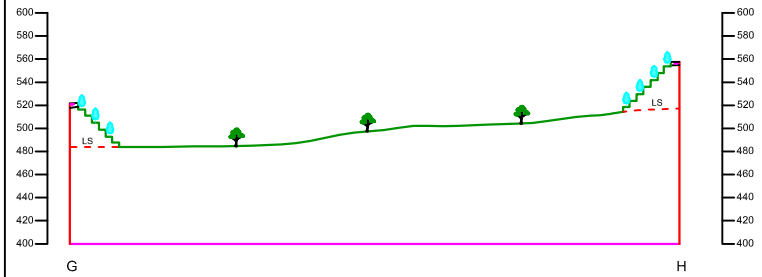

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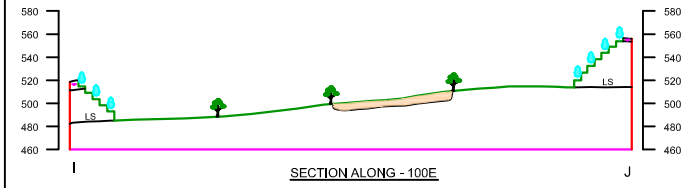

SECTION ALONG - 100E

INDEX

- BOUNDARY
- UPL — ULTIMATE PIT LIMIT
- SANDY SOIL
- SANDSTONE
- LS — LIMESTONE

Reclamation / Rehabilitation Measures	
Bench Plantation	
Back Filling Plantation	

LUMSHNONG LIMESTONE DEPOSIT

OVER AN AREA 70.00 HECTARES
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M/S C.M.C LTD.

CONCEPTUAL SECTIONS

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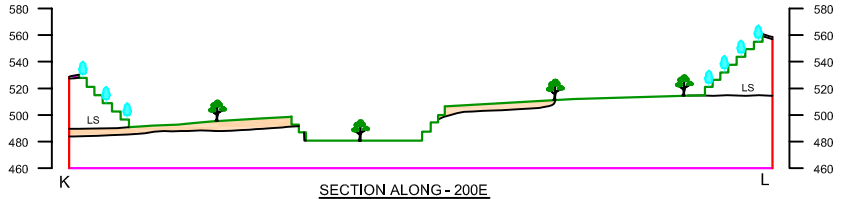
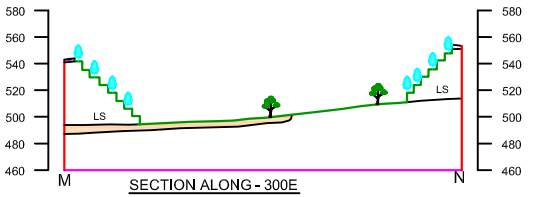
0 40 80 120 M

FIG. NO. :-2.6(i)



SECTION ALONG - 200E



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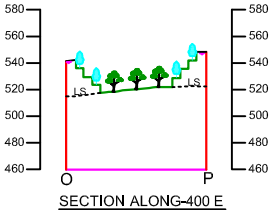

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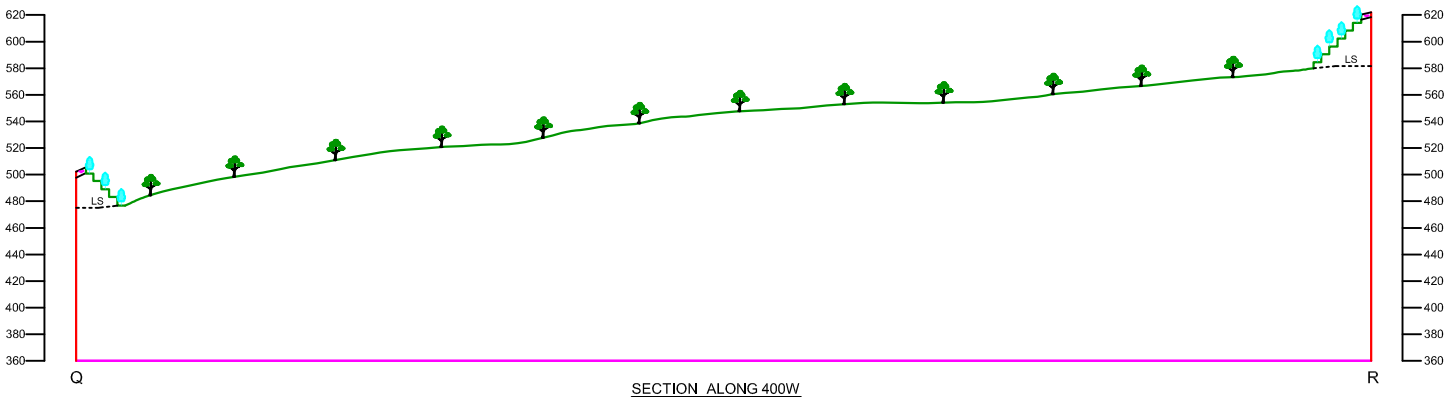

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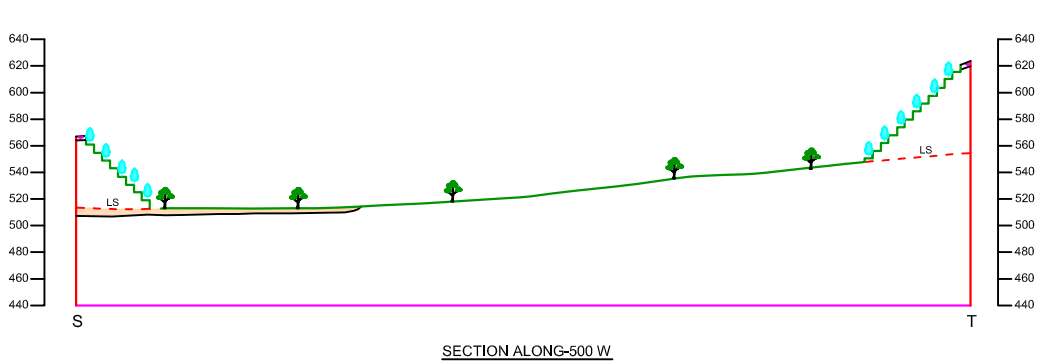

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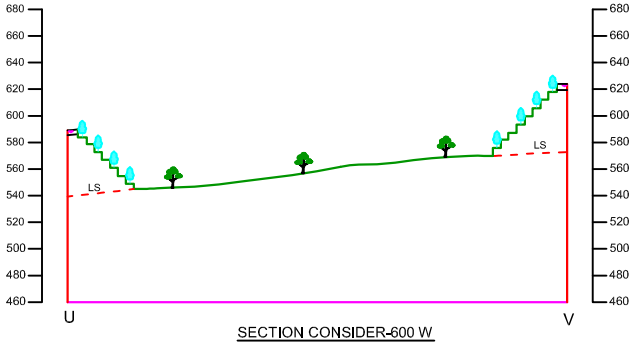

SECTION CONSIDER-600 W

I N D E X

- BOUNDARY
- UPL — ULTIMATE PIT LIMIT
- SANDY SOIL
- SANDSTONE
- LS — LIMESTONE

Reclamation / Rehabilitation Measures	
Bench Plantation	
Back Filling Plantation	

LUMSHNONG LIMESTONE DEPOSIT

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CONCEPTUAL SECTIONS

Prepared by:- GEOMIN CONSULTANTS(P) LTD.
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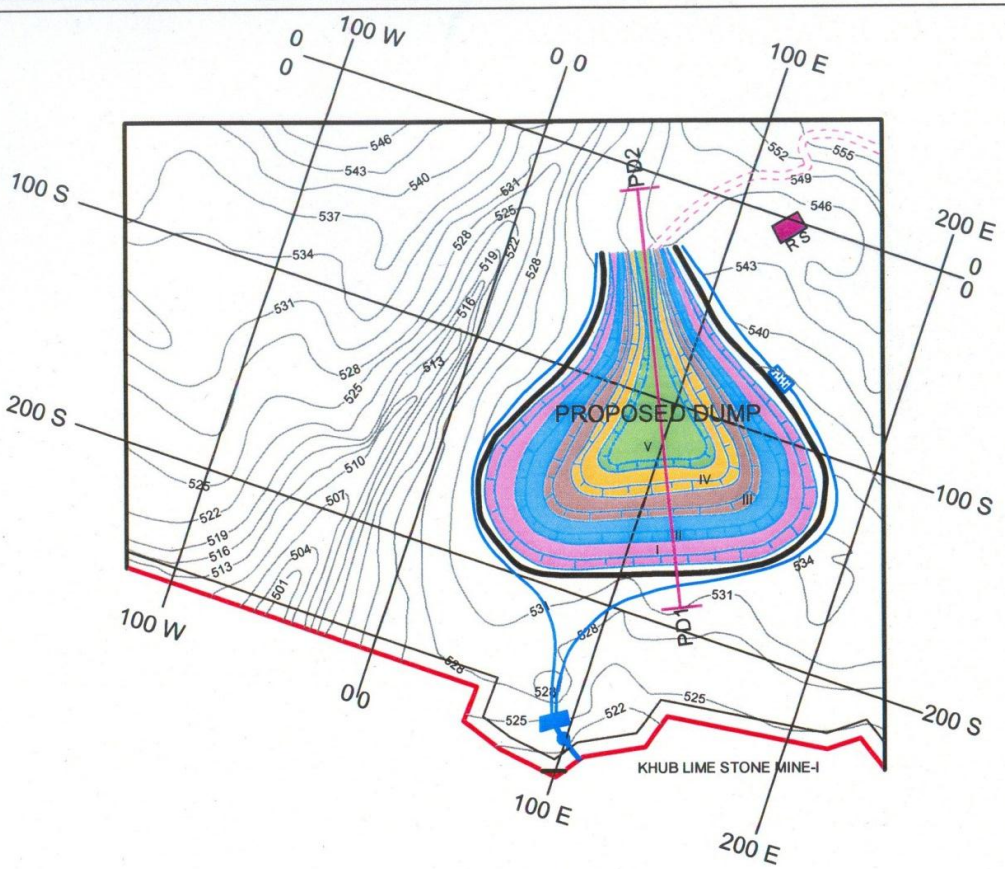
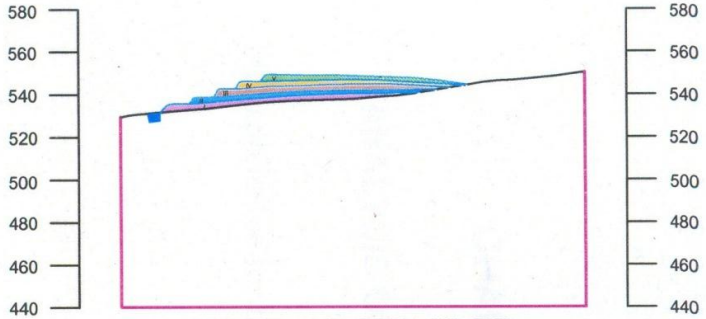
0 40 80 120 M

FIG. NO. :-2.6(ii)





SECTION ALONG PD1 TO PD2

INDEX

- M.L.BOUNDARY
- CONTOUR

PROPOSED FEATURES

- PROPOSED DUMP
- PROPOSED ROAD
- SITE SERVICES
- GARLAND DRAIN
- SETTLING TANK
- CHECK DAM

→ SURFACE DRAINAGE

YEARWISE DUMPING	
YEAR	DUMP
1ST YEAR	
2ND YEAR	
3RD YEAR	
4TH YEAR	
5TH YEAR	

LUMSHNONG LIMESTONE DEPOSIT

OVER AN AREA 70.00 HECTARES

IN JAINTIA HILLS DISTRICT, MEGHALAYA.

M/S C.M.C LTD.

DUMP PLAN AND SECTION

Prepared by:- GEOMIN CONSULTANTS(P) LTD.

267, KHARAVELA NAGAR, BHUBANESWAR

0 40 80 120 M

FIG . NO- 2.7

CHAPTER – 3

ANALYSIS OF ALTERNATIVES

Not applicable for the project as per scoping.

CHAPTER – 4

PRESENT ENVIRONMENTAL SCENARIO

4.0 INTRODUCTION

Today the globe is engaged in seemingly endless discussions about the sustainable development while the mining industry stands on the cross roads involved in the problems of growth, sustainability and imperative need of an environmental agenda. Modern technology has enormously magnified the ability to extract the minerals. Mining activities represent one of the important and vital indexes of economic and industrial development of any country. The occurrence of mineral deposits, being site specific their exploitation cases do not allow for any choice except adoption of an eco-friendly operation. However, the methods are required to maintain environmental equilibrium ensuring sustainable development. Mining processes normally affect the existing environmental domains of the site. It has both adverse and beneficial effects. In a view to maintain the environment commensurate with the mining operations, it is necessary to undertake studies on existing environmental scenario and impacts of mining activities on different environmental domains. This would help in formulating suitable management plans to effect sustainable development plan of the resources.

The entire mining lease area is considered as core zone. The surrounding area covering 10 Km radius from the periphery of the core zone is considered as buffer zone. The core zone and the buffer zone combinedly called as study area.

4.1 METHODOLOGY

An attempt has been made to assess the existing environmental scenario through generation of different data in the study area. Different environmental parameters required to evaluate the prevailing scenario have been generated / collected and compiled for the period from March 2011 to May 2011. The details of the sampling locations are represented in **Fig. 4.1**. The basic environmental attributes generated and compiled for study area are as follows.

- Meteorological Condition
- Ambient Air Quality
- Noise level
- Water Resource and Quality
- Soil Quality
- Land use Pattern
- Ecological Pattern
- Socio-Economic and Demographic Profile

To complete the assignment as per the scope of works the following methods have been adopted.

- Generation of Baseline data
- Analysis of data
- Preparation of report

Then the Public Consultation will be done before submission of final EIA & EMP report for the Environmental Clearance.

4.1.1 Generation of Baseline Data

i) Air quality, noise level and meteorological parameters

To evaluate the air quality, noise characteristics and meteorological parameters two permanent stations are fixed in the core zone and six permanent stations are fixed in the buffer zone by taking into account the prevailing wind conditions in the study season of summer (**Fig. 4.1**). The sampling locations are selected in all the directions of the lease area.

The air monitoring station at the mining site in the core zone is fixed with conventional anemometer to measure the wind speed, wind vane to note wind directions, thermometer for temperature readings and hygrometer for relative humidity data on hourly basis during monitoring periods. Eight locations are selected for studying the noise characteristics in the same place where the air samples are taken.

ii) Ecological Studies

Ecological study is based on the distribution pattern of the various species of plants and density of vegetation within the study area. Detailed species-wise floral surveys have been conducted. Random surveys inside core and buffer zone have been made for determining the faunal characteristics.

iii) Dust fall measurement

Dust fall kits are placed at eight different fixed stations in the core zone and the buffer zone to note the concentration of dust.

iv) Water Quality

Eight water samples were taken from different water sources i.e four samples from surface water and four from ground water.

v) Soil Quality

Three soil samples were taken from five soil profiles (**Fig. 4.1**) to analysis the soil characteristics.

vi) Socio-economic and Demographic profile

Main villages within the core and buffer zones have been selected for sample survey on various aspects to decipher socio-economic and demographic profile. Data collected during survey have been compared with the data collected from the Census Survey of 2001. The details of Socio-economic and demographic profile is appended to this report as **Annexure- 2**.

4.1.2 Analysis of Samples Generated

i) Ambient air samples

High volume samplers/ Respirable dust samplers are used to collect 24 hourly samples for two consecutive days in a week in each permanent station collecting two samples per week, per station for a period of 3 months. This process continued for

the study period and samples are collected from each station. The samples are analysed to know the concentration of PM_{10}, SO_2, NOx and CO as per the procedures laid down by the Indian Standards, IS Code No. 5182 (Part XXIII, II, VI, X respectively). 24 hourly samples were collected for PM_{10} and 8 hourly collection was made for SO_2, NOx and CO for two consecutive days in a week per station for a period of three months.

ii) Meteorological parameters

Meteorological data like wind speed, wind direction, temperature, relative humidity and rainfall are generated from all fixed stations on continuous basis for three months period. Data for previous years were collected mainly from the near by meteorological station for comparison.

iii) Noise characteristics

The noise measurement are made using a sound level meter on hourly basis for continuous period of one day (simultaneously during AAQ monitoring) during the study period and are compared with the prescribed Indian Standards.

iv) Dust fall

The dust fall data collected as per IS Code No. 5182 part-I and analysis was done.

v) Water quality

Samples collected from the representative sites (Figure 4.1) have been analysed to note different parameters as per IS Code NO. 10500 and IS 3025.

vi) Soil quality

The analysis has been conducted to note various (physical and chemical) parameters using Indian standard methods code (IS 2720).

vii) Land use and land cover pattern

Land use and land cover pattern maps are prepared for both core and buffer zone based on the satellite imageries maps. This is substantiated by actual field studies.

4.1.3 Preparation of report

Based on the data generated/complied, studies on Environmental Impact Assessment for the area is made which has helped to formulate a suitable Environmental Management Plan.

4.2 METEOROLOGY

The mining lease area experiences dry to moist subtropical climate. In a view to assess the meteorological parameters of the project area and its surroundings, studies have been made to generate/compile data on rainfall, wind speed, wind direction, temperature and relative humidity.

4.2.1 Rainfall Data

The annual meainfall observed at Shillong was 2415.3 mm while total number of rainfall days was 129.1. While the annual mean annual rainfall observed at Silchar was 3213.7 mm while total number of rainfall days were 132.6.

The rainfall data of near by district i.e Jaintia Hills District, East Garo Hills District and East Kasi Hills District has been collected form the Central Ground Water web site and given below:

Table - 4.1
Rainfall Data in mm.

Year	Name of the Districts		
	Jaintia Hills	**East Garo Hills**	**East Kasi Hills**
2005	3145.6	2053.7	6239.9
2006	2778.3	1754.1	4600.5
2007	--	3270.8	8589.1
2008	--	3162.7	6885.2
2009	--	3059.8	5386.3

The rainfall data being generated by Cement Manufacturing Co. Ltd. at the plant site at Lumshnong during the period 2003 to 2010 shows an average annual rainfall of 5577.31 mm.

4.2.2 Temperature and Relative Humidity

The meteorological data for temperature and relative humidity were collected during the study period. The temperature ranged from 14.6^0C to 29.0^0C while the relative humidity varied from 65.0% to 95.0% during summer season.

4.2.3 Wind speed and Direction

The meteorological data for wind speed and direction were collected in and around the core zone during the study period simultaneously AAQ monitoring. The predominant wind direction is from Southeast to North West. The brief data are represented in Table - 4.2 and wind rose diagram in **Fig. 4.2.**

Table - 4.2
Frequency distribution chart (%)

Sl. No.	Direction	Wind speed in km/hr.			
	From	1.5-5.0	5.1-10.0	10.1-15.0	Total
1	N	---	---	---	---
2	NNE	---	---	---	---
3	NE	---	---	---	---
4	ENE	2.0	---	---	2.0
5	E	6.4	---	---	6.4
6	ESE	6.2	0.8	---	7.0
7	SE	4.3	0.7	0.1	5.1
8	SSE	4.8	0.7	0.1	5.6
9	S	5.6	0.3	0.1	6.0
10	SSW	4.3	0.5	---	4.8
11	SW	3.6	---	---	3.6
12	WSW	1.6	---	---	1.6
13	W	---	---	---	---
14	WNW	---	---	---	---
15	NW	---	---	---	---
16	NNW	---	---	---	---
	Calm	**57.9**			

4.3 AMBIENT AIR QUALITY

Sampling was done in the above station and the same was carried out above 3 m of height from the ground level on a platform erected with outcrops the base. The station represents approximately the highest ground level of the area and practically having no obstruction. The Ambient Air Quality is presented in Table 4.3 and the standard in Table - 4.4.

AAQ monitoring work was carried out at the following stations during summer season in the study area. The direction and the distance are represented with respect to the periphery of the core zone. .

We had tested all the parameters as prescribed by CPCB but all the parameters found below the detetective limit in the study area, so we had not given them in them in tabular form.

Sl. No.	Station Codes	Stations	Direction	Distance (in Km) and Justification
01	A_1	Lease area	Inside the lease area	----
02	A_2	Lease area	Inside the lease area	----
01	A3	Umlaper	S	1 km(Nearby Village in the wind direction during winter season)
02	A_4	Khub	SW)	2km(Nearby Village in the wind direction during winter season
03	A_5	Umlong	NW	1.5 KM(Nearby Village in the wind direction during summer and rainy season)
04	A_6	CMC Plant	E	3 km (Project proponent Plant site where small township is exsts)
05	A_7	Umbadoh	N	0.5 km (Nearby village in the wind direction during summer and rainy season)
06	A_8	Shieruphi	NE	5km (Nearby Village in the wind direction during summer and rainy season)

Table - 4.3
Ambient Air Monitoring Results

CORE ZONE
LOCATION – A1 : Lease Area

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
1	01.03.2011	41.2	10.3	12.5	< 1000
2	02.03.2011	45.6	12.2	13.3	< 1000
3	08.03.2011	46.3	11.6	12.1	< 1000
4	09.03.2011	49.5	14.3	15.5	< 1000
5	15.03.2011	53.3	12.8	14.2	< 1000
6	16.03.2011	51.2	10.3	16.4	< 1000
7	22.03.2011	47.7	13.5	13.2	< 1000
8	23.03.2011	42.3	10.5	12.5	< 1000
9	29.03.2011	46.7	8.5	12.0	< 1000
10	30.03.2011	50.8	12.8	10.5	< 1000
11	05.04.2011	48.3	10.9	11.4	< 1000
12	06.04.2011	41.2	12.6	12.8	< 1000
13	12.04.2011	44.6	13.6	13.6	< 1000

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
14	13.04.2011	41.7	10.5	10.2	< 1000
15	19.04.2011	38.3	12.7	14.4	< 1000
16	20.04.2011	45.3	11.5	13.3	< 1000
17	26.04.2011	47.8	12.8	12.1	< 1000
18	27.04.2011	51.2	12.5	11.3	< 1000
19	03.05.2011	48.4	14.7	10.7	< 1000
20	04.05.2011	40.8	12.2	13.5	< 1000
21	10.05.2011	46.3	08.7	15.2	< 1000
22	11.05.2011	41.7	10.3	15.3	< 1000
23	17.05.2011	48.3	11.2	13.7	< 1000
24	18.05.2011	41.6	12.5	14.5	< 1000
25	24.05.2011	49.3	11.7	13.4	< 1000
26	25.05.2011	44.7	10.9	12.3	< 1000
MAX		53.3	14.7	16.4	
MIN		38.3	8.5	10.2	
AVG.		45.92	11.77	13.07	
95 Percentile		51.2	14.125	15.45	

LOCATION – A2 : Lease Area

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
1	03.03.2011	40.8	10.6	10.5	< 1000
2	04.03.2011	42.3	9.7	12.8	< 1000
3	10.03.2011	45.4	11.3	13.2	< 1000
4	11.03.2011	47.3	12.7	14.8	< 1000
5	17.03.2011	49.7	13.2	11.3	< 1000
6	18.03.2011	41.6	12.4	12.2	< 1000
7	24.03.2011	38.3	13.8	15.2	< 1000
8	25.03.2011	47.5	11.2	13.5	< 1000
9	31.03.2011	44.5	12.7	14.7	< 1000
10	01.04.2011	46.6	13.3	12.5	< 1000
11	07.04.2011	48.9	15.8	14.7	< 1000
12	08.04.2011	41.4	14.5	13.8	< 1000
13	14.04.2011	40.6	16.3	11.2	< 1000
14	15.04.2011	42.2	12.7	12.7	< 1000
15	21.04.2011	40.7	11.8	12.5	< 1000

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
16	22.04.2011	41.2	13.6	14.3	< 1000
17	28.04.2011	43.4	12.5	13.7	< 1000
18	29.04.2011	47.8	14.3	15.2	< 1000
19	05.05.2011	45.7	13.7	14.4	< 1000
20	06.05.2011	48.2	11.4	13.6	< 1000
21	12.05.2011	49.4	15.6	12.5	< 1000
22	13.05.2011	45.5	16.8	15.8	< 1000
23	19.05.2011	46.7	13.7	12.7	< 1000
24	20.05.2011	45.5	14.3	11.4	< 1000
25	26.05.2011	44.2	15.4	12.3	< 1000
26	27.05.2011	46.1	10.5	14.2	< 1000
MAX		49.7	16.8	15.8	
MIN		38.3	9.7	10.5	
AVG.		44.67	13.22	13.29	
95 Percentile		49.275	16.175	15.2	

BUFFER ZONE
LOCATION – A3 : Umlaper

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
1	01.03.2011	40.6	8.5	10.5	< 1000
2	02.03.2011	42.3	9.0	11.5	< 1000
3	08.03.2011	46.8	8.5	12.5	< 1000
4	09.03.2011	45.9	9.0	11.0	< 1000
5	15.03.2011	43.5	8.2	12.5	< 1000
6	16.03.2011	47.3	10.0	11.0	< 1000
7	22.03.2011	44.7	9.5	10.5	< 1000
8	23.03.2011	41.9	8.5	11.0	< 1000
9	29.03.2011	44.5	9.5	10.0	< 1000
10	30.03.2011	43.8	9.5	12.0	< 1000
11	05.04.2011	42.6	8.5	11.0	< 1000
12	06.04.2011	40.4	9.5	10.5	< 1000
13	12.04.2011	41.2	7	9.0	< 1000

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
14	13.04.2011	42.7	9.5	11.5	< 1000
15	19.04.2011	43.5	10.5	10.5	< 1000
16	20.04.2011	44.8	9	10.5	< 1000
17	26.04.2011	45.7	10.5	11.5	< 1000
18	27.04.2011	46.6	10.0	10.0	< 1000
19	05.05.2011	43.8	10.0	9.0	< 1000
20	06.05.2011	44.5	11.0	8.5	< 1000
21	10.05.2011	43.4	12.0	12.0	< 1000
22	11.05.2011	45.5	9.0	11.5	< 1000
23	17.05.2011	47.7	7.5	10.5	< 1000
24	18.05.2011	44.6	8.5	9.5	< 1000
25	24.05.2011	45.5	8.0	9.0	< 1000
26	25.05.2011	46.8	12.5	8.5	< 1000
	MAX	47.7	12.5	12.5	
	MIN	40.4	7	8.5	
	AVG.	44.25	9.35	10.59	
	95 Percentile	47.175	11.75	12.375	

LOCATION – A4 : Khub

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
1	03.03.2011	40.6	9.3	12.6	< 1000
2	04.03.2011	41.3	9.8	10.5	< 1000
3	10.03.2011	42.5	8.8	11.3	< 1000
4	11.03.2011	44.6	7.5	12.5	< 1000
5	17.03.2011	43.6	8.7	10.8	< 1000
6	18.03.2011	42.7	9.3	11.0	< 1000
7	24.03.2011	45.8	10.1	13.5	< 1000
8	25.03.2011	41.8	11.5	14.3	< 1000
9	31.03.2011	42.5	10.3	12.5	< 1000
10	01.04.2011	43.5	9.2	15.7	< 1000
11	07.04.2011	44.9	9.7	12.8	< 1000
12	08.04.2011	45.5	8.3	13.5	< 1000
13	14.04.2011	41.9	9.6	11.9	< 1000
14	15.04.2011	40.2	10.6	13.8	< 1000
15	21.04.2011	41.6	10.3	12.7	< 1000
16	22.04.2011	42.7	9.7	12.4	< 1000
17	28.04.2011	43.3	10.4	13.3	< 1000
18	29.04.2011	44.5	8.5	11.7	< 1000
19	05.05.2011	40.8	9.7	12.3	< 1000
20	06.05.2011	44.6	9.3	13.5	< 1000
21	12.05.2011	43.3	9.6	13.5	< 1000
22	13.05.2011	41.7	9.8	12.5	< 1000
23	19.05.2011	40.6	11.7	10.3	< 1000
24	20.05.2011	41.5	9.5	11.5	< 1000
25	26.05.2011	42.5	10.3	10.3	< 1000
26	27.05.2011	40.2	10.0	13.2	< 1000
MAX		45.8	11.7	15.7	
MIN		40.2	7.5	10.3	
AVG.		42.64	9.67	12.45	
95 Percentile		45.35	11.275	14.175	

LOCATION – A5 : Umlong

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
1	01.03.2011	38.8	9.0	10.1	< 1000
2	02.03.2011	39.5	10.5	12.2	< 1000
3	08.03.2011	40.8	12.5	11.6	< 1000
4	09.03.2011	40.9	10.5	12.5	< 1000
5	15.03.2011	38.7	11.0	13.8	< 1000
6	16.03.2011	40.5	8.5	14.5	< 1000
7	22.03.2011	42.5	12.5	12.2	< 1000
8	23.03.2011	43.5	10.0	13.3	< 1000
9	29.03.2011	41.5	8.5	11.5	< 1000
10	30.03.2011	48.6	8.5	13.5	< 1000
11	05.04.2011	39.5	9.0	14.8	< 1000
12	06.04.2011	38.5	11.0	12.6	< 1000
13	12.04.2011	42.9	11.5	12.5	< 1000
14	13.04.2011	39.8	12.0	14.6	< 1000
15	19.04.2011	38.5	10.5	15.5	< 1000
16	20.04.2011	42.9	10.5	12.3	< 1000
17	26.04.2011	41.9	12.3	12.5	< 1000
18	27.04.2011	45.5	12.2	13.7	< 1000
19	05.05.2011	41.2	14.7	13.3	< 1000
20	06.05.2011	42.8	11.5	12.7	< 1000
21	10.05.2011	44.5	12.3	10.5	< 1000
22	11.05.2011	45.7	12.9	14.6	< 1000
23	17.05.2011	44.7	10.7	12.5	< 1000
24	18.05.2011	43.5	11.5	10.4	< 1000
25	24.05.2011	45.9	10.3	12.5	< 1000
26	25.05.2011	43.6	12.5	10.5	< 1000
	MAX	48.6	14.7	15.5	
	MIN	38.5	8.5	10.1	
	AVG.	42.18	11.03	12.71	
	95 Percentile	45.85	12.8	14.75	

LOCATION – A6 : CMCL Plant Site

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	**SO_2**	**NOx**	CO
1	03.03.2011	42.6	14.5	15.0	< 1000
2	04.03.2011	44.3	15.0	14.5	< 1000
3	10.03.2011	43.6	13.0	16.3	< 1000
4	11.03.2011	44.9	15.1	17.5	< 1000
5	17.03.2011	43.7	15.0	14.5	< 1000
6	18.03.2011	43.4	12.5	15.0	< 1000
7	24.03.2011	41.5	10.5	16.5	< 1000
8	25.03.2011	43.3	12.5	18.0	< 1000
9	31.03.2011	42.7	11.0	14.5	< 1000
10	01.04.2011	45.6	12.5	16.0	< 1000
11	07.04.2011	39.5	12.0	15.5	< 1000
12	08.04.2011	48.9	13.5	13.0	< 1000
13	14.04.2011	43.3	12.5	16.0	< 1000
14	15.04.2011	38.7	10.5	18.5	< 1000
15	21.04.2011	39.5	11.0	13.7	< 1000
16	22.04.2011	39.8	12.5	12.0	< 1000
17	28.04.2011	37.2	14.5	17.0	< 1000
18	29.04.2011	39.4	13.0	13.7	< 1000
19	05.05.2011	38.7	15.5	17.6	< 1000
20	06.05.2011	41.6	12.4	13.5	< 1000
21	12.05.2011	42.4	15.7	17.5	< 1000
22	13.05.2011	43.5	13.5	14.7	< 1000
23	19.05.2011	42.3	12.9	15.5	< 1000
24	20.05.2011	40.5	14.7	16.5	< 1000
25	26.05.2011	40.7	13.5	15.9	< 1000
26	27.05.2011	39.5	15.4	18.7	< 1000
	MAX	48.9	15.7	18.7	
	MIN	37.2	10.5	12	
	AVG.	41.96	13.25	15.65	
	95 Percentile	45.42	15.47	18.37	

LOCATION – A7 : Umbadoh

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	SO_2	NOx	CO
1	01.03.2011	42.5	11.5	12.0	< 1000
2	02.03.2011	43.5	10.5	11.5	< 1000
3	08.03.2011	44.5	8.5	10.5	< 1000
4	09.03.2011	43.5	9.5	11.0	< 1000
5	15.03.2011	45.0	9.0	12.5	< 1000
6	16.03.2011	43.5	8.5	10.0	< 1000
7	22.03.2011	41.5	9.0	11.5	< 1000
8	23.03.2011	43.5	10.0	12.4	< 1000
9	29.03.2011	45.0	12.5	13.3	< 1000
10	30.03.2011	46.0	11.0	11.5	< 1000
11	05.04.2011	45.5	9.0	10.0	< 1000
12	06.04.2011	44.0	9.5	11.0	< 1000
13	12.04.2011	43.5	8.5	11.5	< 1000
14	13.04.2011	45.0	10.6	10.0	< 1000
15	19.04.2011	44.5	11.5	12.5	< 1000
16	20.04.2011	45.0	10.0	10.5	< 1000
17	26.04.2011	44.5	10.5	11.0	< 1000
18	27.04.2011	45.5	11.0	12.0	< 1000
19	05.05.2011	47.0	10.5	13.7	< 1000
20	06.05.2011	43.5	10.5	11.3	< 1000
21	10.05.2011	45.5	11.7	12.5	< 1000
22	11.05.2011	44.0	10.3	10.4	< 1000
23	17.05.2011	45.0	9.5	11.3	< 1000
24	18.05.2011	43.5	8.0	12.4	< 1000
25	24.05.2011	45.0	9.4	10.3	< 1000
26	25.05.2011	46.5	10.5	11.5	< 1000
	MAX	47	12.5	13.7	
	MIN	41.5	8	10	
	AVG.	44.46	10.03	11.46	
	95 Percentile	46.37	11.65	13.10	

LOCATION – A8 : Shieruphi

Sl. No.	Date of Monitoring	In Microgram per Cubic meter			
		PM10	**SO_2**	**NOx**	CO
1	03.03.2011	44.5	8.8	12.0	< 1000
2	04.03.2011	41.5	9.0	11.0	< 1000
3	10.03.2011	40.7	10.9	13.3	< 1000
4	11.03.2011	44.6	11.6	13.5	< 1000
5	17.03.2011	48.8	10.0	14.0	< 1000
6	18.03.2011	40.5	11.5	12.4	< 1000
7	24.03.2011	43.4	11.5	13.5	< 1000
8	25.03.2011	42.5	10.5	14.0	< 1000
9	31.03.2011	40.7	12.5	13.5	< 1000
10	01.04.2011	40.5	11.0	12.0	< 1000
11	07.04.2011	39.7	10.7	12.0	< 1000
12	08.04.2011	40.5	11.5	11.9	< 1000
13	14.04.2011	43.5	11.0	12.2	< 1000
14	15.04.2011	39.8	10.5	12.5	< 1000
15	21.04.2011	39.5	11.0	14.0	< 1000
16	22.04.2011	40.6	10.5	15.0	< 1000
17	28.04.2011	41.7	11.5	13.8	< 1000
18	29.04.2011	42.2	11.0	13.3	< 1000
19	05.05.2011	43.5	11.0	12.7	< 1000
20	06.05.2011	43.3	13.5	13.6	< 1000
21	12.05.2011	42.7	11.0	11.5	< 1000
22	13.05.2011	44.5	12.5	11.3	< 1000
23	19.05.2011	41.3	13.5	10.5	< 1000
24	20.05.2011	43.5	11.5	11.7	< 1000
25	26.05.2011	44.6	10.7	10.3	< 1000
26	27.05.2011	43.5	11.3	11.5	< 1000
	MAX	48.8	13.5	15	
	MIN	39.5	8.8	10.3	
	AVG.	42.38	11.15	12.57	
	95 Percentile	44.6	13.25	14	

The concentration of carbon monoxide found well below the prescribed limit of 1000 microgram/cum. PM values at all stations are much below the norms indicated below. We had tested all the parameters prescribed by the CPCB but all the parameters are below detective limit so we had not given in the tabular form. Some PM10 samples were tested for free silica. The free silica in the PM10 found to be <0.03%.

Table - 4.4
Ambient Air Quality Standards (microgram/cum)

Sl. No.	Pollutant	Time weighed average	Industrial, Residential, Rural and Other Residential areas	Ecologically sensitive area (notified by Central Government)	Methods of Measurement
1	PM_{10}	Annual	60	60	Improved West and Gaeke
		24 hour	100	100	Ultraviolet fluorescence
2	SO_2	Annual	50	20	Modified Jacob & Hochheiser
		24 hour	80	80	Chemiluminescence
3	NO_X	Annual	40	30	Gravimetric
		24 hour	80	80	Beta attenuntation

4.4 DUSTFALL

Dust fall kits were placed at each permanent station of core and buffer zone for a continuous period of one month during study period to know the concentration of dust. Dust fall data are presented in the Table - 4.5.

As there is no prescribed limit of Indian Standard for dust fall, the data obtained have been compared with German norms. The norms as published in Ta LUFT, 1986 are as follows.

Maximum Concentrations :

Annual arithmetic mean - 0.35g/sq.m/day or 10.5 tonne/sq.km./month
98 percentile value - 0.65g/sq.m/day or 19.5 tonne/sq.km/month

Table - 4.5
Dust fall Rate (Summer Season)

Sl. No.	Station Code	Stations	Dust fall (Tonne/sq.km/month)
01	D_1	Lease area	1.2
02	D_2	Lease area	1.4
03	D_3	Umlaper	0.9
04	D_4	Khub	1.7
05	D_5	Umlong	0.8
06	D_6	CMC Plant	2.1
07	D_7	Umbadoh	1.0
08	D_8	Shieruphi	0.8

4.5 NOISE LEVEL

Monitoring was done on hourly basis for a continuous period of one day during the study season and presented as minimum and maximum values in Table - 4.6. The standard of various noise levels for different zones in respect of day and night is shown in Table - 4.7.

Table - 4.6
Noise Level Monitoring (dBA)

Sl. No.	Station Code	Station	Day (L_d)		Night (L_n)	
			MAX	MIN	MAX	MIN
1	N_1	Lease area	60.9	43.5	42.5	38.6
2	N_2	Lease area	61.5	45.5	41.2	39.8
3	N_3	Umlaper	55.9	44.7	41.5	37.9
4	N_4	Khurb	53.5	43.7	40.1	39.5
5	N_5	Umlong	55.8	44.5	42.4	35.6
6	N_6	CMC Plant	55.6	44.5	43.7	37.3
7	N_7	Umbadoh	57.3	43.9	42.6	38.7
8	N_8	Shieruphi	57.7	42.5	40.5	39.5

Table - 4.7
Standards With Respect To Ambient Noise Level

Land Use Category	Limit in dBA	
	Day time	Night time
Industrial area	75	70
Commercial area	65	55
Residential area	55	45
Silence area	50	40

(Source : Air Prevention and Control of Pollution Act, 1981)

Note:
a) Day time : 6 A.M. to 9 P.M.
b) Night time : 10. P.M. to 5 A.M.
c) Silence zone : Hospital, Sanitarium,Educational Institution, Wild Life Sanctuary and Courts (within 100 meter around these locations).

4.6 WATER REGIME

4.6.1 Geohydrology

The area is predominantly made of highly dissected plateau (H.D.P.) followed by moderately dissected plateau (M.D.P.) Some denudational hills (D.H.H) and formation of mesa/butte clearly

signifies that the area has been subjected to erosion over a considerable period of time. The Deep Gorge (D.G.) aligned in North-South direction in the eastern part of Lumshnong is a significant feature of the land morphology. Series of Structural Hills (SH) in the southern part of the fault form a peculiar topography near the international boundary.

Lumshnong is located at Highly Dissected Plateau (HDP) as shown in Figure 3.2. The area is composed of sedimentary rocks of Cretaceous – Tertiary origin. Some fractures are also present in the region. The area is characterized mainly by Karst topography (Limestone) followed by sandstone, granite, and gneisses resulting in undulating uplands with gullies. The area possesses semi-confined to confined aquifers with moderate permeability suitable for bore wells. The area is marked with springs and seepages. Therefore, the area is suitable for dug wells and shallow tube wells etc. Many perennial streams are available in the area, which often make principal source of water for human use.

Parallel deep gorges aligned in North-South direction in the eastern and western part of Lumshnong are also present in the region. These areas are the formations of Archean Gneissic Complex. There are highly deformed massive rocks with fractures. The gorges are often very steep and interspersed with sharp crested hills. As a result, parallel deep valleys are noticed in the east and west part of Lumshnong.

Hydrogeologically, the Jaintia Hills district can be divided into three units namely – consolidated, semi-consolidated and unconsolidated formations. Consolidated formations comprise of the oldest rock formation namely the peneplained gneissic complex and quartzite. Groundwater occurs under both water table and semi-confined condition in these consolidated formations. Unconsolidated formations mainly are represented by recent alluvium formation occurring near the southern fringe of the district adjacent to Bangladesh.

The major part of the district is covered by semi-consolidated formation covering Amlarem and Khliehriat blocks constituting the Shella formation and study area is also part of the same. This type of formation has:

- Fairly thick and discontinuous aquifer down to 250 m. Groundwater occurs under semi-confined to confined conditions. Water level rests at 4-9 below ground level and yield ranges from 25 – 150 m^3/hr; and
- Groundwater occurs under unconfined to semi-confined conditions in cavernous limestone & sandstone and yield ranges from 25 – 150 m^3/hr.

Drainage Pattern

Predominantly two different kinds of drainage patterns can be seen in the study area. They are mainly dendretic and trellis pattern. Lubha is the main river in study area showing common dendritic patterns. In a massively dissected region of horizontal strata, the stream system forms a dendritic drainage pattern, in which, the smaller streams show no predominant directional orientation or control. Seshympa river with the streams of Wah Lariang, Umbadoh and Umutha also show similar dendritic pattern of drainage system. The upper most part of Seshympa river

from where it originated shows trellis pattern of drainage. In this case, the consequent stream cuts across the crest and subsequent streams follow the strike valleys.

Innumerable first order and second order streams signify the high density of drainage system of the project area. Further south both the rivers i.e seshympa and Lubha discharge into Balgladesh. NH – 44 running north – south in the area forms the demarcation line between the two drainage patterns, with steams and tributaries of the two major rivers, Seshympa on western side and Lubha on eastern side of NH – 44.

Umtyrngai nala flowing west to east along the northern boundary of project site is perennial. Umtyrngai nala joins Umlunar river 2 km further east. Umlunar is a tributary of Lubha river. Umutha a perennial nala flowing north to south, joins Umtyrngai at about 0.5 km from the eastern boundary of the project area.

Water Balance

The area receives heavy rainfall and rainy season extends from April to October. The annual rainfall recorded during the last one year at site is 4587mm. Major part of rainfall (about 80%) is drained as surface runoff. The balance is charged into groundwater through soil capping, weathered sand stone, bedding planes, joints, fractures, solution cavities in the limestone and the dolomite formations occurring in the study area.

The data on water balance of the area is not available from secondary sources. At present, the Groundwater resource estimation is going on for the entire state of Meghalaya based on the latest Groundwater Estimation Committee (GEC 1997) norms. However, Groundwater Resource Potential of Jaintia Hills District was calculated to be 120.36 million cubic meter (MCM) based on GEC of 1984 norm. Out of the total resource, the utilizable resources were estimated to 102.31 MCM, which is 85% of the Gross recharge. As per norm, 15% of the gross recharge has to be kept for drinking and allied purpose.

It is proposed to meet the water requirement for ongoing project from Umtyrngai nala from April to October which is 20 m from project site and during the lean season i.e. from November to March, part of water requirements shall have to drawn from a point 500 m further east after the confluence of Umutha nala. Out of the buffer zone area of 314 sq.km, an area of about 40 sq. km forms the catchment area for sustaining surface and sub- surface water flow in Umtyrngai and Umutha nalas.

The proposed water withdrawal locations at Umtyrngai and Umutha nalas proposed to sustain the water requirement of the plant are located on the downstream side of the villages Lumshnong and Wahizar which depend upon for their water requirements from the upstream side of the respective nalas. No irrigation facilities are available in the area for cultivation mainly due to rugged and rock terrain and absence of level and plain areas. The seasonal agriculture and orchards in the area sustained by monsoon rains. Further on the downstream side there are no villages and commercial establishments and the nalas join Umlunar river further 2.0 km east which is a tributary of Lubha river.

However, the details of water requirement of other competing users in the study area is estimated and given in Table - 4.8.

Table – 4.8
Competing Users of Water Source in the Study Area

Sl. No	Usage	Present consumption (m^3 / day)		Addition proposed as per local plan (m^3 / day)		Total (m^3 / day)	
		Surface	**Ground**	**Surface**	**Ground**	**Surface**	**Ground**
1	Irrigation	0	0	0	0	0	0
2	Industry	500	100	-	-	500	100
3	Drinking	236	9	-	-	236	9
4	Others	-	-	-	-	-	-
	Total	**736**	**109**	**0**	**0**	**736**	**109**

Ground Water Recharge and Water Quality

The aquifers of this area are mainly recharged directly from precipitation and percolation through fractures. The recharge of the area varies on factors like amount of rainfall, topography, soil cover, degree and intensity of weathering, vegetation and drainage density. In the hilly terrain of this block, it dose not have much scope of recharge through rainfall because of steep slope and rugged topography as all the amount of rainfall is lost through surface run off.

Ground Water Recharge of the Project Area

The area spreads over an area of 70.0 hects**.** and is characterized by gently undulating topography. Considering the average rainfall of the area is 2400 mm. Since the area is occupied with the consolidated rocks, rate of infiltration due to rainfall is slow so the standard factor 10% is considered to find out groundwater recharge due to rainfall. The annual recharge in the area – Area x Annual rainfall x Infiltration factor = 70Ha. x 5.6 m x 0.1 = 39.2 Ham. As there is no human settlement and agricultural activities and also absence of any groundwater abstraction structure, so annual groundwater recharge can safely met to the demand of water requirement. Fluctuation of water table varies from 195 meters BGL in rainy season to 200 meters BGL in summer season. The fluctuation varies with the geological formation.

4.6.2 Water Quality

All the surface water samples collected and analysed as per IS 3025 (Table -4.9). The ground water samples were analysed and compared with IS 10500 (Table - 4.10). It is observed that all the parameters were within the prescribed limit.

Table - 4.9
Result of Surface Water Samples Analysis

Parameter	Unit	Standard	Surface Water Samples			
			SW_1	SW_2	SW_3	SW_4
pH	---	6.5 - 8.5	6.5	6.8	6.9	6.7
Colour	---	Colourless	Colourless	Colourless	Colourless	Colourless
Odour	----	Odourless	Odourless	Odourless	Odourless	Odourless
Total solid	mg/1	----	265	212	225	235
Total suspended solid	mg/1	----	10	12	15	10
TDS	mg/1	1500	255	200	210	225
Oil and Grease	µg/l	----	BDL	BDL	BDL	BDL
Total residual chlorine	mg/1	0.2	BDL	BDL	BDL	BDL
Total kjeldahl nitrogen as N	mg/1	----	3.5	3.0	3.8	2.7
Ammoniacal nitrogen as N	mg/1	50	0.60	0.65	0.60	0.65
Free ammonia as NH_3	mg/1	----	BDL	BDL	BDL	BDL
BOD	mg/1	3	0.6	0.7	0.2	0.5
Arsenic as As	mg/1	0.2	BDL	BDL	BDL	BDL
Mercury as Hg	mg/1	----	BDL	BDL	BDL	BDL
Lead as Pb	mg/1	0.1	BDL	BDL	BDL	BDL
Total chromium as Cr	mg/1	2.0	BDL	BDL	BDL	BDL
Hexavalent Chromium as Cr	mg/1	0.05	BDL	BDL	BDL	BDL
Copper as Cu	mg/1	3.0	BDL	BDL	BDL	BDL
Cadmium as Cd	mg/1	0.01	BDL	BDL	BDL	BDL
Zinc as Zn	mg/1	15	BDL	BDL	BDL	BDL
Selenium as Se	mg/1	0.05	BDL	BDL	BDL	BDL
Nickel as Ni	mg/1	----	BDL	BDL	BDL	BDL
Boron as B	mg/1	2.0	BDL	BDL	BDL	BDL
Cyanide as CN	mg/1	0.05	BDL	BDL	BDL	BDL
Chloride as Cl	mg/1	600	25	20	20	15
Nitrate as NO_3	mg/1	50	0.7	0.6	0.7	0.8
Flouride as F	mg/1	1.5	BDL	BDL	BDL	BDL
Dissolved PO_4	mg/1	5.0	0.3	0.1	0.2	0.1
Sulphate as SO_4	mg/1	400	10	15	12	15
Sulphide as S	mg/1	2.0	0.5	0.5	0.8	0.9
Iron as Fe	mg/1	5.0	0.6	0.5	0.3	0.6
Silica as SiO_2	mg/1	----	BDL	BDL	BDL	BDL
Phenolic compound	mg/1	0.005	BDL	BDL	BDL	BDL
Residual pesticide	mg/1	Absent	BDL	BDL	BDL	BDL
Sodium Percentage	mg/1	60	BDL	BDL	BDL	BDL
Calcium as Ca	mg/1	75	25	30	30	20
Magnesium as Mg	mg/1	30	3	3	3.5	2
Total hardness	mg/1	300	74	86.5	88.4	57.7
Coliform cells/100ml		BDL	BDL	BDL	BDL	BDL

Standard : IS 3025, Class – A, Inland Surface Water
Surface water sampling stations:-
SW_1: Lubha river SW2-Dongtanglen river SW3-Umlunar nala SW4-Seshymor

Table - 4.10
Result of Ground Water Samples Analysis

Sl. No.	Parameters	Units	Standards	Ground Water Samples			
				GW_1	GW_2	GW3	GW_4
1	Colour	Hazen	Colourless	Colourless	Colourless	Colourless	Colourless
2	Odour	----	Odourless	Odourless	Odourless	Odourless	Odourless
3	pH	----	6.5-8.5	6.4	6.7	6.9	6.8
4	Dissolved oxygen	mg/l	3.0 (min)	6.0	5.2	5.5	5.4
5	T.D.S	mg/l	500	135	125	85	125
6	Suspended solid	mg/l	----	8	10	4	9
7	Chloride as Cl	mg/l	250	8	12	10	10
8	Sulphate as SO_4	mg/l	200	12	7	8	4
9	Cyanide as CN	mg/l	0.05	BDL	BDL	BDL	BDL
10	Fluoride as F	mg/l	1.0	0.1	0.05	0.05	BDL
11	Phosphate as PO_4	mg/l	----	0.2	0.1	0.1	0.1
12	Amonia as NH_3	mg/l	----	BDL	BDL	BDL	BDL
13	Boron as B	mg/l	1.0	BDL	BDL	BDL	BDL
14	Calcium as Ca	mg/l	75	18	14	15	16
15	Magnesium as Mg	mg/l	30	6	3	7	5
16	Arsenic as As	mg/l	0.2	BDL	BDL	BDL	BDL
17	Barium as Ba	mg/l	----	BDL	BDL	BDL	BDL
18	Cadmium as Cd	mg/l	----	BDL	BDL	BDL	BDL
19	Total Chromium	mg/l	----	BDL	BDL	BDL	BDL
20	Hexavalent Chromium	mg/l	----	BDL	BDL	BDL	BDL
21	Copper as Cu	mg/l	0.05	BDL	BDL	BDL	BDL
22	Iron as Fe	mg/l	0.3	0.01	0.01	0.01	0.01
23	Selenium as Se	mg/l	0.01	BDL	BDL	BDL	BDL
24	Silver as Ag	mg/l	----	BDL	BDL	BDL	BDL
25	Zinc as Zn	mg/l	5.0	BDL	BDL	BDL	BDL
26	Phenol	mg/l	0.001	BDL	BDL	BDL	BDL
27	Pesticides	mg/l	Absent	BDL	BDL	BDL	BDL
28	Radioactive substance	mg/l	----	BDL	BDL	BDL	BDL

Standard : IS 10500
Ground water sampling stations:-
GW1- Tongseng well ,GW2-Khurb well,GW3- Thangskei, GW4- Musiang well

4.7 SOIL CHARACTERISTICS

Soil samples were collected from five locations (**Fig. - 4.1**) in the study season and were analysed to know the soil type, moisture content, nutrients level and other chemical parameters of the soil. The analysis results of the samples are indicated in Table - 4.11.

Table 4.11
Result of Soil Sample Analysis

Sl. No.	Parameter	Unit	Soil Samples				
			S_1	S_2	S_3	S_4	S_5
1	pH	----	6.4	6.5	6.7	6.4	6.5
2	E.C	µS/cm	105	100	85	102	95
3	Sodium as Na	ppm	35	32	40	35	30
4	Bulk density	gm/c.c	2.1	2.0	2.3	2.2	2.0
5	Organicmatter	%	1.76	2.15	1.78	1.45	1.72
6	Chloride	%	0.03	0.05	0.06	0.08	0.04
7	Sand	%	12	16	19	12	14
8	Salt	%	42	45	41	40	42
9	Clay	%	46	39	40	48	44
10	Texture	%	Silty-Clayee	Silty-Clayee	Silty-Clayee	Silty-Clayee	Silty-Clayee
11	Porosity	%	42	45	44	47	42
12	Water holding	%	38	42	42	44	38
13	Organic carbon	%	1.21	1.15	1.33	0.84	1.0
14	N	ppm	10	15	12	13	15
15	P	ppm	11	10	13	12	12
16	K	ppm	14	15	14	15	15
17	S	ppm	12	12	10	13	11
S_1 : Lease area S_2 : Tomseng S_3 : Umbadoh S_4 : Khub S_5 : lumshnong village							

In the of proposed activity area the thickness of the topsoil zone is very thin. The soil is mostly red and brownish-red in colour and lateritic in nature. These lateritic soils are mostly poor in organic contents and moisture retaining capacity.

4.8 LAND USE PATTERN

The total M.L area is non-forest land. The existing land use pattern of the core zone is as follows (Table - 4.12).

Table - 4.12
Existing Core Zone Land use Pattern

Classification of land	Village/ District	Total area in Hects.
Total Private Land (non-forest)	**Lumshnong/Jaintia hills**	**70.00** • **Agricultural land – 46.809** • **Waste land – 23.191**

Proposed landuse pattern

Proposed Land Pattern (Area in Ha.)				
Sl. No.	**Features**	**Planned period**	**Beyond planned period**	**Total**
1	Mining	8.64	47.13	55.77
2	Over Burden Dump to be rehandled min	2.25	----	2.25
3	Infrastructure (workshop, admn. Building etc.)	0.02	---	0.02
4	Roads	0.2	---	0.2
5	Magazine	---	---	---
6	Green Belt	10.0	1.56	11.76
7	**Total**	**21.11**	**48.69**	**70.00**

The land use pattern of buffer zone is presented in Table - 4.13 and **Fig. 4.3.**

Table - 4.13
Land Use Pattern of Buffer Zone

Type of Land Use	Area in Sq. Km.	%
Settlement	4.71	1.5
Agriculture	58.14	18.5
Forest	216.85	69
Grass and Scrub	18.85	6.0
Barren land	15.71	5.0
Total	**314.28**	**100**

The study area does not have harbour or archaeological site and any other places of historical importance.

4.9 BIODIVERSITY

ECOLOGICAL PATTERN

The project site (core zone) as well the buffer zone area was surveyed to assess the ecological status.

FLORA

The vegetation of the project area can be broadly classified as tropical evergreen forest with elements from tropical moist deciduous and subtropical forest vegetation. The project area (Clinker Grinding Project site) has less than 10% canopy cover. The forests within 10 km radius have three distinct strata, viz., (i) Upper canopy layer with dominance of emergent trees, (ii) Sub-canopy layer with dominance of small trees and pole size trees, and (iii) Undercanopy layer with dominance of shrubs, herbs and juvenile trees. The details of species available are highlighted in Table - 4.14.

Table – 4.14
Details of Species available

LIST OF FLORA SPECIES

List of tree species around Project area

Species	Family	Vernacular Name
Actinodaphne obovata	Lauraceae	
Ailanthes grandis	Simarubaceae	Lalong-baiong
Albizzia lucida	Mimosaceae	
Albizzia sp.	Mimosaceae	
Alstonia scholaris	Apocynaceae	Diend-ryteng
Anthocephalus chinense	Rubiaceae	
Aralia armata	Araliaceae	Dieng-la-tymphu
Ardisia nerifolia	Myrsinaceae	
Artocarpus heterophyllus	Moraeceae	Sohphan
Bambusa tulda	Gramineae	Shken, seij
Bauhinia purpurea	Caesalpinaceae	
Bischofia javanica	Bischofiaceae	
Bombax ceiba	Bombacaceae	
Bridelia sp.	Euphorbiaceae	
Callicarpa arborea	Verbenaceae	Dieng-lakhoit
Caryota urens	Palmae	
Castanopsis indica	Fagaceae	
Castanopsis tribuloides	Fagaceae	
Cinnamomum bezolghota	Lauraceae	
Cinnamomum obtusifolium	Lauraceae	
Citrus sp.	Rutaceae	
Cyathea sp.	Leguminosae	
Cynometra polyandra		
Dalbergia sp.		
Dendrocalamus hamiltonii	Gramineae	Siej
Duabanga grandiflora	Sonneratiaceae	
Elaeocarpus aristatus	Eleocarpaceae	Dieng-thang-khapiah
Elaeocarpus sp.	Eleocarpaceae	
Englegardtia spicata	Juglanaceae	Dieng-lyba
Exbucklandia populnea	Hammamelidaceae	Dieng-sohmyndot
Ficus elmeri	Moraceae	Dieng-jri
Ficus sp.	Moraceae	Dieng-jri
Garcinia acuminata	Clusiaceae	

Species	Family	Vernacular Name
Gmelina arborea	Verbenaceae	Dieng-laphiang
Grewia disperma	Tiliaceae	Dieng-tiewser
Grewia sp.	Tiliaceae	
Hevea brasiliensis	Hernandiaceae	Dieng-jri
Hibiscus macrophyllus	Malvaceae	Tyllen-dkhar
Hydnocarpus kurzii	Flacourtiaceae	Dieng-sohlap
Litsaea sebifera	Lauraceae	Dieng-ja-lowan
Litsea citrita	Lauraceae	Dieng-si-ing
Litsea laeta	Lauraceae	
Litsea salicifolia	Lauraceae	Dieng-lali
Litsea sp.	Lauraceae	
Macaranga denticulata	Euphorbiaceae	
Macropanax disperma	Analiaceae	Dieng-ia-rasi
Magnolia hodgsonii	Magnoliaceae	
Mallotus tetracoccus	Euphorbiaceae	
Meliosma sp.	Meliaceae	
Oroxylum indicum	Bigoniaceae	Dieng-kawait-blai
Pandanus sp.	Pandanaceae	
Persea sp.	Lauraceae	
Pithecellobium sp.	Leguminosae	Dieng-iap-iar
Premna milleflora	Verbenaceae	Dieng-phonri
Prunus acuminata	Rosaceae	Dieng-soh-iong-blei
Pterospermum acerifolium	Sterculiaceae	Dieng-tharo-masi
Pterospermum lancifolium	Sterculiaceae	
Quercus lancifolia	Fagaceae	Dieng-sningrit, Dieng-patlua
Quercus spicata	Fagaceae	
Sapium baccatum	Euphorbiaceae	Dieng-jalong
Sarcosperma griffithii	Sapotaceae	Dieng-ja-lytpai, Dieng-kymbu-blang
Saurauia roxburghii	Ternstroemiaceae	Dieng-soh-la-pied
Saurauia sp.	Ternstroemiaceae	
Schima wallichii	Theaceae	Dieng-shyr-ngan
Shima sp.	Theaceae	
Spondias pinnata	Anacardiaceae	
Streospermum chelenoides	Bigoniaceae	Dieng-phsiar
Syzygium sp.	Myrtaceae	Soh-um
Terminalia bellerica	Conbretaceae	
Terminalia myriocarpa	Combretaceae	
Terminalia chebula	Combretaceae	Diengsoh-khoru
Tetrameles nudiflora	Combretaceae	

Species	Family	Vernacular Name
Toona ciliata		
Toona sp.		
Travesia palmata		
Trema orientalis	Ulmaceae	Dieng-lattar
Villebrunea frutescens	Urticaceae	
Vitex pedunculata	Verbenaceae	
Vitex sp.	Verbenaceae	
Wendlandia paniculata	Rubiaceae	Deing-ja-lakba
Xerospermum sp.	Sapindaceae	Diengsoh-moniar-shree

List of shrub/herbs species in Project area

Species	Family	Vernacular Name
Ageratum conyzoides		
Alpinia sp.		
Amaranthus sp.	Amaranthaceae	
Ardisia nerifolia		
Aroides sp.		
Arundina graminifolia		
Baliospermum montana	Euphorbiaceae	Lasem-dumuin
Begonia sp.	Begoniaceae	Jajew
Bidens biternata		
Bidens pilosa		
Blachnum sp.		
Boehmeria glomerulifera		
Boehmeria sp.	Urticaceae	Diengsoh-khar, thynrait
Calamus flagellum		
Calamus leptospadix		
Carax cruciata		
Chenopodium sp.	Chenopodiaceae	
Clerodendron colebrookianum	Verbenaceae	Syntiew-dohmahi
Clerodendron viscosum		
Clerodendrum sp.		
Coffea sp.	Rubiaceae	Ja-laryngksang
Coleus sp.	Labiateae	
Commelina sp.		
Crassocephalum crepidioides		

Species	Family	Vernacular Name
Cyathula prostrate		
Dracena sp.		
Elatostema sp.	Urticaceae	Ja-ew
Erigeron Canadensis	Compositae	
Eupatorium odoratum	Compositae	Kynbat-nongrim
Fagopteris auriculata		
Ferns sp.		Tyrkhang
Forrestia sp.		
Globba sp.		
Hedychium sp.		
Jasminum sp.	Oleaceae	Mei-lar-um
Laportea crenulata	Urticaceae	Dieng-synrem
Leea indica	Ampelidaceae	
Leea sp.	Ampelidaceae	
Licuala peltata		
Luduwigia octovalis		
Lycopodium sp.	Lycopodiaceae	Tmain-khla
Maesa indica	Myrsinaceae	Diengsoh-jala-tyrkai
Maesa sp.	Myrsinaceae	
Melastoma malabathricum	Melastomaceae	Soh-khing
Mannihot esculenta	Euphorbiaceae	
Mimosa himalayana	Leguminosae	
Morinda angustifolia	Rubiaceae	Dieng-shongrei
Musa sp.	Musaceae	Lakait
Osbeckia sp.	Melastomaceae	Soh-kthem
Osbekia crenata	Melastomaceae	Jalang-kthem
Oxalis corniculata	Oxalidaceae	Jajew
Oxyspora sp.	Melastomaceae	Tiew-sohkthem
Phrynium capitata		
Phrynium pubenervae		
Pinanga gracilis		
Polygonum chinense	Polygonaceae	
Pteris sp.		Tyrkhang
Randia sp.	Rubiaceae	Sohladung
Rhynchotecum ellipticum	Gesneraceae	Sieng-ia-mahek
Rungia sp.	Acanthaceae	
Saccharum spontaneum	Andorpogonaceae	
Salamona sp.		
Saurauia sp.		
Scoperia dulcis		

Species	Family	Vernacular Name
Selaginella sp.	Selagenaceae	
Solanum torvum	Solanaceae	Soh-nang
Spilanthus paniculata		
Tabernaemontana divericata	Apocynaceae	
Thysanolaena maxima	Thysanolaceae	Synsar
Trevesia palmata	Araliaceae	Soh-kynthur
Triumfetta pilosa	Liliaceae	Soh-byrthid
Urena lobata	Malvaceae	Soh-byrthit
Wallichia sp.		

List of climbers/epiphytes species in Project area

Species	Family	Vernacular Name
Acacia oxyphylla	Leguminosae	Mei-suai
Acacia pinnata	Leguminosae	Jermai-sheih-lyngkshiah
Acacia prunascens	Leguminosae	Shitli
Acampe sp.		
Aeschynanthus sp.	Gesneraceae	
Agapetes sp.	Vacciniaceae	
Asplenium nidus		
Byttneria aspera		
Calamus leptospadix		
Dendrobium sp.	Orchidaceae	Tiew-dieng
Derris sp.	Leguminosae	Diengthing, Diengphulot, Meisohphlang
Dioscorea sp.		
Ficus sp.	Moraceae	
Gnetum scandens	Gnetaceae	Jermaisaprah
Hedyotis scandens	Rubiaceae	Jylli-iamu-sem
Hoya sp.	Asclepidiaceae	Tiew-reng-synreh
Luisea sp.		
Lygodium flexuosum		
Lygodium fluxuosa		
Melocalamus compectiflorus		
Microsorum sp.		
Mikenia macrantha		
Neohouzia helferii		
Nepenthes khasiana	Nepenthaceae	Tiew-rakot
Paederia scandens	Rubiaceae	
Porana paniculata	Convolvulaceae	
Pothos sp.		

Species	Family	Vernacular Name
Raphidophora decursiva		
Raphidophora lancifolia		Lapadong
Scefflera venulosa		
Smilex sp.		
Thunbergia grandiflora	Acanthaceae	Jyrmi-khnong

List of plants found at the cement plant project site at Lumshnong

Trees
Albizia lucida
Bauhinia purpurea
Bridellia sp.
Callicarpa arborea
Citrus sp.
Ficus elmeri
Litsea sp.
Herbs/Shrubs
Ageratum conyzoides
Bidens pilosa
Clerodendrum viscosum
Eupatorium odoratum
Fagopteris auriculata
Hedychium sp.
Maesa indica
Malastoma malabathricum
Oxalis corniculata
Polygonum chinense
Rhynchotecum ellipticum
Solanum torvum
Thysanolaena maxima
Trevesia palmate
Triumfetta pilosa
Urena lobata
Climber & epiphyte
Ficus sp.
Hoya sp.
Mikania macrantha
Porana paniculata
Raphidophora decursiva

List of plants found in Lumshnong – Umlong sector

Trees
Actinodaphne obovata
Albizia lucida
Alstonia sholaris
Artocarpus heterophyllus
Bauhinia purpurea
Bischofia javanica
Bombax ceiba
Bridellia sp.
Callicarpa arborea
Caryota urens
Castanopsis indica
Citrus sp.
Duabanga grandiflora
Engelhardtia spicata
Ficus elmeri
Garcinia acuminate
Grewia disperma
Litsea laeta
Litsea sp.
Macaranga denticulate
Meliosma sp.
Pandanus sp.
Prunus acuminate
Pterospermum acerifoilium
Saurauia roxburghii
Schima wallichii
Syzygium sp.
Terminalis chebula
Trema orientalis
Villebrunea frutescens
Vitex pedunculata
Wendlandia paniculata
Herbs/Shrubs
Ageratum conyzoides
Baliospermum Montana
Bidens pilosa
Boehmeria sp.
Calamus flagellum
Calamus leptospadix
Clerodendrum viscosum
Crassocephalum crepidioides

Dracena sp.
Eupatorium odoratum
Fagopteris auriculata
Globba sp.
Jasminum sp.
Hedychium sp.
Laportia crenulata
Leea sp.
Lycopodium sp.
Maesa indica
Malastoma malabathricum
Mannihot esculanta
Morinda angustifolia
Musa sp.
Oxalis corniculata
Polygonum chinense
Randia sp.
Rhynchotecum ellipticum
Rungia sp.
Saccharum spontaneum
Solanum torvum
Spilanthus paniculata
Thysanolaena maxima
Trevesia palmate
Triumfetta pilosa
Urena lobata
Wallichia sp.
Climber & Epiphyte
Acacia oxyphylla
Acacia prunascens
Acacia pinnata
Acampe sp.
Asplenium nidus
Derris sp.
Ficus sp.
Hoya sp.
Lygodium fluxuosa
Mikania macrantha
Paederia scandens
Porana paniculata
Pothos sp.
Raphidophora decursiva
Raphidophora lancifolia

List of plants found in Lumshnong - Umbadoh sector

Trees
Actinodaphne obovata
Ailanthes grandis
Aralia armata
Ardisia nerifolia
Bambusa tulda
Bauhinia purpurea
Bischofia javanica
Caryota urens
Castanopsis tribuloides
Cinnamomum obtusifolium
Citrus sp.
Elaeocarpus sp.
Exbucklandia populnea
Ficus sp.
Litsea citrita
Lirsea sebifera
Litsea salacifolia
Litsea sp.
Macranga denticulate
Macropanax disperma
Persea sp.
Pithecellobium sp.
Quercus lancifolia
Quercus spicata
sapium baccatum
Sarcosperma griffithii
Shima sp.
Syzygium sp.
Trema orientalis
Vitex sp.
Travesia palmate
Shrubs/Herbs
Ageratum conyzoides
Ardisia nerifolia
Bidens biternata
Boehmeria glomerulifera
Calamus leptospadix
Carax cruciata
Clerodendrum sp.
Commelina sp.

Crassocephalum creepidioides
Cyathula prostrate
Eupatorium odoratum
Forrestia sp.
Hedychium sp.
Leea sp.
Maesa sp.
Morinda angustifolia
Musa sp.
Osbeckia sp.
Pinanga gracilis
Polygonum chinense
Rungia sp.
Tabernaemontana divericata
Thysanolaena maxima
Climber/Epiphyte
Aeschynanthus sp.
Agapetes sp.
Asplenium nidus
Byttneria aspera
Calamus leptospadix
Lygodium flexuosum
Miicrosorum sp.
Mikenia macrantha
Scefflera venulosa
Smilex sp.
Thunbergia grandiflora

List of plants found in Lumshnong - Tongseng sector

Trees
Ailanthes grandis
Albizia sp.
Anthocephalus chinense
Bauhinia purpurea
Callicarpa arborea
Cinnamomum bezolghota
Cyathea sp.
Cynometra polyandra
Dalbergia sp.
Dendrocalamus hamiltonii
Duabanga grandiflora
Elaeocarpus aristatus
Elaeocarpus sp.

Englegardtia spicata
Ficus sp.
Gmelina arborea
Grewia sp.
Hevea brasiliensis
Hibiscus macrophyllus
Hydnocarpus kurzii
Magnolia hodgsonii
Mallotus tetracoccus
Oroxylum indicum
Pandanus sp.
Premna milleflora
Prunus acuminate
Pterospermum acerifolium
Pterospermum lancifolium
Sapium baccatum
Saurauia sp.
Spondius pinnata
Streospermum chelenoides
Terminalia bellerica
Terminalia myriocarpa
Tetrameles nudiflora
Toona sp.
Villebrunea frutescens
Xerospermum sp.
Herbs/Shrubs
Ageratum conyzoides
Alpinia sp.
Amaranthus sp.
Aroides sp.
Arundina graminifolia
Begonia sp.
Blachnum sp.
Boehmeria sp.
Carax cruciata
Chenopodium sp.
Clerodendron colebrookianum
Clerodendron viscosum
Coffea sp.
Coleus sp.
Dracena sp.
Elatostema sp.
Erigeron Canadensis

Eupatorium odoratum
Fagopteris auriculata
Ferns sp.
Leea indica
Leea sp.
Licuala peltata
Luduwigia octovalis
Mimosa himalayana
Musa sp.
Osbekia crenata
Oxyspora sp.
Phrynium capitata
Phrynium pubenervae
Polygonum chinense
Pteris sp.
Saccharum spontaneum
Salamona sp.
Saurauia sp.
Scoperia dulcis
Sellaginella sp.
Solanum torvum
Thysanolaena maxima
Climbers /Epiphyte
Asplenium nidus
Dendrobium sp.
Dioscorea sp.
Gnetum scandens
Hedyotis scandens
Luisea sp.
Lygodium flexuosum
Melocalamus compectiflorus
Mikania macrantha
Neohouzia helferii
Paederia scandens
Raphidophora decursiva
Thunbergia grandiflora

List of plants found in Tongseng – Sonapur sector

Trees
Albizia sp.
Anthocephalus chinense
Bauhinia purpurea
Callicarpa arborea

Cyathea sp.
Dalbergia sp.
Dendrocalamus hamiltonii
Duabanga grandiflora
Elaeocarpus sp.
Englegardtia spicata
Ficus sp.
Gmelina arborea
Grewia sp.
Hibiscus macrophyllus
Hydnocarpus kurzii
Mallotus tetracoccus
Oroxylum indicum
Pandanus sp.
Prunus acuminate
Pterospermum acerifolium
Sapium baccatum
Saurauia sp.
Streospermum chelenoides
Terminalia bellerica
Terminalia myriocarpa
Tetrameles nudiflora
Toona ciliate
Villebrunea frutescens
Xerospermum sp.
Herbs/Shrubs
Ageratum conyzoides
Alpinia sp.
Amaranthus sp.
Aroides sp.
Begonia sp.
Blachnum sp.
Boehmeria sp.
Chenopodium sp.
Clerodendron viscosum
Coffea sp.
Coleus sp.
Elatostema sp.
Erigeron Canadensis
Eupatorium odoratum
Fagopteris auriculata
Ferns sp.
Leea sp.

Licuala peltata
Luduwigia octovalis
Musa sp.
Osbekia sp.
Oxyspora sp.
Phrynium pubenervae
Polygonum chinense
Pteris sp.
Saccharum spontaneum
Salamona sp.
Saurauia sp.
Sellaginella sp.
Solanum torvum
Thysanolaena maxima
Climbers /Epiphyte
Asplenium nidus
Dendrobium sp.
Dioscorea sp.
Lygodium flexuosum
Melocalamus compectiflorus
Mikania macrantha
Raphidophora decursiva
Thunbergia grandiflora

List of plants found in Lumshnong – Umlunar sector

Trees
Ailanthes grandis
Albizia sp.
Anthocephalus chinense
Bauhinia purpurea
Cinnamomum bezolghota
Cyathea sp.
Dalbergia sp.
Dendrocalamus hamiltonii
Duabanga grandiflora
Elaeocarpus aristatus
Englegardtia spicata
Ficus sp.
Grewia sp.
Hydnocarpus kurzii
Mallotus tetracoccus
Pandanus sp.
Sapium baccatum
Saurauia sp.
Spondius pinnata
Tetrameles nudiflora
Toona ciliate
Villebrunea frutescens
Herbs/Shrubs
Ageratum conyzoides
Alpinia sp.
Aroides sp.
Begonia sp.
Boehmeria sp.
Carax cruciata
Chenopodium sp.
Clerodendron colebrookianum
Coffea sp.
Elatostema sp.
Erigeron Canadensis
Eupatorium odoratum
Fagopteris auriculata
Ferns sp.
Leea indica
Luduwigia octovalis
Mimosa himalayana
Musa sp.

Osbekia sp.
Phrynium capitata
Phrynium pubenervae
Polygonum chinense
Pteris sp.
Saccharum spontaneum
Salamona sp.
Sellaginella sp.
Solanum torvum
Thysanolaena maxima
Climbers /Epiphyte
Asplenium nidus
Dendrobium sp.
Melocalamus compectiflorus
Mikania macrantha
Nepenthes khasiana
Raphidophora decursiva
Thunbergia grandiflora

Agricultural Crops

The principal crop of the area is paddy. At some areas maize, rabi and other pulses are cultivated. Some of the agricultural crops are as follows: *Brassica nigra, Capsicum frutescens, Cucumis sativus, Oryza sativa, Phaseolus vulgaris, Raphanus sativus, Zea mays*

Commercial Crops

The commercial crops in the area are: *Citrus aurantium*, *Haevea brasilensis*, *Thysanolaena maxima.*

Plantation

Some of the species normrmally planted here are: *Litsea citrata, Populus glambelei, Terminalia myriocarpa*

Grasslands

Mimosa himalayana, Osbekia sp., *Oxyspora* sp., *Saccharum spontaneum, Salamona* sp., *Sellaginella* sp., *Solanum torvum*

NTFP Species including Ornamentals

Aroides sp., *Begonia* sp., *Calamus, Phrynium capitata, Phrynium pubenervae*
Raphidophora decursiva

Endangered Species

Arundina graminifolia, Cyathea spinulosa, Dendrobium sp, Gnotum scandens, Nepenthes khasiana

Endemic Species

Nepenthes khasiano

FAUNA

Buffer Zone: The following species of fauna found in the buffer zone of the plant area

Table - 4.15
List of Fauna

List of Vertibrates
Mammals

Zoological Name	**Common Name**	**Schedule Status**
Arctonyx collaris	Hog Badger	Schedule I Part I
Cannomys badius badius	Bamboo Rat	Schedule V
Collosciurus erythraeus erythraeus	Squirrel	US
Crocidura attenuata rubricosa	Grey Shrew	Schedule V
Felis bengalensis bengalensis	Leopard Cat	Schedule I Part I
Herpestes edwardsi	Indian Grey Mangoose	Schedule IV
Lutra lutra monticola	Otter	Schedule II Part III
Mus booduga	Field Rat	Schedule V
Mus musculus	House Mouse	Schedule V
Niviventer fulvescens fulvescens	White bellied Rat	Schedule V
Presbytis pileatus	Monkey	Schedule V
Rattus nitidus nitidus	Himalayan Rat	Schedule V
Rattus rattus	House Rat	Schedule V
Rattus rattus brunneusculus	Black Rat	Schedule V
Rhinolopus affinis himalayanus	Intermediate Horse Shoe Bat	US
Rhinolopus pearsoni	Pearson’s Horse Shoe Bat	US
Scotomanes ornatus ornatus	Harlequin Horse Shoe Bat	US
Suncus murinus griffithi	House Shrew	US

Birds

Zoological Name	Common Name	Schedule Status
Acridotheres tristis tristis	Indian Myna	US
Bambusicola fytchii hokinsoni	Assam Bamboo Patridge	Schedule I Part III
Bubo flavipes	Tawny Fish Owl	US
Milvus migrans lineatus	Large Indian Kite	US
Motacilla indica	Forest Wagtail	US
Scolopax rusticola rusticola	Wood Cock	US
Alcedinidae	Kingfisher	Schedule IV

Reptiles

Zoological Name	Common Name	Schedule Status
Calotes versicolor	Garden Lizard	US
Collophis macclellandi	Coral Snake	US
Chrysopelea ornata		US
Natrix pscicolor	Water Snake	US
Varanus bengalensis	Indian Monitor	Schedule II Part II
Chameleon sp.	Cameleon	Schedule II Part I

Amphibians

Zoological Name	Common Name	Schedule Status
Amolops afghanus		US
Bufoides meghalayana		US
Microphyla ornata		US
Rana danieli	Frog	US
Rana livida	Frog	US
Rhacophorus maximus		US

Fishes

Zoological Name	Khasi Name	Schedule Status
Brachydanio rerio	Shalynnai	US
Danio aequipinnatus	Shalynnai	US
Danio dangila	Shalynnai	US
Labeo dera	Kha bah	US
Labeo rohita	Kha bah	US
Puntius shalynius	Shalynnai	US

List of Invertebrate species found in the area

Group/Species of Invertebrates	Common Name	Schedule Status
Acari		
Malaconothrus sp.		US
Scheloribates parvus		US
Paralamellobates bengalensis		US
Annelida: Oligochaeta		
Drawidia sp.	Earthworm	US
Arthropoda: Crustacea		
Macrobrachium assamensis	Shrimp	US
Arthropoda: Lepidoptera		
Arneta atkinsoni		US
Eurema brigitta rubella		US
Halpe kumara		US
Matapa druna		US
Arthropoda: Insecta		
Plecoptera- Immature		US
Trichptera- Immature		US
Odonata- Immature		US
Chironomidae larvae		US
Mollusca: Gastropoda		
Bellamya bendalensis	Snail	US
Zooplankton: Rotifera		
Brachonus *quadridentatus*		US
Brachonus calciflorus		US
Filinia longiseita		US
Lecane sp.		US
Zooplankton: Cladocera		
Sida crystallina		US
Daphnia carinata		US
Zooplankton: Copepoda		
Arctodiaptomus keifari		US
Heliodiaptomus sp.		US
Mescocyclops leuckrti		US

Threatened Animal species in the Area

Zoological Name	**Common Name**	**Schedule Status**
Lutra lutra monticola	Otter	ScheduleIII
Presbytis pileatus	Monkey	ScheduleII

Here no endemic, endangered migratory fauna found in the area. This area is not also a migratory path of any faunal species.

List of Aquatic fauna

Fishes	**Schedule status**
Brachydanio rerio	US
Danio aequipinnatus	US
Danio dangila	US
Labeo dera	US
Labeo rohita	US
Puntius shalynius	US
Arthropoda: Insecta	
Plecoptera- Immature	US
Trichptera- Immature	US
Odonata- Immature	US
Chironomidae larvae	US
Mollusca: Gastropoda	
Bellamya bendalensis	US
Zooplankton: Rotifera	
Brachonus *quadridentatus*	US
Brachonus calciflorus	US
Filinia longiseita	US
Lecane sp.	US
Zooplankton: Cladocera	
Sida crystallina	US
Daphnia carinata	US
Zooplankton: Copepoda	
Arctodiaptomus keifari	US
Heliodiaptomus sp.	US
Mescocyclops leuckrti	US

US- Un-scheduled animals

AESTHETIC BEAUTY

This area has got its own scenic beauty, with high hill ranges at a distance from project area on either side which have greenery look from a distance. However, this beauty by and large is not going to be affected by the proposed project activity under this proposed plan.

4.10 SOCIO ECONOMIC DEMOGRAPHIC PROFILE

Location of villages within 10 kms. radius of the core area are shown and the details of socio-economic demographic profile is presented.

The statistical information is summarised below:

The socio-economic profile of the area under this EIA study, i.e. 10 km radius of the project site is based on the published census report and the interpretation of satellite imageries.

The demographic data presented and analysed below are based on the 2001 census. People, predominantly belonging to Jaintia tribe inhabit the area within 10 km radius centering the project site speak native language.

The study area i.e. within 10 km. radius centering the Project area comprises of 19 villages (Annexure-2).

Population:

As per the census 2001, the following details are observed

No. of Census Villages	:	16 nos. **(Fig. 4.4)**
Total population in the buffer zone	:	8967 nos.
Population desity	:	28.55 per sq.km.
Sex Ratio (male/female)	:	1000:990
Total number of house holds	:	1594
Schedule caste	:	Nil
Schedule Tribe	:	97.97%
Literacy rate:		
Male:	:	37.38%
Female	:	39.60%
Overall	:	38.48%

As per the census and secondary data collected it is observed that 44.66% of the population working under main workers category.

Occupational Structure

Three nearby villages are having medical facilities. There are number of doctors practicing privately in the area. Good medical facilities are available in the town ship area of M/s CMCL and is close to the project site.

The study area facilitates with education upto primary level. Medical facility is available at Khiliehriat.

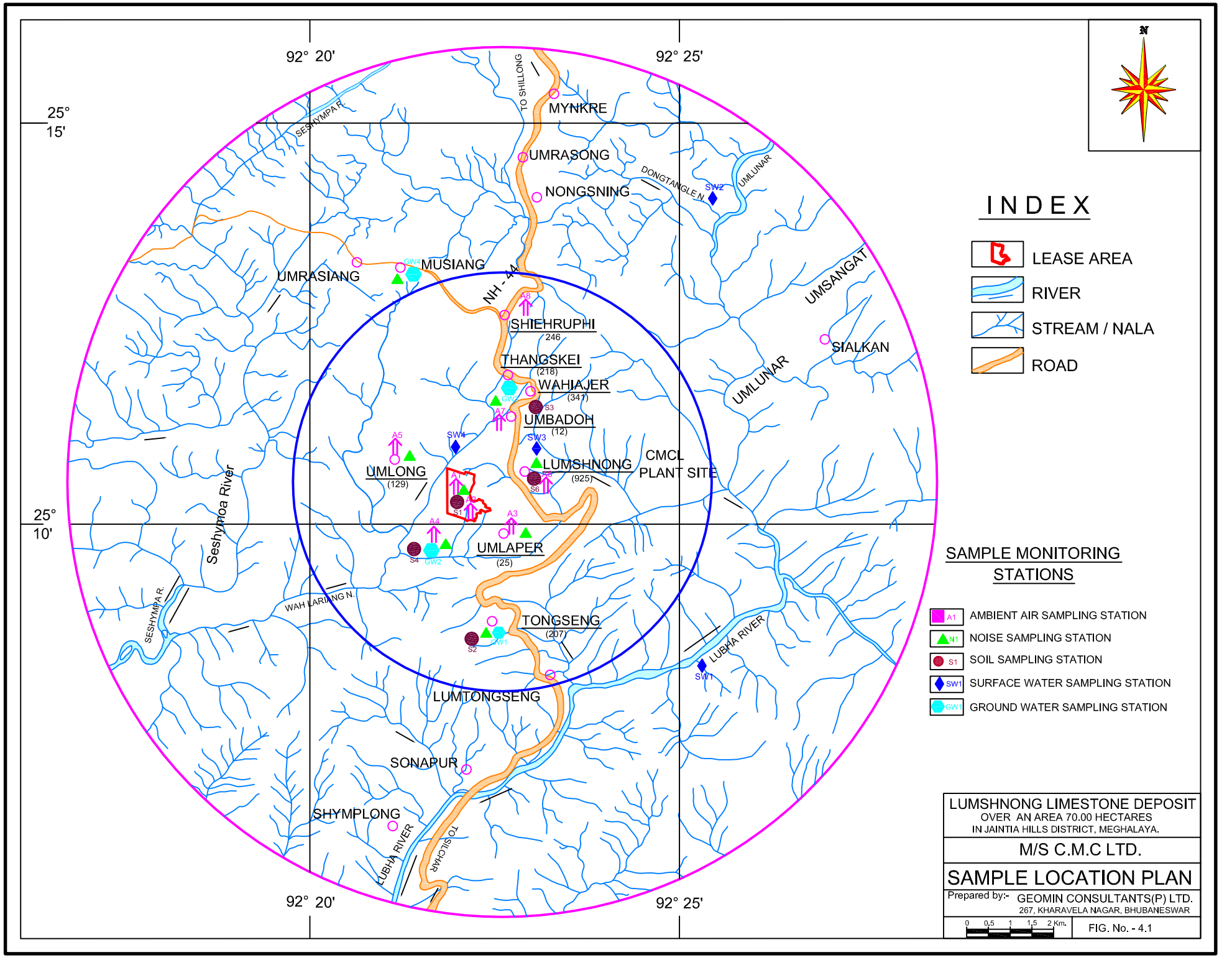
Spings and perennial nalas are the main sources of drinking water in the area. There is no problem for drinking water in the area.

Post office facility available in the plant premises of CMCL.

Since NH 44 passes about a km from the area, communication to the villages is not a problem. The maximum distance from NH to villages is 5 kms.

Almost all villages are provided with electricity in the area.

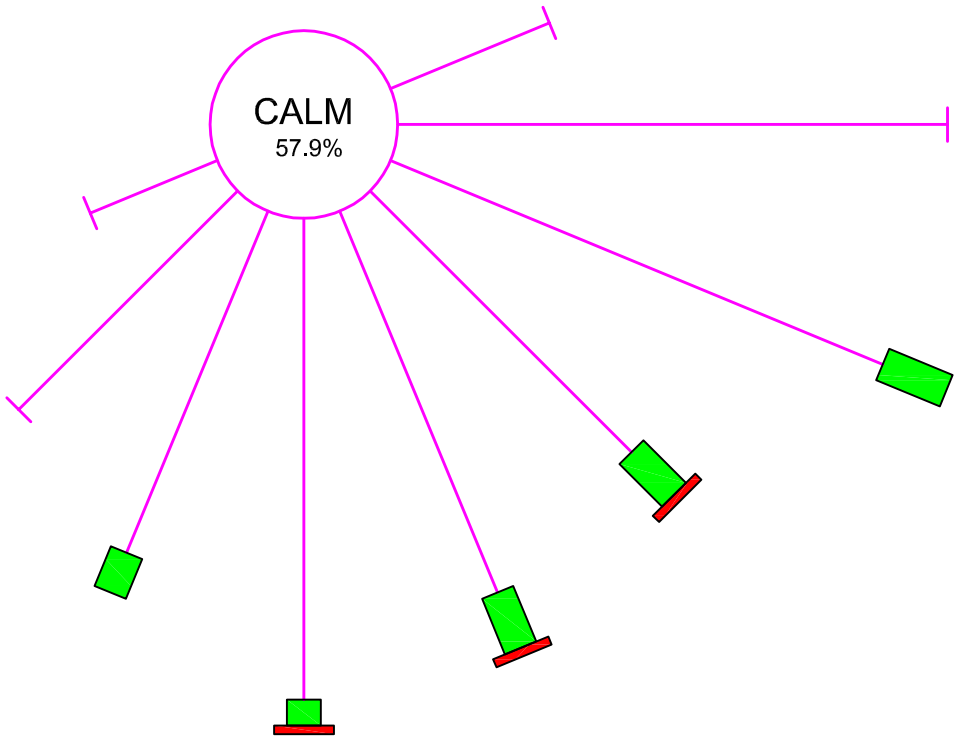
There is no place of historical/archeological sites present within 10km radius around the project site.


92° 20'
92° 25'
25° 15'
25° 10'
TO SHILLONG
MYNKRE
SESHYMPA R.
UMRASONG
NONGSNING
DONGTANGLEN.
UMLUNAR
SW2
UMRASIANG
GW4
MUSIANG
NH - 44
UMSANGAT
A6
SHIEHRUPHI
246
SIALKAN
THANGSKEI
(218)
WAHIAJER
(341)
GW1
S3
A7
UMBADOH
(12)
A5
SW4
SW3
UMLONG
(129)
LUMSHNONG
(925)
CMCL
PLANT SITE
A1
S1
S6
A2
A4
A3
S4
GW2
UMLAPER
(25)
Seshymsa River
SESHYMPA R.
WAH LARIANG N.
TONGSENG
(207)
S2
GW1
LUBHA RIVER
SW1
LUMTONGSENG
SONAPUR
SHYMPLONG
LUBHA RIVER
TO SILCHAR
N
INDEX
LEASE AREA
RIVER
STREAM / NALA
ROAD
SAMPLE MONITORING STATIONS
A1 AMBIENT AIR SAMPLING STATION
N1 NOISE SAMPLING STATION
S1 SOIL SAMPLING STATION
SW1 SURFACE WATER SAMPLING STATION
GW1 GROUND WATER SAMPLING STATION
LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.
M/S C.M.C LTD.
SAMPLE LOCATION PLAN
Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR
0 0.5 1 1.5 2 Km.
FIG. No. - 4.1

WIND ROSE DIAGRAM

STATION - LUMSHONG

SEASON -



1.5 - 5 5.1 - 10 10.1 - 15 km / hr

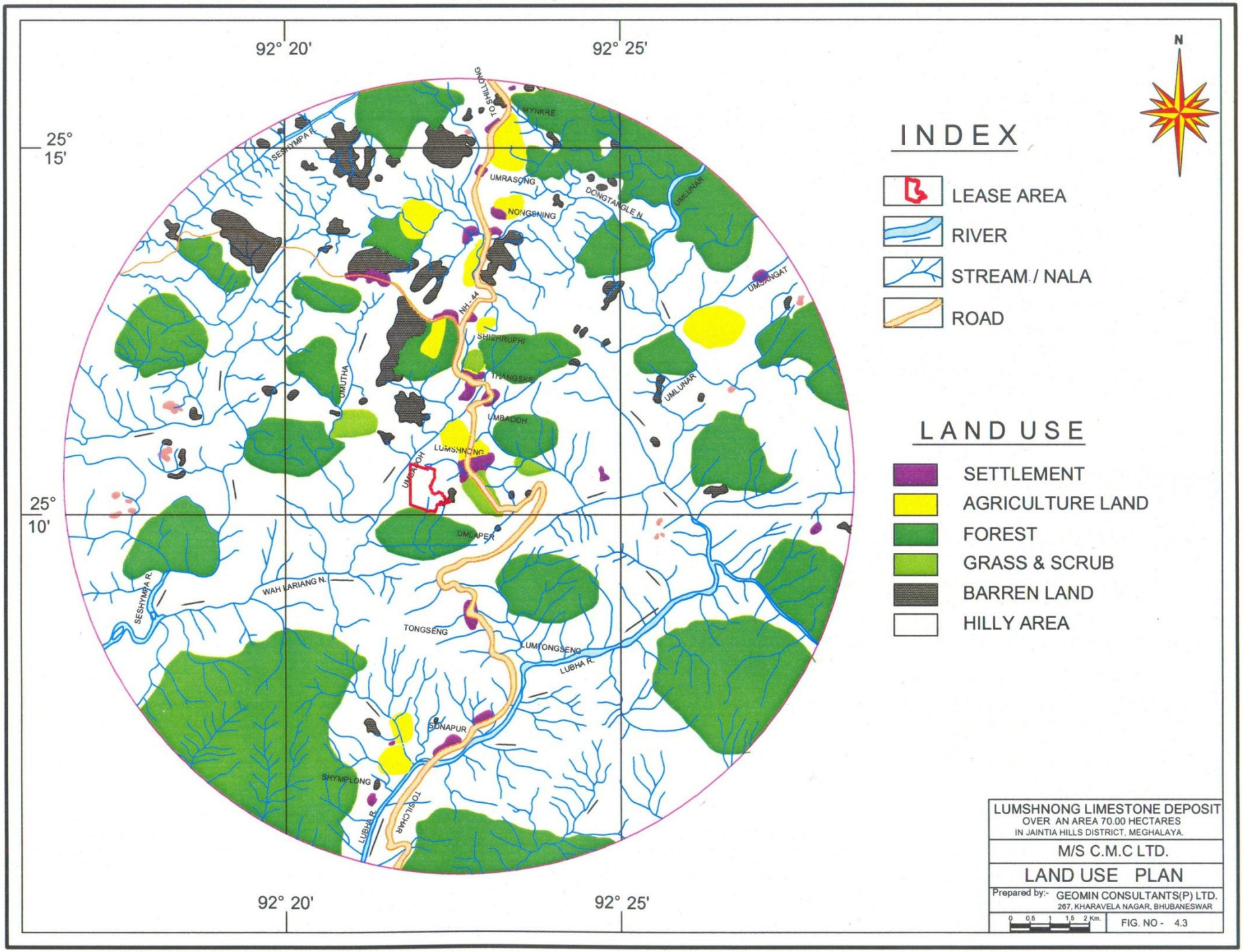
LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.

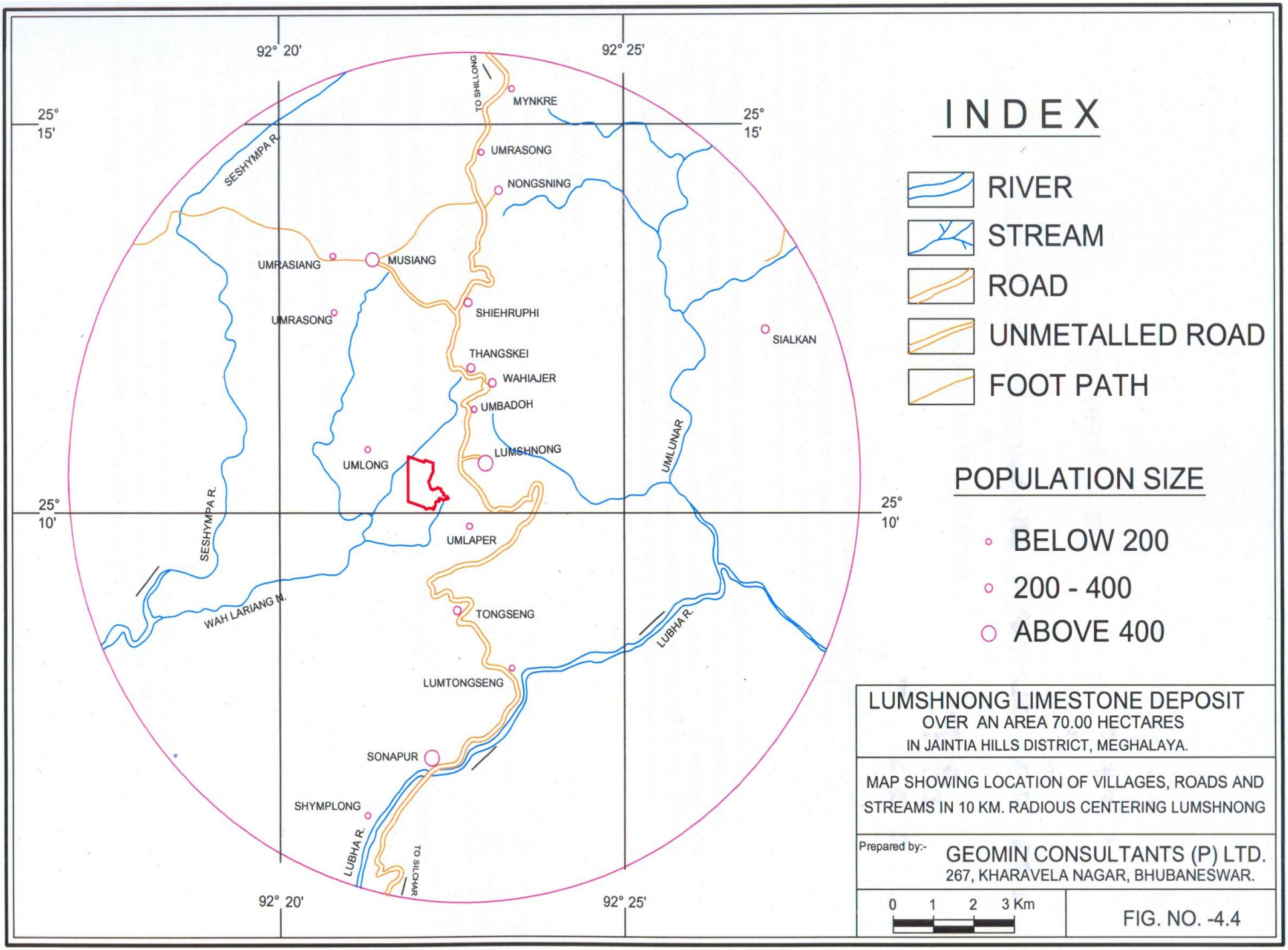
M/S C.M.C LTD.

WIND ROSE DIAGRAM

Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR

SCALE - 1CM=1% FIG . NO- 3.2


92° 20'
92° 25'
25° 15'
25° 10'
N
INDEX
LEASE AREA
RIVER
STREAM / NALA
ROAD
LAND USE
SETTLEMENT
AGRICULTURE LAND
FOREST
GRASS & SCRUB
BARREN LAND
HILLY AREA
TOSHILLONG
MYNKRE
SESHYMPA R.
UMRASONG
DONGTANGLE N.
UMLUNAR
NONGSNING
UMSANGAT
NH-44
SHIEHRUPHI
UMUTHA
THANGSKE
UMBADOH
LUMSHNONG
UMLAPER
WAH LARIANG N.
TONGSENG
LUMTONGSENG
LUBHA R.
SONAPUR
SHYMPLONG
TOSILCHAR
LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.
M/S C.M.C LTD.
LAND USE PLAN
Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR
0 0.5 1 1.5 2 Km.
FIG. NO - 4.3


92° 20'
92° 25'
25° 15'
25° 10'
TO SHILLONG
MYNKRE
UMRASONG
NONGSNING
SESHYMPA R.
UMRASIANG
MUSIANG
UMRASONG
SHIEHRUPHI
SIALKAN
THANGSKEI
WAHIAJER
UMBADOH
UMLUNAR
UMLONG
LUMSHNONG
SESHYMPA R.
UMLAPER
WAH LARIANG N.
TONGSENG
LUBHA R.
LUMTONGSENG
SONAPUR
SHYMPLONG
LUBHA R.
TO SILCHAR
INDEX
RIVER
STREAM
ROAD
UNMETALLED ROAD
FOOT PATH
POPULATION SIZE
BELOW 200
200 - 400
ABOVE 400
LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.
MAP SHOWING LOCATION OF VILLAGES, ROADS AND STREAMS IN 10 KM. RADIOUS CENTERING LUMSHNONG
Prepared by:-
GEOMIN CONSULTANTS (P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR.
0 1 2 3 Km
FIG. NO. -4.4

CHAPTER – 5

ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

5.1 INTRODUCTION

While providing essential minerals for the use in our economies, uncontrolled mining can also have many adverse impacts on the environment and human health. Potential impacts include air and water pollution, mine waste disposal and land degradation. Hence, environmental impact assessment is essential for the present environmental scenario.

The project activities have certain effects on various environmental domains that exist in the area. A scientific assessment of these impacts those are likely to influence the existing environmental scenario is needed. This could also facilitate in formulating a suitable environmental management plan depicting all mitigation measures. It can help in implementing the project in an eco-friendly manner. The project activities influencing the following environmental attributes have been studied and their impacts on the following attributes have been assessed.

- Land use pattern
- Air Quality
- Noise Quality
- Water Quality
- Ecological Condition
- Socio-Economic Condition

The mining and allied activities in the proposed project area have influence on environmental attributes. These attributes include:

- Excavation
- Construction of approach and haulage road
- Drilling and Blasting
- Loading and Transportation
- Processing and Sizing of limestone
- Disposal of overburden/waste etc.
- Site preparation

The magnitude of the proposed mining activity being small is not likely to create any serious impacts on the existing environmental set up of the area. However, the likely impacts of the proposed mining and allied activities on the various environmental parameters are discussed.

5.2 IMPACT ON LAND USE PATTERN

The project area, which is classified as non- forestland, has got sparse vegetation. The area is devoid of irrigation facility so agricultural yield is very less in percentage. A good number of people are depending on other jobs.The proposed land use pattern is as follows. (Table - 5.1)

Table - 5.1

Proposed Land Pattern (Area in Ha.)				
Sl. No.	**Features**	**Planned period**	**Beyond planned period**	**Total**
1	Mining	8.64	47.13	55.77
2	Over Burden Dump	2.25	----	2.25
3	Infrastructure (workshop, admn. Building etc.)	0.02	---	0.02
4	Roads	0.2	---	0.2
5	Magazine	---	---	---
6	Green Belt	10.0	1.56	11.76
	Total	**21.11**	**48.69**	**70.00**

Provision of drinking water, canteen, rest shed and recreation facilities will be provided for workers.

To mitigate the adverse impact , plantation to be carried out in and around the area and scientific progressive reclamation plan to be followed.

5.3 IMPACT ON AIR QUALITY

The dust generated from mining activities is the primary source of air pollution. The emission sources include excavation and mining of limestone, drilling, blasting, sizing and transportation within the project area. During air quality monitoring it is observed that dust generation is of short term and settle quickly within close ranges. There is very less scope of spreading of dust particles to the near by residential areas as these operations are carried out at far off distances from the habitational areas. Hence, human population is not directly affected by the air pollution as the impact of dust generation. It is found that the dust nuisance is not a problem due to deployment of water tankers with sprinklers to keep the haulage road surface wet resulting suppressed dust particles. It is also observed that the dust nuisance is localized i.e. within the project area only.

Negligible amount of auto exhaust emissions also expected to be found in the core zone because of vehicular activities arising due to transportation of limestone and waste by dumpers and excavators. However, there will be very little impact on air quality due to automobiles.

Air quality modelling is carried out for prediction of impact of the project on the air quality of the area. The impact of movement of vehicles for transportation of mineral is considered. "Breeze Aeromod" software is used for prediction of air. As per the modeling 15.7 microgram of PM may increase and after the increament the resultant value will be 64.6-microgram, which will be under the prescribed limit.(**Fig. 5.1**).

To mitigate the adverse impact the following measuresare to be carried out. Sprinkling of water during winter and summer seasons on haul road, face of working pit, laoding & dumping site. Drlling to be carried out by wet drill method, Plantation all around the lease boundary. Maintenance of vehicles etc.

5.4 IMPACT ON WATER QUALITY

Water is one of the most precious resources on the earth. The applied area does not have any perennial nala. The source of water in the project area is from near by nala only. More over due to small scale of mining operation using minimum machineries, dust suppression is by water spraying through water sprinkler limited to haulage road and dumping area only. Rainwater flowing through the exposed mine cuts would carry some sediment of soil and rock. These are found to be non-toxic in nature. Surface runoff water from mines has only high turbidity during monsoon. As discussed, the mining activity will require very less quantity of water in comparison to the recharging. Hence, it will not affect the water regime of the area. Quarry water shall be treated before releasing to natural drainage system.

As discussed in chapter–4, the annual ground water recharge will be 16.9 Ham. For facilitating mining and allied activities water requirement will be 75 m^3 per day, out of which 65 Cum/day shall be met from surface watercourse and 10 Cum/day from plant supply. Thus, the annual requirement of water by taking 300 working days shall be 2.25 Ham. This water requirement is less than that of the utilizable water resources. Water requirement for the area is given in **Fig. 5.2**.

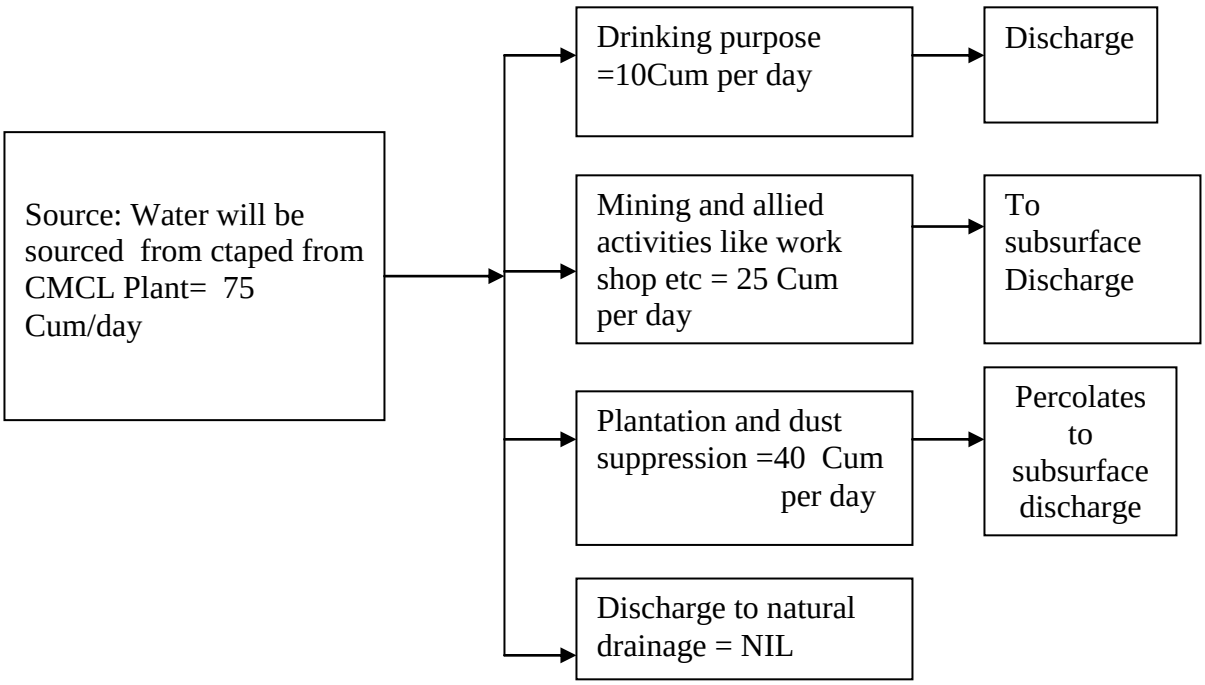
The outside seasonal nalas will be protected by barrier of rocks and dump area will be kept away from it. The seasonal nala will not be hampered by mining activities. The seasonal nala flows with rain water in rainy season only. Rest of the year it is dry.

The exploitation of ground water for irrigation and other purposes is negligible in the buffer zone surrounding the mine lease area, as the area falls in the non-agricultural category and sparsely populated. Ultimate working depth of the mine will be 480m AMSL where as ground water table is at 420m AMSL (in summer) and 425m AMSL (in rainy season). Hence mining will not touch ground water table (**Fig. 5.3**).

It is further noted that, due to excavation of hard rock the filtration rate will increase. So, due to mining the ground water recharge will increase as requirement of water is very small in comparison to the availability and ground water recharge. Hence, ground water impact will be marginal.

To mitigate any adverse impact due to the mining activity, rain water from the active mining area shall not be allowed to flow out side lease before settling.

Figure : 5.2
WATER BALANCE



5.5 IMPACT ON NOISE QUALITY

As mentioned in chapter-2 the proposed mining will be open cast mostly mechnised working. In this open cast Mechanized mining the various sources of noise in the area are attributable mainly due to drilling, blasting, operation of compressor, loading & haulage, operation of diesel pump and vehicular traffic.

The level of limestone production, being very small, the operation will be limited to one shift of eight hours duration in a day. The various sources of noise mentioned above shall only be periodical and is limited to a fixed period of operation only. In addition to this, the transportation of limestone might cause a little effect on the noise level. The noise level result due to such operations in the active working zones in the area do not indicate any serious concern as it is well below in prescribed standard limit.

The various noise levels and their effects along with hazards on the human being are noted (Table - 5.2). The ambient noise level data (Table - 4.6) of the area on comparison with the possible health hazards due to noise level (Table - 5.2), it can be concluded that there is no serious alarming effect due to mining.

Table - 5.2
Health Hazards by Different Noise Levels

Sl.No.	dB(A)	Effects
01	20	No sound perceived
02	25	Hearing threshold
03	35	Slight sleep interference
04	50	Moderate sleep interference
05	55	Annoyance (mild)
06	60	Normal speech level
07	70	Smooth muscles/glands react
08	75	Changed mortor coordination
09	80	Moderate hearing damage
10	85	Very annoying
11	90	Affect mental and mortor behaviour
12	95	Severe Hearing Damage
13	100	Awaken Everyone
14	115	Maximum Vocal Effort
15	125	Pain Threshold
16	130	Limit Amplified Speech
17	135	Very painful
18	140	Potential of hearing loss high

To mitigate any adverse impact regular maintenance of vehicle & machineries shall be carried out.

5.6 TRANSPORTATION

Almost 3000 TPD of limestone will be produced. Approximately 150 number of vehicles per day will be added to the traffic density over a short distance of 1.5 Kms in the area. Steps will be taken for road repairing. Awareness campaign among dumper /truck drivers will be generated for clearance of road and lower down the pollution load due to transportation.

The transportation shall be carried out from lease area to plant site which is situated within 3 kms. Existing road will serve the transportation

5.7 ECOLOGICAL CONDITIONS

The proposed mining operation shall have little impact on the existing ecological conditions. The area required for mining is having very less vegetation cover. Plantation shall be carried out to minimize the advesrse impact.

5.8 IMPACT ON SOCIO-ECONOMIC CONDITIONS

The proposed enhancement activities of the project shall have major beneficial and negligible adverse impacts on the following domains.

5.8.1 Employment

Since the company's Mines are in operation adjoining to this project and both will serve as captive source of limestone to the cement plant, the employment opportunities shall remain unchanged. The proposed project will contribute direct employment scope for about 137 persons including skilled, semi-skilled and un-skilled mine workers, supervisory staffs, mining engineers, geologists and surveyors. It can create indirect employment scope for about 200 persons. In addition to this it can also facilitate developing of indirect employment opportunities mainly for organized workshops and spare parts dealers network.

5.8.2 Education

The project activities shall create awareness with the local people for preferring permanent services than periodical agricultural activities. The activities will help them to analyse the importance of education. With the increased amount of income, people can send their children to nearby schools.

The Project proponent will take necessary steps to improve the quality of education and overall literacy level of the local people. Thus the implementation of this project shall naturally augment the education status of the local people.

5.8.4 Communication

The mining area is well connected with important places in the vicinity. Nearest Railway station is at Badarpur , The mine area is connected with the national High way-44 by an all weather road.

In addition the telecommunication facilities like telephone and Mobile services are easily accessible

5.9 SCOOPING PROCESS

As it is evident, due to mining activities the environment of the area in respect of Air and land use shall be adversely affected. Due to activities like drilling, blasting and transportation shall have effect on the air environment of the area. The PM_{10} level shall go up.

In order to mitigate the above adverse effect project proponent has to take required steps to minimize the affect. Adverse effect in respect of air shall be mitigated by

a) Construction of well compacted roads.
b) Regular water spraying on roads and waste dumps
c) Provision of dust collectors for the drilling machines
d) Controlled blasting
e) Supply of dust masks for the drill operators
f) Plantation of wide leaf trees, creepers, around quarry sites, waste dumps, roads, and other surrounding barren zones.

Land degradation affect shall be mitigated by proper plantation and reclamation programmes.

5.10 MITIGATION MEASURES

The various mitigation measures, covering both physical as well as socio-economic factors, to minimise the adverse environmental impacts are proposed to be taken up for the following environmental components.

• Degradation of land/soil	• Disturbance of habitat
• Degradation of natural vegetation cover	• Disposal and management of waste
• Pollution of air	• Socio-economic measures
• Noise pollution	• Occupational safety and health

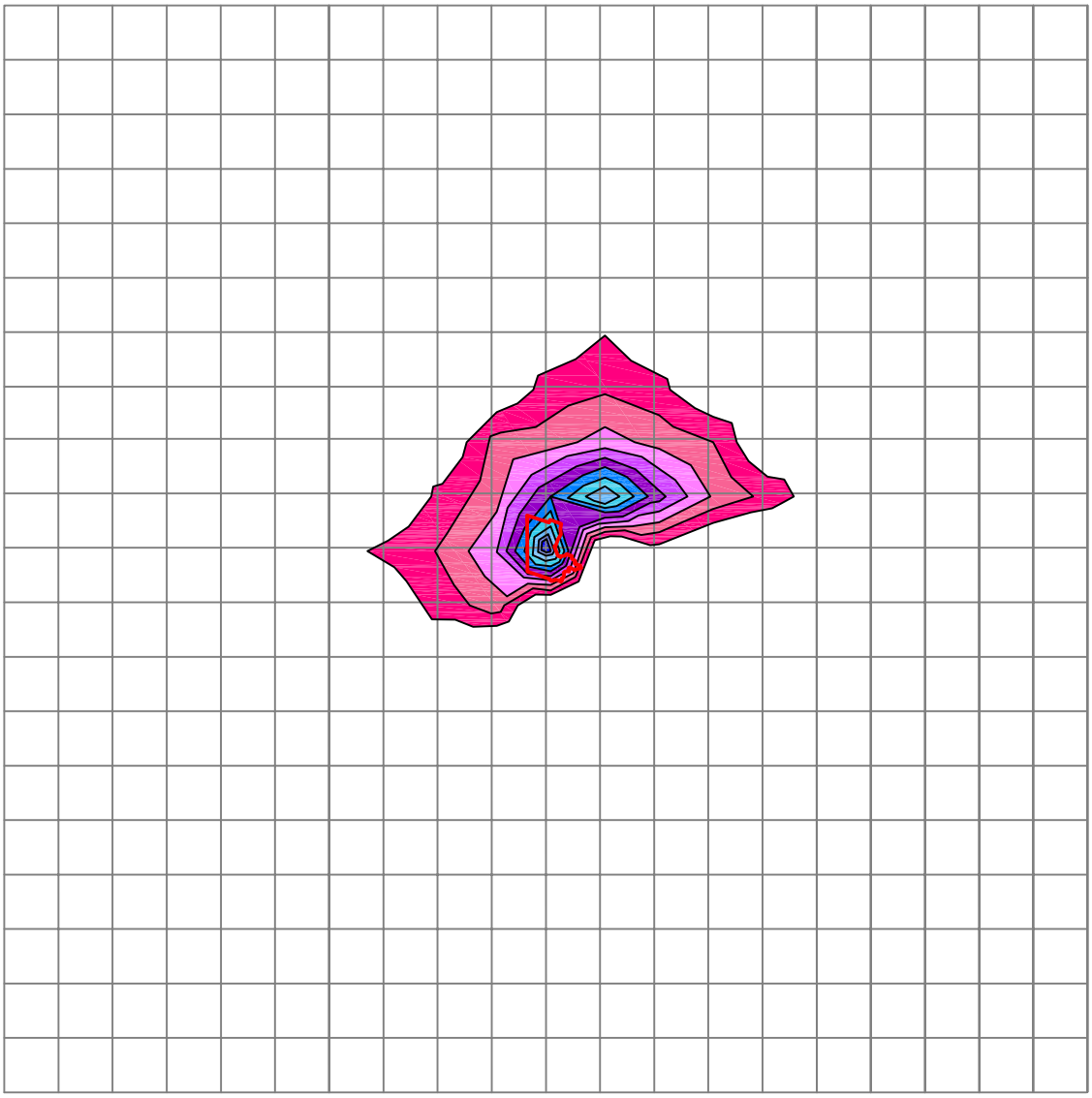
Various mitigative measures for all these environmental components are discussed in Chapter-10.


PREDUCTION MODELLING.dwg


GROUND WATER TABLE.dwg

STATION- LUMSHNONG

SEASON - SUMMER



- > 15.7µg/Cum
- > 14.4µg/Cum
- >13.1µg/Cum
- > 11.8µg/Cum
- > 10.5µg/Cum
- > 9.1µg/Cum
- > 7.8µg/Cum
- > 6.5g/Cum
- > 5.2µg/Cum
- > 3.9µg/Cum

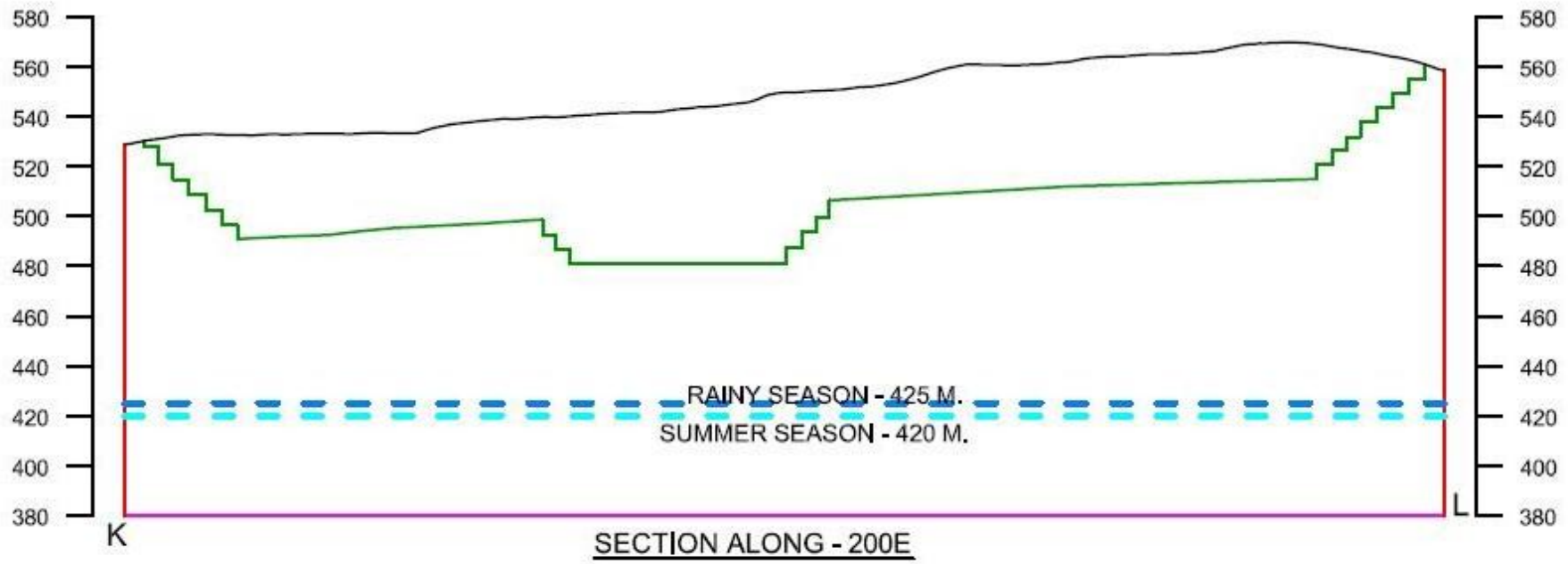
LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.

M/S C.M.C LTD.

PREDICTION MODELING FOR RSPM

Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR

EACH SQUARE 1 K.M	FIG. NO - 5.1



SECTION ALONG - 200E

LUMSHNONG LIMESTONE DEPOSIT
OVER AN AREA 70.00 HECTARES
IN JAINTIA HILLS DISTRICT, MEGHALAYA.

M/S C.M.C LTD.

GROUND WATER TABLE

Prepared by:- GEOMIN CONSULTANTS(P) LTD.
267, KHARAVELA NAGAR, BHUBANESWAR

0 20 40 80 M

FIG . NO- 5.3

CHAPTER – 6

ENVIRONMENTAL MONITORING PROGRAM

6.1 INTRODUCTION

The mitigation measures suggested above should be implemented so as to reduce the impact on environment due to the operations of the proposed mining activities. In order to facilitate easy implementation, the mitigation measures are phased as per the priority of implementation. The implementation schedule is given as below. (Table - 6.1).

Table - 6.1
Implementation Schedule

Sl. No.	Recommendations	Time Requirement	Immediate	Progressive	Discretion of the Management
1	Air pollution control measures	Before commissioning of respective units	*	--	--
2	Water pollution control measures	Before percolation/seepage and dewatering starts	*	--	--
3	Noise control measures	Along with the commissioning of the mine project	*	--	--
4	Ecological preservation and upgradation	Stagewise implementation	*	*	--
5	Land reclamation/Soil waste management	Stagewise implementation	*	*	--
6	Socio-economic measures	As per the CSR proposals of the company and the need of the local residents		*	*

Note (*) indicates implementation of recommendations

6.2 MONITORING AND REPORTING PROCEDURE

The monitoring of various environmental parameters is necessary which is a part and parcel of the environmental protection measures. Monitoring is as important as that of control of pollution since the efficacy of control measures can only be determined by monitoring. A comprehensive monitoring program is suggested underneath. Environmental attributes should be monitored as given below:

- Air Pollution and Meteorological Aspects;
- Water and Wastewater Quality;
- Noise Levels;
- Soil Characteristics; and
- Ecological Preservation and Up gradation

6.3 INFRASTRUCTURE FOR ENVIRONMENTAL PROTECTION

A full fledged environmental cell, established at the company's cement plant will supervise and implement the environmental issues.

6.4 BUDGETARY COST ESTIMATES

The cost estimates presented in this section are for the recommendations made above. These cost estimates give only the indication of the likely cost. The estimated environmental cost of the project is as follows. (Table - 6.2)

Table - 6.2
Cost of Environmental Protection Measures (In Lakh)

Sl. No.	Measures	Annual Recurring Cost
1	Pollution Control equipments & consumables	--
2	Laboratory chemicals	2.0
4	Green Belt (Nursery)	---
5	Reclamation	-
6	Staff Salary	5.0
Total		**7.0**

CHAPTER – 7

ADDITIONAL STUDIES

7.1 PUBLIC CONSULTATION

All projects have significant effects on the community within which they are located. Actions that require environmental impact assessments and statements are usually extensive and likely to affect the local community in a variety of ways and these affects may be beneficial or adverse. However, the need for the project to take place in response to the requirements of the local community establishes the necessity for effective public consultation. Without such consultation the project may take on a direction that (although seemingly directed towards public benefit) is counterproductive to the community needs.

The Public consultation will be done with appropriate person(s) to get some additional information. It is necessary for the following general objectives.

- Information, education, liaison
- Identification of real problems, needs and importance
- Idea generation and problem solving
- Reaction and feedback on proposals
- Evaluation of alternatives

Public consultation will provide some useful information for the project, especially when some factors cannot be easily identified and quantified. This process helps to enhance the confidence and decision making among public because local people can see the environmental impacts which can be carefully handled. The public consultation in decision making provides both judicial and public examination of the factors and consideration in the decision making process.

7.2 RISK ASSESSMENT

Human health and Environmental risk from developmental activities is mainly due to occurrence of some accident consisting of an event or sequence of events like explosion, fire and toxic hazards. Risk analysis provides a numerical measure of the risk that a particular facility poses to the public. It begins with the identification of probable hazardous events at an operational area and categorization as per the predetermined criteria. The consequences of major events or accidents are calculated for different combinations of weather conditions to stimulate worst possible scenario. These predictions of consequences are combined to provide numerical measures of the risk for the entire facility. Risk assessment should be done on the basis of past accident analysis at similar projects, previous judgments and expertise in the field of risk analysis especially in accident analysis.

7.3 DISASTER MANAGEMENT PLAN

Disaster management plan is prepared with respect to the following possible accidents.

7.3.1 Open Cast Bench Slope Failure

For determining factor of safety, the bench slopes are to be monitored regularly by sensitive instruments at precise level at regular intervals to check for any possible ground movement. A well developed drainage system over the lease hold area is to be ensured to check that the storm water flows out of the lease area.

- Failure to make and keep the quarry sides secure by proper benching, sloping and keeping benches of adequate height and width.
- Undercutting so as to cause dangerous covering.
- Inadequate nos. of competent persons for carrying out statutory inspections.
- Lack of supervision.

7.3.2 Accidents due to Machinery

- During reversal operation
- Unauthorised driving of vehicles (mostly by helpers)
- Riding of vehicles unauthorisedly
- Attempt to ride moving vehicles
- Overloading
- Driving vehicles in a intoxicated stage
- Vehicles moving in steep gradient or on benches of inadequate width

7.3.3 Other than Transportation Machinery

- Use of sub standard equipments
- Attempt to clean moving parts of machinery
- Non provision or removal of guards for moving parts of machinery

7.3.4 Accidents due to use of Explosives

- Fly rock throw due to blasting
- Inadvertent handling of explosives

TABLE – 7.1

RISK ASSESSMENT

METHOD / STAGES	SURVERILLANCE AND MONITORING	TOXICITY ASSESSMENT	HEALTH SERVICE PROVISION	SAFETY PROVISION AND PREVENTION	OBTAINING ADVICE FROM HEALTH SECTOR
LOCATION	Site specific health hazards, general health status of local communities, common causes of mortility, location and functioning of health service.		Access to Health services	Settlement citing	Disease foci, vector biology
PLANNING AND DESIGN	Improve routine health service surveillance though retraining, health information systems.	Toxicological and epidemiological risk valuation, hazard identification for pollutants, dose response assessment, exposure assessment, risk characterization.	Health centre, trained staff, drug supply equ-ipment maintenance, casualty/ emergency unit	OHS planning environmental management	Communicable disease control, vector control environmental health
CONSTRUCTION	OHS monitoring, environme-tal health: water supply, sanitation, drug supply, vector monitoring.		STD clinic, distribution of contraceptives, health training casualty/ emergency unit, communicable disease control	Safety measures, OHS training, traffic routing	Communicable dise-ase control, environmental health
OPERATION	Routine medical examinations, OHS monitoring, IMR and vector monitoring, casualty rates.		Health education, immunization, supplem-entary nutrition, training of workers, casualty/ emergency visit, disease control	OHS implementation, environmental management	Communicable disease control, environmental health, human behavior modification
PROJECT ENHANCEMENT	Health information system, laboratory services		Healthy workforce is more productive and vice-versa	Safer working me-thods, training, inj-ury compensation	Intersectoral collaboration

7.4 RISK MANAGEMENT

The following precautionary measures shall be taken to prevent any accident

- Elimination of the source of hazard
- Substitution of hazardous process and materials by those which are less hazardous
- Geographical/ physical isolation of hazards from vulnerable communities
- Use of engineering controls to reduce the health risk
- Adoption of safe working practices such as regular equipment maintenance
- Use of Personal Protective Equipment should be mandatory.
- Top edge of opencast workings shall be kept properly fenced.
- Quarrying shall be done from top downwards. No overhang will be allowed.
- Special attention and requisite provisions shall be taken while working in areas of geological weakness like existence of slip, fault etc.
- Regular dressing of bench sides to ensure safety of workers employed within 5m or working face.
- Provision of safety belt or rope while persons are at work at the quarry sides or benches from where there are chances of falling down for more than 1.8m.
- Spoil banks not to be retained by artificial means at an angle of repose in excess of its natural angle.
- Drafting and implementation of preventive maintenance schedule for various kinds of machinery deployed in opencast workings.
- Provision of maintenance of properly laid haul roads with parapet wall fencing or guards and road signs at strategic points.
- Precautions against danger while traversing dumpers, excavators etc. by installing audio-visual alarms and appointment of spotters.
- Transportation of Limestone within mine workings by vehicles under the direction, supervision and control of Mine Management only.
- Proper maintenance of vehicles and weekly examination by an engineer and daily examination by a competent person.
- Training and retraining (at specified interval) of the machinery operators.
- Use of controlled blasting techniques. 500 m radius danger zone to be followed strictly.
- Provision of blasting shelters – properly constructed and maintained.
- Adequate maintenance of electrical equipments.
- Adequate illumination after daylight.

7.4.4 Social Impact

Socio-economic impact assessment has taken on a new and important direction. Decision makers at all levels, as well as community members have developed an increasing awareness of the need for estimating the effects for projects on communities. Estimation and analysis of these impacts have direct and immediate action in planning for change and growth that might occur as a result of large projects. The categories of effects that may be covered in socio-economic impact analysis includes:-

- Housing status effects
- Educational effects
- Government fiscal effects
- Labor force effects
- Economic status effects
- Family status effects
- Public health status effects
- Public safety effects
- Physical environmental quality effects
- Recreational opportunity effects
- Cultural alternative effects

7.4.5 Occupational Health

Since it is opencast mining, health problems due to dust may be expected. By using various PPEs, the chances of occupational health disease will be lowered. Due to dust various diseases like Asthma, TB, Pneumoconiosis, Silicosis etc. may occur. By periodical medical check up & treatment and job rotation of employees the impact would be minimized.

7.4.6 R&R Action Plan

No displacement is involved for the proposed project. Hence R&R action plan is not applicable for the project.

CHAPTER – 8

PROJECT BENEFITS

8.1 IMPROVEMENTS IN THE PHYSICAL INFRASTRUCTURE

8.1.1 Communication

The mining area is well connected with important places in the vicinity. The M.L area can be approached from National highway at a distance of 1.5 km. Nearest railway station Badarpur is 80 km from the lease area.

8.1.2 Agricultre and Public Health

Greenery development can lead to improved public health and increased yield of crops and fodder which in turn results in better socio-economic environment. It protects land degradation and erosion, protects and improves soil nutrients.

8.2 IMPROVEMENTS IN THE SOCIAL INFRASTRUCTURE

The project activities shall create awareness with the local people for preferring permanent services than seasonal agricultural activities. The activities will help them to analyse the importance of education. With the increased amount of income people can send their children for higher education / professional courses. The school established by CMCL provides quality education to the local students and taking care of the local students in their studies

8.3 EMPLOYMENT POTENTIAL

Since this is an operating unit the employment opportunities shall remain unchanged. The project will contribute direct employment scope for about 137 persons including skilled, semi-skilled and un-skilled mine workers, supervisory staffs, mining engineers, geologists and surveyors. It can create indirect employment scope for about 200 persons.

8.4 OTHER TANGIBLE BENEFITS

This project, on implementation shall help in increasing the overall income pattern of the neighboring people which shall indirectly help them to improve their living standards. Facilities like electricity and telephone are available in these interior/remote areas. There will be no displacement of families for the mining of limestone.

CHAPTER – 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

No recommendations at the Scooping stage.

CHAPTER – 10

ENVIRONMENTAL MANAGEMENT PLAN

(DESCRIPTION OF THE ADMINISTRATIVE ASPECTS OF ENSURING THE MITIGATIVE MEASURES)

10.1 INTRODUCTION

The environment management plan is prepared considering the impacts and areas of concern which have been indicated in Chapter – 4. This covers management of air quality, noise pollution, land use pattern, water pollution, socio-economic conditions etc.

10.2 MANAGEMENT OF LAND

The total amount of Sandstone OB generated will be 3.645 Million Cum during life of the mine including 3,21,453 cum of OB during first 5 years of plan period.70% of the waste material shall be used for backfilling and 30 % shall be utilised as an additive to make up the deficiency of Silica in the rawmix . Dumping shall be carried out temporarily and material shall be re-handled for back filling.There would be a dump over 2.25 ha. of land for storage of sandstone OB and it's subsequent use for back filling .The capacity of the dumps will be 2.25 lakh cum. .The height & width of the terraces will be 10m and 5m respectively and maximum height of the dump will be 10m.The sandstone would be stacked in dump yard and will be utilized for backfilling of mined out area.

Plantation will be made accordingly. The selection of plant species will be based on the local soil conditions. Post plantation care like watering and protection from grazing will be done. The scheme of reclamation and afforestation has been proposed. (**Fig. 10.1**).

Table – 10.1
Year Wise Production of Limestone, Overburden and Management of OB

Year	Limestone Production In Tonne	OB Generation in cum	OB utilized In cum	OB dumped in Cum.	Quantity used for Backfilling in Cum
1	100012.5	9170	2750	6420	
2	313537.5	27870	8360	19510	
3	392175	94860	28450	66410	
4	769088	119553	35866	83687	
5	900009	70000	21000	49000	
6	900000	54000	16200		87800
7	900000	54000	16200		87800
8	900000	54000	16200		87800
9	900000	54000	16200		87800
10	900000	54000	16200		62827
11	900000	54000	16200		37800
12	900000	54000	16200		37800
13	900000	54000	16200		37800
14	900000	54000	16200		37800
15	900000	54000	16200		37800
16 to ultimate	46341403	2783200	834960		1948240
Total	**57816225**	**3644653**	**1093386**	**Nil**	**2551267**

Table - 10.2
Post-operational Land use

					Area in Ha.
Land use	**Plantation**	**Water Body**	**Public Use**	**Undisturbed**	**Total**
Mining	58.02	--	--	--	58.02
Road and Infrastructure	0.22	--	--	--	0.22
Green Belt	11.76	--	--	--	11.76
Total	**70.00**	**--**	**--**	**--**	**70.00**

The stage wise cumulative plantation is as follows.

Table - 10.3
Stage Wise Cumulative Plantation

REQUIREMENT OF PLANTS FOR AFFORESTATION / RECLAMATION										
Year	**Un-worked Area (Greenbelt)**		**Out Side Dump**		**Dump Area**		**Top Soil Dump**		**Total**	
	Area (Ha)	**Trees**	**Area (Ha)**	**Trees**	**Area (Ha)**	**Trees**	**Area (Ha)**	**Trees**	**Area (Ha)**	**Tree**
1st	2.0	3200			--	--	--	--	2.0	3200
2nd	4.0	6400			--	--	--	--	4.0	6400
3rd	6.0	9600			--	--	--	--	6.0	9600
4th	8.0	12800			--	--	--	--	8.0	12800
5th	10.0	16000			--	--	--	--	10.0	16000
Ultimate	11.76	18816	58.24	93184	--	--	--	--	70.00	112000

All the lease and buffer area falls under area with lack of irrigation facilities. There will be less chance of improvement in agriculture. By using these land in mining there will generation of employment and revenue.

Green Belt Development

As per the guidelines of CPCB for developing of green belts plant species will be planted. An area 11.76 ha of land shall be developmed as green belt. For development of green belt an amount of Rs. 30,000/- per hectare will be allocated. The area considered for green belt and its phase wise plantation programme is shown in Table 10.3. The plant specices to be planted is reflected in Table - 10.4

Table - 10.4

List of Plant Specises selected for Plantation

Scintific Name	Common Name
Aegle Marmelos	Bael (wood Apple)
Azadirachta indica	Nim (Neem)
Cassia Fistula	Sunari (Golden Shower)
Citrus limon	Nimbu (Lemon)
Dalbergia Latifolia	Sitsal (Black wood)
Dalbergia Sisoo	Sisoo (Sisoo)
Derris indica	Karanja (India beech)
Diospyros melanoxylon Roxb.	Kend (Ebony)
Emblica officanalis	Amla (Emblic myrobalan)
Fiscus Benghalensis	Bar (Banyan Tree)
Fiscus religiosa	Ashthwa (Peepal tree)
Grevillea robusta	Silky oak
Madhuca Latifolia	Mahuwa (Butter tree)
Magifera indica	Am (Mango)
Moringa oleifera	Sajina (Drumstick)
Pinus khasiana	Khasipine
Pinus roxburghii	Chiri
Pinus wallichiana	Chir pine
Populus deltoids	Caroline popular
Populus euphratica	Indian Popular
Quercus palustris	Oak
Quercus petraea	Oak
Tamarindus indica	(Anbli)Tamarind tree

10.3 MEASURES FOR CONTROLLING WATER POLLUTION AND CONSERVATION OF WATER

The cause and source of pollution of water in the area could be attributed mostly to the surface run-off during rainy season. The following measures are to be taken for preventing possible water pollution.

- No overburden or loose sediments will be kept in the working benches particularly during monsoon months.
- Check dam will be provided around the overburden dumpsites to arrest flow of loose sediments before discharge into the drainage system of the region.
- Peripheral drain proposed to arrest the inflow of run-off water to the quarry area.
- The possibility of the project activity contributing to the pollution of watercourses of the region or to the ground water regime is so less that this does not significantly constitute an area of concern.
- A rain water harvesting pond will built up in lower part of the proposed site, by which natural surface rain water will automatically come to the pond. The rain water harvesting pond will be in the size to carry minimum 5 days of heavy rain fall in the tank.these water passes through the ETP for treatment and then it will be used. The rain waters will be used for fire fighting, gardening and plantation etc.

10.4 MEASURES FOR CONTROLLING AIR POLLUTION

The mining area, due to its very nature and scale of operation is likely to marginally contribute towards air pollution in the area. The effect is analyzing and this effect is mostly due to fugitive emission. For the mine, the only pollution occurs from dust (SPM) during vehicular traffic, blasting, loading / unloading etc. As the particles are heavy in nature, they settle easily in the immediate vicinity. There is no other source for SO_2, NOx and CO except a little contributed by the vehicular traffic, which is well below the prescribed limits. Still, the following different control measures are proposed.

- Construction of well-compacted roads.
- Regular water spraying on roads and waste dumps by tankers.
- Provision of dust collectors for the drilling machines
- Controlled blasting
- Supply of dust masks for the drill operators
- Plantation of wide leaf trees, creepers, tall grasses around quarry sites, waste dumps, roads, colony and other surrounding barren zones.

10.5 NOISE ABATEMENT

The sources and causes of noise have been discussed in Chapter-3 and its negligible impact has been highlighted in Chapter – 4. However, the following measures will be taken to analyzing the adverse impact of noise, though negligible within the project area and its surrounding region.

- Proper and regular maintenance of vehicles, compressors and jack hammers.
- Provision of supplying earplugs for jackhammer drillers and compressor operators.
- Carrying of blasting only during daytime (not during cloudy weather and when strong wind is blowing towards residential areas). Blasting will be carried out with limited explosives at a time so that the noise generation can be well maintained with the prescribed limits.
- Provision of Green Belt (thick foliage) along the lease boundary and road.

10.6 SOCIO-ECONOMIC MEASURES

The impact of the project on the socio-economics of the region has been discussed in Chapter – 4. Apart from overall beneficial impact of the project on the local people of the region, it is felt necessary to augment facilities in the fields of education, health and social awareness including concern for ecology. These are presented in an analyzing form in the following statement.

Sl. No.	Environmental Attributes	Nature of Impact
a	Employment	Beneficial
b	Service, trade/commerce	- do -
c	Public utility/education, social awareness	Augmentation
d	Health care facilities	- do -

It is necessary to create awareness among the people. The beneficial aspects of the following measures that would be taken up by the mine as a periphery development project.

- Family planning
- Abandonment of Jhum / shifting cultivation
- Planting of trees and social forestry
- Reduction in the consumption of fuel wood and encourage use of alternative fuels
- Use of clean and boiled water
- Reducing the consumption of alcohol
- Saving from earnings
- Personal hygiene
- Regular health check

In implementation of these measures, the mine management can contribute a lot on the overall socio-economic scenario of the region.

10.7 SAFETY AND OCCUPATIONAL HEALTH

The proposed mining will be operated by semi-mechanised methods deploying man and machines. Hence, it is envisaged to take up the following precautionary measures.

- Strict observance of the provisions of Acts, Rules and Regulations in respect of safety both by management and the workers.
- Proper planning and designing of work in order to reduce the risk of hazards.
- Specific instructions and supervisions of working where danger due to fall of side (overhanging, undercutting of bench, fall of objects from higher benches/places, working at height is apprehended).
- Training of work persons and the officials.
- Since the haul road will be of nearly 6.0 km long and in the hilly terrain, due importance will be given in the construction of road. Parapet walls have been constructed on the sides of the haul road to prevent fall of vehicles. The width of road will be maintained more than thrice the width of the vehicle. A code of traffic rules will be implemented.
- A code of practices for tipping in stock piles/dumping of overburden at dump yard and loading point will be implemented.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centers. All personal protective equipments will be supplied to them.
- A code of practice for fighting fire will be implemented.
- Competent persons like fitters, mechanics will imparted with special attention to
- The safe handling of materials while attending to repairs, maintenance of HEMM.
- Provision of pit safety committee meeting every month (20^{th} day) to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness amongst employees.
- Pre joining medical check up shall be done and regular health check up in 6 monthly ionterval is planned for the employees.

10.8 IMPLEMENTATION AND MONITORING

As the major attributes of environment are not confined to the project area alone, implementation of the proposed control measures and monitoring there of have to be undertaken on a regional basis. The mine management will however, implement the control measures and monitor the efficacy within the lease area relating to the following specific areas as per the action plan.

- Collection of air and water samples at strategic locations with appropriate frequency and testing there of. If the parameters exceed the permissible tolerance limits, corrective measures should be taken to arrest the pollution.
- Collection of soil samples at strategic location at least once in every year and testing there of with regards to deleterious constitutions, if any.
- Desiltation of drainage system and check dams.
- Measurement of water level fluctuation in the near by dug wells and bore wells periodically.
- Plantation/afforestation as per programme, regular watering of plant and fencing to protect them from cattle/goats.
- Measurement of noise levels at the mine site, stationery and mobile sources, mine office, canteen and colony would be taken during day time only as mining operation will be carried out in one long day shift.

10.9 PLANS TO MAINTAIN BETTER ENVIRONMENT IN THE AREA

For maintaining better environment in the area the components relevant to the project that need to be taken into account include.

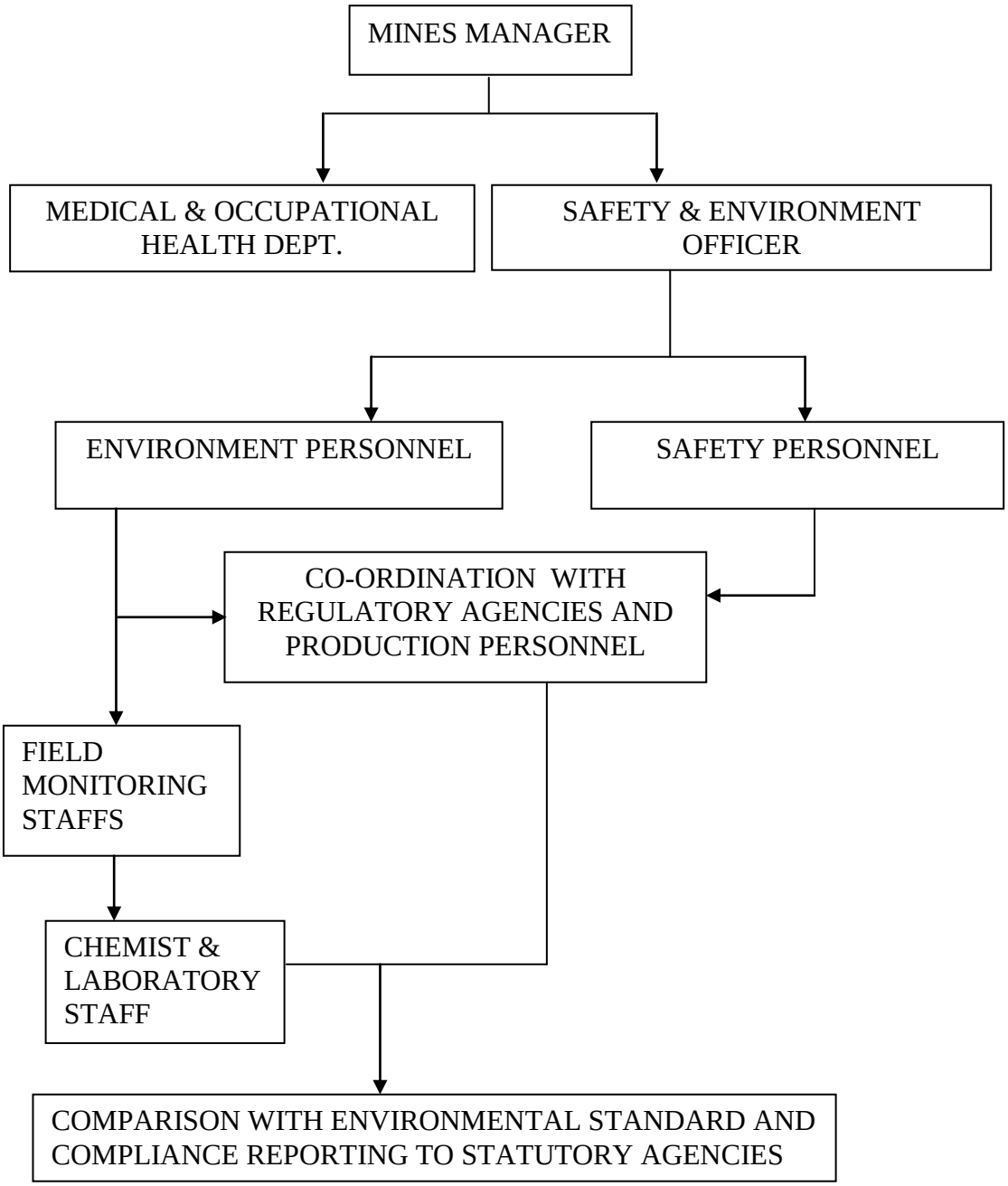
- Afforestation/plantation details of plantation/afforestation programme
- Reclamation of degraded lands, quarries and dumps.
- Constructions of check dam, boulder pitching of bench edges and haul roads etc.
- Monitoring of environmental parameters.

Organisational chart for environmental monitoring in the mining lease area, fiscal estimates for year-wise expenditure (both capital and recurring) and action plan to maintain better environment in this chapters, to augment the environmental development, the measures are suggested.
(Fig. 10.2)

Fig. No. 10.2

ORGANISATIONAL CHART

(ENVIRONMENTAL MANAGEMENT)



10.10 BUDGETARY COST ESTIMATES

The cost estimates presented in this section are for the recommendations made above. These cost estimates give only the indication of the likely cost. The estimated environmental monitoring cost of the project is as follows.. (Table - 10.5).

Table - 10.5
Cost of Environmental Protection Measures (In Rs. Lakh)

Sl. No.	Measures	Capital Cost	Annual Recurring Cost
1	Pollution Control equipments & consumables	Already available with CMCL	--
2	Laboratory chemicals		2.0
4	Green Belt (Nursery)		1.0
5	Reclamation		
6	Staff Salary		4.0
Total			**7.0**

10.11 CSR ACTIVITY

CORPORATE SOCIAL RESPONSIBILITY (CSR)

For social sustainability of any project, attentions need to be paid to the development of the society that existed before or builds up around the project area. The Corporate Social Responsibility is the internalization by the country of the social and environmental effect of its operations through proactive pollution prevention and social impact assessment so that it is anticipated and avoided and benefits are optimized.

The concept is about companies seizing opportunities and targeting capabilities that they have built up for competitive advantages to contribute to sustainable development goals in ways that go beyond traditional responsibilities to shareholders, employees and the law. It is the active partnership of the company which defines the voluntary works with local communities as well as with regional and national Government and reciprocity based on trust and openness to reach agreed objectives and shared involvement.

The presently operating mines along with this mine which are captive sources of limestone & sandstone to the company's cement plant located nearby. The CSR activities by CMCL as an integrated unit already in place will continue .

Employment:

The best method to improve the living standard of any the area is to provide employment for the locality. The lessee has always followed this principle and will do the same in future as well. 80% of workers (un-skilled, semi skilled and skilled) engaged in the mine belong to local villages. The lessee also proposes for maximum appointment of local people to fulfill the manpower requirement for this proposal.

Education:

A strong promoter of basic and primary education has been adopted for educational institutions to enhance their education standards and equip them with better infrastructure facilities. Financial help to schools in tribal villages and slum areas, sponsored funds for school building, teachers' salaries, books, school uniforms and other study materials has been done. Computers will also been donated to Government schools and schools in rural remote areas promoting computer literacy. School room, reparing, new room formation, salary to teachers etc will be provided.

Community Development:

Being committed and socially responsible, the objective of the Lessee is community development. Providing villages with basic amenities, and extending friendship to senior citizens, orphans and physically challenged people are few initiatives taken in the direction of community development.

The lessee has regularly been provided funds for cultural activities such as football tournament, local festivals etc. Drinking water supply to near by villagers will be the prime concern.

Healthcare:

The objective is to provide basic healthcare facilities and a better quality of life to people in the lower rung of the ladder. As a part of the healthcare program, hospitals and foundations of the area are supported by the lessee, and also promotion and assistance to the Government of India initiatives like Pulse Polio drive has been provided. Some instances include:

- Arranging health camps, free medicine distribution, eye check up camp, mobile ambulance and doctor facility etc.
- Providing medical kits to villages along with basic first-aid training
- Organising blood donation drives for well-known blood banks
- Organising a Cancer Screening in coordination with a renowned medical foundation
- Extending support to the leprosy affected people through micro-financing and providing sewing machines and utensils to Leprosy homes

Environmental Awareness:

The lessee will play a conscious and active role to improve the quality of life around the mine. A variety of campaigns to be initiated towards environmental causes including awareness sessions for employees on issues like global warming, environment day celebration through pamphlet distribution and planting of saplings and other environmental awareness campaigns across locations.

Other Peripheral Development Activities:

Development of infrastructure facilities is one of the main activities in CSR domain. Water supply, road construction , additional class rooms in schools etc. are main infrastructure for any area. The project proponent is also involved in the development of all these activities.

The mines are the captive source of raw material for CMCL's cement plant located near by. CMCL as an integrated unit of cement plant and mines, executes CSR activities with a larger budget. The details of CSR activities of CMCL are as under ,

Measures to Improve Socio-Economic Conditions

In addition to payment of royalty, sales tax and excise duty to the Government, CMCL shall continue its efforts to improve the socio-economic status of the local habitants. Preference shall be given to locals for any direct and indirect employment based on the availability of skills and required educational qualifications. With due regard to Corporate Social responsibility towards development of surrounding areas CMCL has created infrastructural facilities like school, hospital, bank, Post Office, Community Center facilities of which are extended to locals also to the possible extent. In addition CMCL extends lots of facilities and benefits to the local population and some of the points are highlighted here under.

Facilities and benefits extended to locals by the operating integrated Cement plant and Mines :

Medical Facilities –

- CMCL is proving free medical services to the residents of nearby villages.
- Ambulance is available.
- Company is providing free medical services to the residents of nearby villages.
- Ambulance is available around the clock for shifting the patients to meet any Emergency.
- Medical camps- Company is organizing several medical camps from time to time in nearby villages with free medicines and free health checkups.
- Company has treated 1554 local people free of cost with free distribution of Medicines worth Rs.92,000/- in year 2008-09.
- Medicines are provided to Lumshnong village residents free of cost based on Headman's recommendations.
- Company has provided free Meningococcal Meningitis vaccines to the residents Of Lumshnong village. Over 1650 residents have been vaccinated. Company Has spent an amount of Rs.6.50 lakhs for this vaccination programme.

i) Educational facilities –

- Company has started a school which has at present 22 rooms catering to the need of the local people and adjoining companies.
- School is running on subsidized Fee basis to all the students, however free quality education is provided to local students.
- Text books are also provided free of cost to the students once in a year.
- School bus is provided to local students on free of cost basis to attend school.

ii) Employment and other Benefits-

- Company has provided employment to 185 local tribal people, out of these 90 employees are from Lumshnong village. Employment will increase many fold for local people with the upcoming of SCML.
- Considerable increase in supply of Coal, Sand, Bamboo etc. to the plant for their regular consumption, again a good source of a regular income to the local people under "Indirect Employment Move". More than 20 Local Coal Depots are engaged in supplying the coal with the movement of more than 20 trucks daily.
- 20 shops are allotted to locals inside the factory premises.

iii) Special Subsidies/ donations-

- Donation of "Cement and Cash Fund" is given to various Institutions for encouraging sports, vocations, Beauty Contests etc**.**
- Company is paying Rs.50, 000 per month to Christian Upper Primary School Lumshnong to ensure the smooth running of school and to provide Quality Education to Local students.
- Company has donated in various activities approximately Rs. 25 lakhs in the year 2008-09, which is higher than all the previous years.
- CMCL is paying @ Rs.0.50 per tonne of limestone consumed from our own Quarry for cement manufacturing. Thus CMCL is paying more than Rs.3.75 lakhs per year to Lumshnong village Trust for the development of village.

iv) Cultural Activities-

- Company organizes/ participates in various cultural activities e.g. Celebration of various festivals as per local/ regional traditions.
- CMCL has constructed: Church Tower Bell" in Lumshnong village by spending Rs.8 lakhs.

vi) Employee Development Programme –

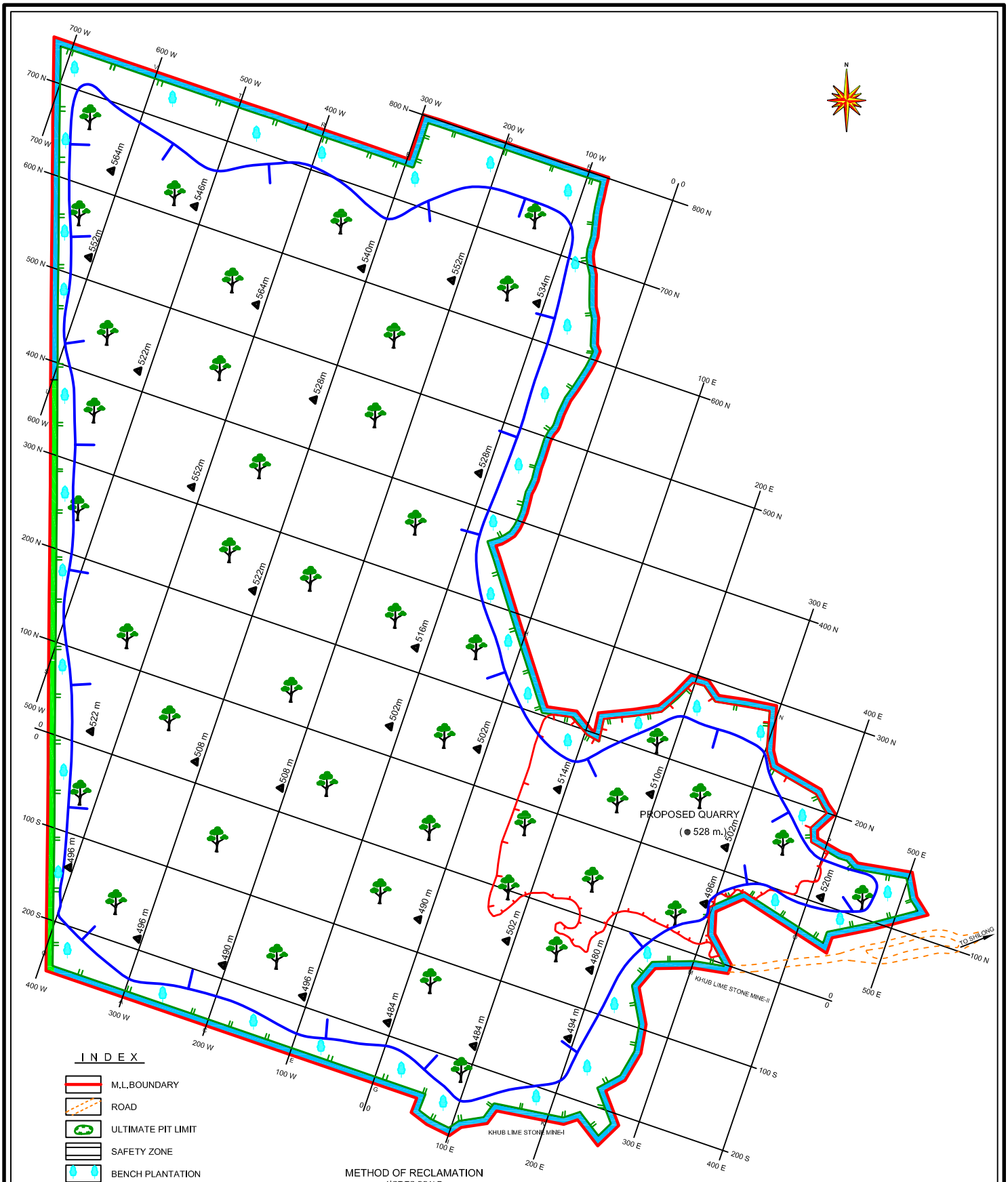
- Company is focusing Specially on Local Employees under Employees Development Programme by imparting the training for upgrading their Basic Skills and Technical Competence. This will lead to good Evolution in local employees to enable them to improve their work performance and deciding the career path.

Additional facilities to be extended for the benefit of the local people as per the agreement made between CMCL and village council of Lumshnong.

- Medical camps to local people will be held thrice in a year with free medicine to patients Rs.18,000/- per annum will be paid to village council for maintenance of LP school Lumshnong Rs.30,000/- per month will be paid to village council for running and maintenance of high school in Lumshnong village

.

- The amount of Rs 0.50 per tonne on limestone supplied to the plant from captive mines will increase with the increase in production capacity by expansion. An escalation clause in the agreement provides 50% increase after five years.



INDEX

- M.L.BOUNDARY
- ROAD
- ULTIMATE PIT LIMIT
- SAFETY ZONE
- BENCH PLANTATION
- BACK FILLING PLANTATION
- PROPOSED PLANTATION
- CONCEPTUAL PLANTATION
- ULTIMATE PIT BENCH LIMIT
- (● 528 m.) FLOOR RL (PROPOSED QUARRY)

METHOD OF RECLAMATION

NOT TO SCALE

A. RECLAMATION OF WORK OUT QUARRIES

Back filling of worked out quarries with wastes spreading of top soil plantation of trees / species based on soil characterstics.

LUMSHNONG LIMESTONE DEPOSIT

OVER AN AREA 70.00 HECTARES

IN JAINTIA HILLS DISTRICT, MEGHALAYA.

M/S C.M.C LTD.

RECLAMATION PLAN

Prepared by:- GEOMIN CONSULTANTS(P) LTD.

267, KHARAVELA NAGAR, BHUBANESWAR

0 40 80 120 M

FIG. NO -10.1

CHAPTER – 11

SUMMARY & CONCLUSION

- Mining Lease for the Lumshnong limestone project area over 70 ha. was granted by Meghalaya state Govt. vide letter number MG/54/2009/190 dated 22.12.2009 to M/s Cement Manufacturing Company Limited which is a private limited company
- The project area is of private land category. No forest area involved.The mine will be in operation as per approved mining plan. Mining plan for the period 2010-11 to 2014-15 was approved by IBM, Govt. of India vide letter No 314(3)/ 2010-MCCM(CZ)/MP-37 dated 10.06.2011. This TOR presentation is for production capacity upto a maximum of 9,00,450 MT as per the mining plan.
- This is a new mining proposal.The Limestone from the mines shall be utilised in the cement plant of the company. **C**ement Manufacturing Company Ltd (CMCL) an ISO9001:2000 certified company was incorporated as a Public Limited Company on 2nd November 2001 with Registered office and works at Lumshnong, Jaintia Hills district, Meghalaya. CMCL was granted licence for setting up a 900 TPD cement plant at Lumshnong village, Jaintia Hills district Meghalaya by the Govt. of Meghalaya in the year 2002 and subsequently was granted for expanding the capacity in two stages to 2400 TPD . The second expansion to 2400 TPD was granted in the year 2010.
- The company commissioned the 900 TPD cement plant at Lumshnong village in Jaintia Hills district of Meghalaya State in 2004. The cement plant expanded it's capacity from 900TPD to 1800TPD clinker production and 2nd phase expansion from 1800 TPD to 2400 TPD was completed in 2010.
- .This is a new mining proposal. The lease area is located in Toposheet No 83C/W ($25^0$10'05" to $25^0$10'32"N and $92^0$21'46.4" to $92^0$22'25.6"E) in Lumshnong village of Jaintia Hills District of Meghalaya. The RML area is a hilly terrain with elevation varying between 498 to 630 m AMSL. There is a perennial Nalla passing at 0.7 kms from the lease & drainage of the area is controlled by this nala. There is no wild life sanctuary, national park within 10kms radius of the area
- EIA/ EMP is prepared as per the approved mining plan of IBM. Opencast mechanised method shall be adopted for mining.
- Required machineries are wagon drills, Hydraulic Excavators, Rear dumping tippers, water sprinkler, , compressor, dozer, explosive Van,, jeep etc.
- Height and width of the mine benches would be 6 to 8 meters and 15 meters respectively.
- Slope of the benches will be 75^0 to 80^0 where as overall slope of the pit will be 45^0.
- .Keeping the above production, the life of the mine will be 66 years, including 5 years of plan period and 61 years of beyond plan period.
- The capital cost of the project is Rs 6.65 crores.
- Total 75 Cum water will be required per day will be met from plant supply.
- The depth of working of mine will not intersect the ground water table.

- Total proposed employment potential shall be 137 for proposed project.
- The average annual rainfall at Lumshnong is 5578 mm.as per records maintained by CMCL during the period 2003 to 2010.
- The temperature ranged from 14.6^0C to 29.0^0C while the relative humidity varied from 65.0% to 95.0% during summer season.
- The predominant wind direction is from SE-SW.
- The observed ambient air quality, water quality and noise level of the area are within the prescribed limits.
- The annual ground water recharge shall be 16.8 Ham.
- The depth to water level in summer ranges from 200m to 205m in lease area and 200m in village site.
- The commonly seen flora species are of Momosaceae, Lauraceae, Conbretaceae family.
- The recorded fauna species are common reptiles, birds, amphibians, insects and few mammals such as Bamboo Rat, Squirrel, Otter, House rat, .Monkey.
- Proper control measures shall be taken for the anticipated deterioration including afforestation.
- No pollution of ground water is anticipated due to the proposed mining activity.
- Due to mining the socio-economic, health, employment, education and communication of the area will improve.
- An existing monitoring cell will be strenthened to monitor the environmental parameters and implement the proposed control measures.
- Regular health camp shall be organized which will be able to create awareness of environmental impacts on health.
- Total Rs.7 lakhs will be incurred towards recurring expenditure monitovested as environmental measures.
- The precautionary measures shall be taken to mitigate any risk and disaster during accident due to fall of sides, open cast bench slope failure and accident due to machinery.

CHAPTER – 12

BRIEF RESUME AND NATURE OF CONSULTANCY

12.1 ORGANISATION

Geomin Consultants (P) Ltd. is registered in 1990 under Companies Act and is having registered office at Bhubaneswar, Orissa. The company, a pioneer consultancy house in Eastern India is engaged for various activities related to mining, geology, geoengineering, geohydrology environmental engineering and other engineering project. The company has also undertaken studies on socio-economic survey, flora & fauna survey, river dynamics & siltation process and forestry. Geomin has also extended its activities related to various irrigation and power projects. Though the company is located in Orissa, it's activities have spread in the states like Uttranchal, Assam, Bihar, Chhatisgarh, Gujrat, Jharkhand, Madhya Pradesh, Maharastra, Meghalaya, Nagaland and Sikkim. The company also worked as the supporting organisation for undertaking exploration for gold, diamond, precious and semi-precious stones on behalf of Empire Gold mine NL., Australia, Australian Kimberley Diamonds NL., Australia and Mackay and Schnellmann Pty. Limited, western Australia. Geomin has got the recognition from Indian Bureau of Mines (IBM) Govt. of India and also enlisted as approved consultant for Orissa. Within this span of time, the organisation has completed more than 250 mining plan and schemes, 64 environmental projects for mining and allied industries and more than 56 forestry projects. The growth rate of the company can be judged by the technical support for different clientele of prominence like IBM, TISCO, Larsen & Toubro, Indian Rayon & Industries Ltd., MESCO, FACOR, NALCO, INDAL, Aditya Aluminium Project, Jindal Strips Ltd., Usha Rectifier Corporation (India) Ltd., Orissa Minerals Development Company Ltd., Orissa Mining Corporation Ltd., Orissa Sponge Iron Ltd., Bhalotia Granite, Orissa Cement Ltd., Kalinga Power Corporation Ltd., Nagpur Alloys & Castings Ltd., Raipur Alloys & Steels Ltd., Bihar State Mineral Development Corporation, Pollution Control Board of Orissa, Irrigation Department, Govt. of Maharastra, The Maharashtra State Mining Corporation Ltd., Nagpur, Dept. of Power, Govt. of Nagaland, State Electricity Board, Meghalaya, Prakash Industries Ltd., New Delhi, Sterlite Industries (India) Ltd., Empire Gold Mine Nl., Australia, Australian Kimberley Diamonds Nl, Australia and Mackay and Schnellmann Pty. Limited, Western Australia. Geomin interacts with Ministry of Environment and Forests, Govt. of India, Dept. of Forest and Environment, Govt. of Orissa, Federation of Indian Mineral Industries (FIMI), Confederation Of Indian Industry, Australasian Institute Of Mining & Metallurgy, Australia.

Geomin has always put its vision on to be a premier environmental friendly project developer for mineral resources, industry, Infrastructure, Information Technology, Research and Development with Financial Services.

The mission of the group is to achieve excellence in providing services for customers' satisfaction with objectives of

- Creating a data base center
- Creating a research and development center
- Providing support for project development
- Creating a project engineering division for industrial and infrastructure projects
- Sustainable business development.
- Development of center for business process out sourcing and imparting training for skill development.

12.3 FIELD MONITORING AND LABORATORY FACILITIES

Monitoring of air, water, noise and soil quality is now a routine requirement for all kinds of projects. There has been a growing realization among the citizens that the deterioration of environment has harmful effects. Hence, to asses the existing environmental quality, the 'GEOMIN' is also engaged in field monitoring. The firm has the following instruments of different make.

12.3.1 **Instruments** (Used in Field Monitoring)

1. RDS (Respirable Dust Sampler)
2. HVS (High Volume Sampler)
3. Anemometer
4. Barometer
5. Wind vane
6. Hygrometer
7. Thermometer
8. Dust Sampling Kit
9. Noise Level Meter
10. Water Sampling Kit (Portable)
11. Soil augers

12.3.2 **Make** (Used in Field and Laboratory)

1. Envirotech Instruments Pvt. Ltd.
2. Vayubodhan Upkaran Pvt. Ltd.
3. Elico Pvt. Ltd.
4. Systronics
5. Lucid Laboratories Pvt. Ltd.
6. Bhanu Scientific Instruments Company

12.4 IMPACT ASSESSMENT FACILITIES

For the impact assessment, the persons are involved from several fields like, Geology, Chemistry, Mining Engineering and environmental Science.

12.4 EMPANELMENT

The company is empanelled in State Pollution Control Board, Orissa to carry out REIA/EMP studies for various developmental activities.

12.5 INVOLVED PERSONNELS

Person actively involved in the preparation of this report are as follows.

NAME	ASSOCIATION IN THE PROJECT	EXPERTISE
Dr. S.K. Sarangi	Managing Director of the company	M.Sc Ph.D (Geology) Approved co-ordinator for Mining O/C and U/G, Pelletisation
Dr. R.C. Mohanty	Project Co-ordinator, Project evaluation, Field Study and EIA and EMP preparation (Approved Co-Ordinator for Mining and Thermal Power)	Ph. D, (Geology) (Approved Co-Ordinator for Mining and Thermal Power)
Dr. S.K. Misra	Project Co-Coordinator, Project evaluation, Field Study and EIA and EMP preparation	Ph. D (Geology), (Approved Co-Ordinator for Mining, beneficiation and Thermal Power Plant)
Mr.Pradeepta Mohapatra	Geologist, Mining Plan Evaluation and Analysis	M.Sc., Geology, Approved expert for Geology and soil
Mr. D. Mishra	Assisting in EIA/EMP preparation	M.Sc, PGDEPCT (Approved expert for Ecology and Bio-Diversity)
Mr. R.R. Behera	Assisting in EIA/EMP preparation	M.Sc., Geology, Approved expert for Geology and soil
Dr. B.M. Faruque	Assisting in EIA/EMP preparation in Geology. Mining and Reclamation	M.Sc., Geology, PhD Approved expert for Geology and soil
Mr. R.N. Mahapatra	Assisting in EIA/EMP preparation in Geology and Mining	M.Sc., Geology, Approved expert for Geology and soil
Mr.B .P. Mishra	Assisting in EIA/EMP preparation in Geology and Mining	M.Sc., Geology, Approved expert for Geology and Soil
Mrs. Dr. N. Rath	Assisting in EIA/EMP preparation in Socio Economic study	M.Sc. (Sociology) PhD, Approved expert for SE
Mr. K.L. Narayana	Assisting in EIA/EMP preparation for Noise Level	M.Sc. (Physics), Approved expert for NV

Mr. N.K. Shukla	Assisting in EIA/EMP preparation for Hydrology, Geo-hydrology aspect	M.Sc., Geology, Approved expert for Hydrogeology
Dr. P.C. Rath	Assisting in EIA/EMP preparation for Water Pollution, Air, Occupational Health aspect	M.Sc (Chemistry, Ph.D(Approved expert for water Pollution)
Mr. P.K. Panda	Assisting in EIA/EMP preparation in solid waste management etc.	M. Tech (Chemical Engg. & Chemical Technology)
Mr. R.C. Parida	Assisting in EIA/EMP preparation for interpretation of satellite imagery and preparation of land use plan	B.E (Civil Engineering) Retired after serving in Government of Orissa in different capacities
Dr. Kailash Nath Sharma	Assisting in EIA/EMP preparation for Air Quality monitoring, Prediction, Water Pollution Control and Solid waste management System	M.Sc. Ph.D (Chemistry) expert in Air Quality, Water Pollution and Solid waste. Retd. From IMMT (CSIR), Bhubaneswar
Mr. Siddarth Parida	Assisting in preparation	M. Sc. (Bio Technology) Expert in water pollution and Solid Waste
Miss Sanmukta Sarangi	Data compilation, Assiting in Preparation of EIA report	B. Tech

'By Speed Post

No. J-11015/04/2011-IA.II(M)
Government of India
Ministry of Environment & Forests

ANNEXURE-I

Paryavaran Bhavan,
C.G.O. Complex, Lodi Road,
New Delhi-110003.
Telefax. 2436 2434

Dated the 28th March, 2011

To

M/s Cement Manufacturing Company Ltd.
281 Deepali, Pitampura,
New Delhi – 110 034.

Sub: Lumshnong Limestone Mine of M/s Cement Manufacturing Co. Ltd., village Lumshnong, District Jaintia Hills, Meghalaya – Prescribing of TOR - Regarding.

Reference is invited to your letter no. MoEF/IA/2010-11/1812 dated 18.12.2010 along with the application in the prescribed format (Form-I) and a copy of the pre-feasibility report to prescribe the TORs for undertaking detailed EIA study for the purpose of obtaining environmental clearance under the provisions of the EIA Notification, 2006 in respect of the above mentioned project.

2. The proposal is for opening of a new mine for production of 9,00,450 TPA of limestone for their captive use in their cement plant located at a distance of about 3.5 km. The mine lease area is 70 ha. No forestland is involved. A perennial nallah is reported at a distance of 0.7 km from the mine lease. No National Park / Sanctuary is reported within 10 km of the mine lease. Mine working will be opencast mechanised involving drilling and blasting. Life of mine is 6 years. The ultimate working depth will be 473 m AMSL. The groundwater table is reported to vary between 420 m AMSL to 425 m AMSL. Mine working will not intersect groundwater table. Water requirement is 75 kld, which will be met from surface water and 10 m^3 of treated water will be supplied from CMCL plant site.

3. Based on the information contained in the documents submitted and the presentation made before the Expert Appraisal Committee (EAC) for mining projects during its Meeting held on February 23-25, 2011, the following TORs are prescribed:-

1) A copy of the document in support of the fact that the proponent is the rightful lessee of the mine should be given.

2) All documents including approved mine plan, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology and

should be in the name of the lessee.

3) 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.

4) Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary and national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated.

5) Land use plan of the mine lease area should be prepared to encompass pre-operational, operational and post operational phases and submitted.

6) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, 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, if any, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above should be obtained from the State Wildlife Department/ Chief Wildlife Warden under the Wildlife (Protection) Act, 1972 and copy furnished.

7) A detailed biological study for the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, duly authenticated, separately for core and buffer zone should be furnished based on field survey clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

8) Impact of change of land use should be given.

9) R&R plan / compensation details for the project affected people should be furnished. While preparing the R&R plan, the National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs / STs and other weaker sections, need based sample survey, family-wise, should be undertaken to assess their requirement and action programmes prepared accordingly integrating the sectoral programme of line departments of the State Government.

10) One season (non-monsoon) primary baseline data on ambient air quality (PM_{10}, SO_2 and NOx), water quality, noise level, soil and flora and fauna shall be collected and the AAQ data so collected presented date-wise in the EIA and EMP report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be justified. 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 PM_{10} particularly for free silica should be given.

11) 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.

12) The water requirement for the project, its availability and source to be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should be indicated.

13) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided.

14) Details of water conservation measures proposed to be adopted in the project should be given.

15) 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.

16) Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed hydro geological study should be undertaken and report furnished. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.

17) Details of first order stream, if any passing through lease area and modification/ diversion proposed, if any and the impact of the same on the hydrology should be brought out.

18) Details of rainwater harvesting proposed, if any, in the project should be provided.

19) 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.

20) Quantity of solid waste generation to be estimated and details for its disposal and management should be provided. The quality, volumes and methodology planned for removal and utilisation (preferably concurrently) of top soil should be indicated. Details of backfilling proposed, if any, should also be given. It may be clearly indicated that out of the total waste generated during the mine life, how much quantity would be backfilled and how much quantity would be disposed off in the form of external dump (number of dumps, their height, terraces etc. to be brought out).

21) The reclamation plan, post mine land use and progressive greenbelt development plan shall be prepared in tabular form (prescribed format) and submitted.

22) 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 increased load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered.

23) The use of conveyor for transport of mineral from mine to the cement plant should be examined and details furnished.

24) Details of the infrastructure facilities to be provided for the mine workers should be included in the EIA report.

25) Conceptual post mining land use and Reclamation and Rehabilitation of mined out area (with plans and with adequate number of sections) should be given in the EIA report.

26) Phase-wise plan of greenbelt development, plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted.

27) Occupational health impact of project should be anticipated and preventive measures initiated. Details in this regard should be provided. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP.

28) Measures of socio economic significance and influence to the local community proposed to be provided by project proponent should be indicated. As far as possible, quantitative dimensions may be given with time frame for implementation.

29) Detailed environmental management plan to mitigate the environmental impacts which, should inter-alia also include the impact due to change of land use, due to loss of agricultural land and grazing land, if any, occupational health impacts besides other impacts of the projects.

30) Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same should be provided.

31) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given.

32) The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.

4. Besides the above, the below mentioned general points should also be followed:-

a) A note confirming compliance of the TOR, with cross referencing of the relevant sections / pages of the EIA report should be provided.

b) All documents may be properly referenced with index, page numbers and continuous page numbering.

c) Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.

d) Where the documents provided are in a language other than English, an English translation should be provided.

e) The Questionnaire for environmental appraisal of mining projects as prescribed by the Ministry shall also be filled and submitted.

f) Approved mine plan along with copy of the approval letter for the proposed capacity should also be submitted.

g) While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry should also be followed.

5. 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.

6. The prescribed TORs would be valid for a period of two years for submission of the EIA/EMP reports, as per the O.M. No. J-11013/41/2006-IA.II(I) dated 22.3.2010.

7. After preparing the draft EIA (as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006) covering the above mentioned issues, the proponent will get the public hearing conducted and take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.

(Dr. S.K. Aggarwal)
Director

Copy to:-

1. The Secretary, Department of Environment, Government of Meghalaya, Secretariat, Secretariat, Shillong.
2. The Chairman, Meghalaya State Pollution Control Board, Arden, Lumpyngngad, Shillong - 793014
3. The Chief Conservator of Forests, Ministry of Environment and Forests, Regional Office (NEZ), Upland Road, Laitumkhrah, Shillong – 793 003
4. Guard File.

(Dr. S.K. Aggarwal)
Director

POINTWISE COMPLIACE TO THE TOR ISSUED BY MINISTRY OF ENVIRONMENT AND FORESTS, GOVT. OF INDIA VIDE LETTER NO. J-11015/04/2011-IA.II(M) DATE 28.03.2011

1) A copy of the document in support of the fact that the proponent is the rightful lessee of the mine should be given.

Grant order is`enclosed as Annexure-3

2) All documents including approved mine plan, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology and should be in the name of the lessee.

The EIA/EMP is prepared as per the approved mining plan and all document is in the name of CMCL.

3) 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.

The total lease area is considered as core zone and the 10 Km radious around the core zone is considered as buffer zone. The total waste generation is calculated as per the life of the mine.

(Refer para 4.0 chapter para 10.2 Tabla 10.1 of Chapter 10 of EIA/EMP report)

4) Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary and national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated.
The present land use pattern is as follows.

Lumshnong M.L area over 70.00 hectares is coming under non-forest land i.e. Agricultural land & waste land etc. There is no wild life sanctuary, National park, human settlement in the core zone.

Land use pattern as per the land schedule is as follows.

Classification of land	**Village/ District**	**Total area in Hects.**
Total Private Land (non-forest)	Lumshnong/Jaintia hills	70.00 • Agricultural land – 46.809 • Waste land – 23.191

(Ref. and para 4.8 chapter 4 of EIA/EMP report.).

5) Land use plan of the mine lease area should be prepared to encompass pre-operational, operational and post operational phases and submitted.

Land use pattern as per the land schedule is as follows.

Classification of land	Village/District	Total area in Hects.
Total Private Land (non-forest)	Lumshnong/Jaintia hills	70.00 • Agricultural land – 46.809 • Waste land – 23.191

Proposed landuse pattern (Operational)

				Proposed Land Pattern (Area in Ha.)
Sl. No.	**Features**	**Planned period**	**Beyond planned period**	**Total**
1	Mining	8.64	47.13	55.77
2	Over Burden Dump to be used for mining	2.25	----	2.25
3	Infrastructure (workshop, admn. Building etc.)	0.02	---	0.02
4	Roads	0.2	---	0.2
5	Magazine	---	---	---
6	Green Belt	10.0	1.56	11.76
	Total	**21.11**	**48.69**	**70.00**

Post-operational Land use

					Area in Ha.
Land use	**Plantation**	**Water Body**	**Public Use**	**Undisturbed**	**Total**
Mining	58.02	--	--	--	58.02
Road and Infrastructure	0.22	--	--	--	0.22
Green Belt	11.76	--	--	--	11.76
Total	**70.00**	**--**	**--**	**--**	**70.00**

(Ref. Table 4.12 para 4.8 chapter 4 and Para Table 10.2 &10.3 & para 10.2 chapter 10 of of EIA/EMP report.).

6) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, 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, if any, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above should be obtained from the State Wildlife Department/ Chief Wildlife Warden under the Wildlife (Protection) Act, 1972 and copy furnished.

There is no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Tiger/Elephant Reserves (existing as well as proposed) within 10 km of the mine lease.

(Ref.para 4.9 chapter 4 of EIA/EMP report.).

7) A detailed biological study for the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, duly authenticated, separately for core and buffer zone should be furnished based on field survey clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

Details have been given in Para 4.9 of Chapteer 4 of EIA/EMP report. Only few Schedule-I fauna found in buffer zone of the lease area. Lessee shall follow all necessary conservation plan to be proposed by state Forest Dept.

(Ref. and para 4.9 chapter 4 of EIA/EMP report.).

8) Impact of change of land use should be given.

The project area, which is classified as non- forestland, has got sparse vegetation. The area is devoid of irrigation facility so agricultural yield is very less in percentage. A good number of people is depending on other jobs.The proposed land use pattern is as follows.

Proposed Core Zone Land Use Pattern

		Proposed Land Pattern (Area in Ha.)		
Sl. No.	**Features**	**Planned period**	**Beyond planned period**	**Total**
1	Mining	8.64	47.13	55.77
2	Over Burden Dump to be used for mining)	2.25	----	2.25
3	Infrastructure (workshop, admn. Building etc.)	0.02	---	0.02
4	Roads	0.2	---	0.2
5	Magazine	---	---	---
6	Green Belt	10.0	1.56	11.76
	Total	**21.11**	**48.69**	**70.00**

(Ref. and para 5.2 Table 5.1, chapter 5 of EIA/EMP report.).

9) R&R plan/compensation details for the project affected people should be furnished. While preparing the R&R plan, the National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs/STs and other weaker sections, need based sample survey, family-wise, should be undertaken to assess their requirement and action programmes prepared accordingly integrating the sectoral programme of line departments of the State Government.

There is no homestead land in the mine lease area or having any people living in the lease area, so there is no need of R& R for this project.

(Ref. para 7.3.3 chapter 7 of EIA/EMP report.).

10) One season (non-monsoon) primary baseline data on ambient air quality (PM_{10}, SO_2 and NOx), water quality, noise level, soil and flora and fauna shall be collected and the AAQ data so collected presented date-wise in the EIA and EMP report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be justified. 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 PM_{10} particularly for free silica should be given.

An attempt has been made to assess the existing environmental scenario through generation of different data in the study area. Different environmental parameters required to evaluate the prevailing scenario have been generated / collected and compiled for the period from March 2011 to May 2011.

(Ref. Para 4.3 chapter 4 of EIA/EMP report)

11) Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modeling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.

The emission sources include excavation and mining of ore bodies, drilling, blasting, screening/sizing and transportation within the project area. During air quality monitoring it is observed that dust generation is of short term and settle quickly within close ranges. There is very less scope of spreading of dust particles to the near by residential areas as these operations are carried out at far off distances from the habitational areas. Hence, human population is not directly affected by the air pollution as the impact of dust generation. It is found that the dust nuisance is not a problem due to deployment of water tankers with sprinklers and keep the haulage road surface wet resulting suppressed dust particles. It is also observed that the dust nuisance is localized i.e. within the project area only.

Negligible amount of auto exhaust emissions also expected to found in the core zone because of vehicular activities arising due to transportation of ores and waste by dumpers and excavators. However, there will be very little impact on air quality due to automobiles.

Air quality modelling is carried out for prediction of impact of the project on the air quality of the area. The impact of movement of vehicles for transportation of mineral is considered. "Breeze Aeromod" software is used for prediction of air. As per the modeling 15.7 microgram of PM may increase and after the increament the resultant value will be 64.6 microgram per cubicmeter, which will be within the prescribed limit.

(Ref. para 5.3 chapter 5 of EIA/EMP report.).

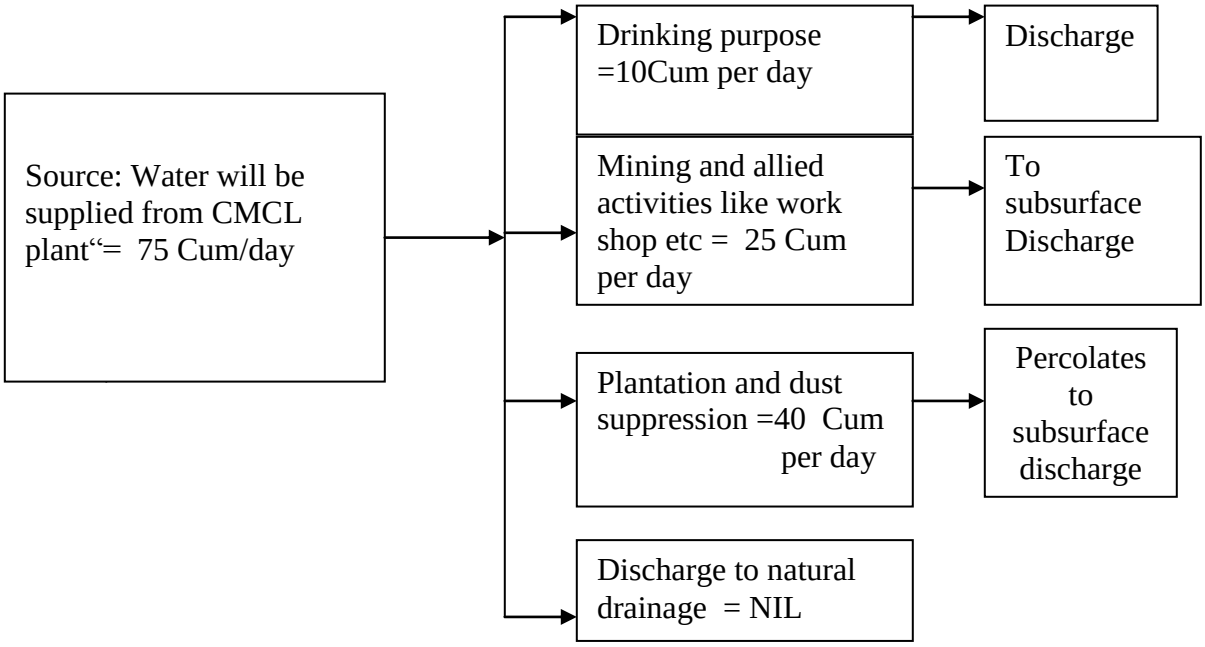
12) The water requirement for the project, its availability and source to be furnished. A detailed water balance should also be provided. Fresh water requirement for the project should be indicated.

As we are taking a very less amount of water from the CMCL plant site which has been accoded permission for drawl of water from local perennial Nallas, So a very negligible effect upon it will come. The outside seasonal nalas will be protected by barrier by rocks and dump area will be kept away from it. Steps will be taken so that the various channels which are connecting the seasonal nala will not be hampered by mining activities. The seasonal nala is only flodded with rain water in rainy season. Rest of the year it is dry.

The exploitation of ground water for irrigation and other purposes is minimum in the buffer zone surrounding the mine lease area.. Ultimate working depth of the mine will be 480m AMSL where as ground water table is at 420m AMSL (in summer) and 425m AMSL (in rainy season). Hence mining will not touch ground water table.

It is further noted that, due to excavation of hard rock the filtration rate will increase. So, due to mining the ground water recharge will increase as requirement of water is very small in comparison to the availability and ground water recharge. Hence, ground water impact will be marginal.

WATER BALANCE



(Ref. and para 5.4 chapter 5 of EIA/EMP report.).

13) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the project should be provided.

Necessary clearance for drawl of surface water course is under process, shall be obtained before initiation of mining opration.

(Ref. and para 5.4 chapter 5 of EIA/EMP report.).

14) Details of water conservation measures proposed to be adopted in the project should be given.

The steps taken for water pollution control are as under,

- **No overburden or loose sediments will be kept in the working benches particularly during monsoon months.**
- **Check dam will be provided around the overburden dumpsites to arrest flow of loose sediments before discharge into the drainage system of the region.**
- **Peripheral drain proposed to arrest the inflow of run-off water to the active mining area.**
- **The possibility of the project activity contributing to the pollution of watercourses of the region or to the ground water regime is so less that this does not significantly constitute an area of concern.**

- **A rain water harvesting pond will built up in lower part of the proposed site, by which natural surface rain water will automatically come to the pond. The roof top of each unit will be connected to the pond by pipes and drains.. The rain water harvesting pond will be in the size to carry minimum 5 days of heavy rain fall in the tank.these water passes through the ETP for treatment and then it will be used The rain waters will be used for fire fighting, gardening and plantation etc.**

(Ref. and para 10.3 chapter 10 of EIA/EMP report.).

15) Impact of the project on the water quality both surface and groundwater should be assessed and necessary safeguard measures, if any required should be provided.

The mining operation will require very less amount of water from the perennial Umlunar river, so a very negligible effect upon it will come. The outside seasonal nalas will be protected by barrier by rocks and dump area will be kept away from it. Steps will be taken for the various channels which are connecting the seasonal nala will not be hampered by mining activities. The seasonal nala is only flodded with rain water during rains. Rest of the period it is dry.

The exploitation of ground water for irrigation and other purposes is minimum in the buffer zone surrounding the mine lease area. Ultimate working depth of the mine will be 480m AMSL where as ground water table is at 420m AMSL (in summer) and 425m AMSL (in rainy season). Hence mining will not touch ground water table.

(Ref. and para 5.4 chapter 5 of EIA/EMP report.).

16) Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed hydro geological study should be undertaken and report furnished. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.

The exploitation of ground water for irrigation and other purposes is minimum in the buffer zone surrounding the mine lease area as the area falls in the nonforest category with sparsely populated. Ultimate working depth of the mine will be 480m AMSL where as ground water table is at 420m AMSL (in summer) and 425m AMSL (in rainy season). Hence mining will not touch ground water table.

(Ref. and para 5.4 chapter 5 of EIA/EMP report.).

17) Details of first order stream, if any passing through lease area and modification/ diversion proposed, if any and the impact of the same on the hydrology should be brought out.

No first order or second order stream is passing through the lease.

(Ref. and para 2.2 chapter 2 of EIA/EMP report.).

18) Details of rainwater harvesting proposed, if any, in the project should be provided.

A rain water harvesting pond will built up in lower part of the proposed site, by which natural surface rain water will automatically come to the pond. The roof top of each unit will be connected to the pond by pipes and drains. The rain water harvesting pond will be in the size to carry minimum 5 days of heavy rain fall in the tank , this water passes through the ETP for treatment and then it will be used. The rain waters will be used for fire fighting, gardening and plantation etc.

(Ref. para 10.3 chapter 10 of EIA/EMP report.).

19) Information on site elevation, working depth, groundwater table etc. should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.

The surface level of the mining lease area is between 498m AMSL to 630m AMSL. Ultimate working depth of the mine will be 480m AMSL where as ground water table is at 420m AMSL (in summer) and 425m AMSL (in rainy season). Hence mining will not touch ground water table.

(Ref. Fig No 5,3 and para 5.4 of chapter 5 of EIA/EMP report.).

21) Quantity of solid waste generation to be estimated and details for its disposal and management should be provided. The quality, volumes and methodology planned for removal and utilisation (preferably concurrently) of top soil should be indicated. Details of backfilling proposed, if any, should also be given. It may be clearly indicated that out of the total waste generated during the mine life, how much quantity would be backfilled and how much quantity would be disposed off in the form of external dump (number of dumps, their height, terraces etc. to be brought out).

About 3.645 million cum of overburden shall be generated from the mining operation. After the mining operation the full area of the mining will be reclaimed with plantation.

(Refere para10.2 Table 10.1 chapter 10 of EIA/EMP report).

22) The reclamation plan, post mine land use and progressive greenbelt development plan shall be prepared in tabular form (prescribed format) and submitted.

Post-operational Land use (Post Mine Land Use)

					Area in Ha.
Land use	**Plantation**	**Water Body**	**Public Use**	**Undisturbed**	**Total**
Mining	58.02	--	--	--	58.02
Road and Infrastructure	0.22	--	--	--	0.22
Green Belt	11.76	--	--	--	11.76
Total	**70.00**	**--**	**--**	**--**	**70.00**

The stage wise cumulative plantation is as follows.

Stage Wise Cumulative Plantation (Progressive Greenbelt development)

REQUIREMENT OF PLANTS FOR AFFORESTATION / RECLAMATION										
Year	**Un-worked Area**		**Out Side Dump**		**Dump Area**		**Top Soil Dump**		**Total**	
	Area (Ha)	**Trees**	**Area (Ha)**	**Trees**	**Area (Ha)**	**Trees**	**Area (Ha)**	**Trees**	**Area (Ha)**	**Tree**
1st	2.0	3200	--	--	--	--	--	--	2.0	3200
2nd	4.0	6400	--	--	--	--	--	--	4.0	6400
3rd	6.0	9600	--	--	--	--	--	--	6.0	9600
4th	8.0	12800	--	--	--	--	--	--	8.0	12800
5th	10.0	16000	--	--	--	--	--	--	10.0	16000
Ultimate	11.76	18816	58.24	93184	--	--	--	--	70.00	112000

(Ref. para 10.2 chapter 10 of of EIA/EMP report.).

23) 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 increased load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered.

The transportation shall be carried out from lease to plant site which is situated within 4 kms. The road from National highway to plant is existing and mining lease area to National Highway will be developed. Only 1.5 Kms of existing NH shall be used for the transportation purpose. So existing road is not required to expand due to this project.

By increment in production almost 3000 TPD of limestone will be produced. Approximately 150 numbers of vehicles during two shifts (16 Hours) will be

added to the traffic density of the area. Steps will be taken to care by providing peripheral development trough district authority and the govt. agencies for road repairing/ maintenance. Awareness campaign among dumper /truck drivers will be generated for clearance of road and lower down the pollution load due to transportation.

(Refer para 5.6 Chaper 5 of EIA/EMP report

24) The use of conveyor for transport of mineral from mine to the cement plant should be examined and details furnished.

As per the suggestion of EAC, (Mining) coveyor option has been worked out. However, because of the tarrain and the need for crossing NH it is not found to be feasible. However in future if further expansion of cement plant takes place conveyor transportation option shall be looked into.

(Refer para 2.8 Chapter 2 of EIA/EMP report)

25) Details of the infrastructure facilities to be provided for the mine workers should be included in the EIA report.

The workers in the mines will be provided rest shed, first aid centre, ambulance facility. Besides this all infrastructural facility available in the plant of CMCL will be made available to the employees. The hazardous protecting equipment also will be provided to the employees such as helmet, ear muff , mask etc.

(Ref. para 2.8 chapter 2 of of EIA/EMP report).

26) Conceptual post mining land use and Reclamation and Rehabilitation of mined out area (with plans and with adequate number of sections) should be given in the EIA report.

Concetual post mining land use of the area has been so planned that the total area will be reclaimed and plantaion over the area shall be done.

(Refere figure no. 10.1 and para 10.2 Chapter10 of EIA EMP report).

27) Phase-wise plan of greenbelt development, plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted.

Detail of greenbelt development has been described in the EIA report.

(Ref. Table 10.2, 10.3 & 10.4 para 10.2 in chapter 10 of of EIA/EMP report.).

28) Occupational health impact of project should be anticipated and preventive measures initiated. Details in this regard should be provided. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP.

Details have been discussed in the EMP.

(Ref. para 10.7 chapter 10 of EIA/EMP report.).

29) Measures of socio- economic significance and influence to the local community proposed to be provided by project proponent should be indicated. As far as possible, quantitative dimensions may be given with time frame for implementation.

The proposed mine is a captive source of limestone to the plant of CMCL. Due to the operation of the plant the positive impact of the activity already reflected in the area and it will continue further due the proposed mining project.
(Ref. para 7.4 chapter 7 of EIA/EMP report.).

30) Detailed environmental management plan to mitigate the environmental impacts which, should inter-alia also include the impact due to change of land use, due to loss of agricultural land and grazing land, if any, occupational health impacts besides other impacts of the projects.

Environmental management plan in details discussed in EIA/EMP report

(Ref. Chapter 10 of EIA/EMP report.).

31) Public hearing points raised and commitment of the project proponent on the same along with time bound action plan to implement the same should be provided.

Public hearing is yet to be done. Will be incorporated after public hearing

(Ref. para 7.1 chapter 7 of EIA/EMP report.).

32) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the project should be given.

No litigation or court cases are pending against the project.
(Ref. para 2.11 chapter 2 of EIA/EMP report.)

33) The cost of the project (capital cost and recurring cost) as well as the cost towards implementation of EMP should clearly be spelt out.

The cost of the project is 6.65 crores
(Ref. para 2.9 chapter 2 of EIA/EMP report.)

Annexure-2

SOCIO-ECONOMIC DEMOGRAPHIC PROFILE

NAME	TRU	No.HH	TOT.P	TOT.M	TOT.F	P.SC	M.SC	F.SC	P.ST	M.ST	F.ST	P.LIT	M.LIT	F.LIT	P.ILL	M.ILL	F.ILL	Tot-Worker	Male Worker
Wahiajer	Rural	741	4295	2088	2207	0	0	0	4278	2080	2198	1680	738	942	2615	1350	1265	1764	984
Nongsning	Rural	65	365	185	180	0	0	0	344	172	172	121	61	60	244	124	120	163	102
Mynkre	Rural	64	293	148	145	0	0	0	219	96	123	53	28	25	240	120	120	174	102
Shiehruphi	Rural	73	416	211	205	0	0	0	416	211	205	154	86	68	262	125	137	123	80
Musniang Lamare (New)	Rural	30	173	90	83	0	0	0	173	90	83	35	19	16	138	71	67	118	64
Umrasong	Rural	15	82	51	31	0	0	0	82	51	31	14	5	9	68	46	22	41	26
Thangskai	Rural	57	342	178	164	0	0	0	338	174	164	175	99	76	167	79	88	109	72
Wahiajer	Rural	89	442	235	207	0	0	0	438	231	207	226	129	97	216	106	110	203	135
Lumshnong	Rural	231	1250	643	607	0	0	0	1230	632	598	588	303	285	662	340	322	617	313
Umlong	Rural	52	260	138	122	0	0	0	260	138	122	73	39	34	187	99	88	116	62
Umlatdoh	Rural	45	313	181	132	0	0	0	313	181	132	141	82	59	172	99	73	157	96
Umlaper	Rural	7	24	10	14	0	0	0	24	10	14	2	1	1	22	9	13	12	8
Tongseng	Rural	65	402	201	201	0	0	0	361	165	196	136	70	66	266	131	135	221	122
Lumtongseng	Rural	18	68	34	34	0	0	0	67	33	34	11	4	7	57	30	27	34	16
Shymplong	Rural	36	214	99	115	0	0	0	214	99	115	27	13	14	187	86	101	146	69
Sialkan	Rural	6	28	13	15	0	0	0	28	13	15	15	7	8	13	6	7	7	4
		1594	**8967**	**4505**	**4462**	**0**	**0**	**0**	**8785**	**8785**	**4409**	**3451**	**1684**	**1767**	**5516**	**2821**	**2695**	**4005**	**2255**

N.B:

No.HH - No. of Household
TOT.P - Total Population
TOT.M - Total Male
TOT.F - Total Female
P.SC - Population Schedule Caste
M.SC - Male Schedule Caste
F.SC - Female Schedule Caste
P.ST - Population Schedule Tribe
M.ST - Male Schedule Tribe
F.ST - Female Schedule Tribe

P.LIT - Population Literate
M.LIT - Male Literate
F.LIT - Female Literate
P.ILL - Populaiton Iliterate
M.ILL - Male Iliterate
F.ILL - Female Iliterate

GOVERNMENT OF MEGHALAYA
MINING AND GEOLOGY DEPARTMENT

ANNEXURE-3

***

NO.MG.54/2009/190 Dated Shillong, the 22nd December, 2009.

From : Shri.C.K.Marak,
Under Secretary to the Govt. of Meghalaya,
Mining and Geology Department.

To : The Director,
Cement Manufacturing Company Limited
Lumshnong Village,
P.O.Khliehriat,
Jaintia Hills District.

Sub : Grant of Mining Lease for Limestone over an area of 70 hectares at Lumshnong Village, Jaintia Hills District to M/S Cement Manufacturing Company Limited.

Sir,

I am directed to refer to your application No.CMCL/ML-70Ha/KLM-III/2008, dated 24.06.2008 and to convey the decision of the Government to the grant of Mining Lease for Limestone over an area of 70 hectares at Lumshnong Village, Jaintia Hills District, for a period of 30 (thirty) years under Rule 22(4)of Mineral Concession Rules, 1960, subject to the following conditions :-

1. Submission of Mining Plan duly approved by the Indian Bureau of Mines.
2. Certificate of consent to Establish and Operate from Meghalaya State Pollution Control Board.
3. Forest Clearance under Forest Conservation Act, 1980.
4. Revenue Clearance for land transfer from Revenue and Disaster Management Department.
5. Environment Clearance and EIA/EMP Clearance from the Competent Authority.
6. Financial assurance under MCDR, 1988.
7. Other material/particulars that may be required.

This has the approval of the competent Authority.

Yours faithfully,

(C.K.Marak)
Under Secretary to the Govt. of Meghalaya.
Mining and Geology Department

Memo No.MG.54/2009/190-A Dated Shillong, the 22nd November, 2009.

Copy to the:-

1. Director of Mineral Resources, Meghalaya, Shillong with reference to letter No.DMR/MM/699/2009/2026 dated 22.10.2009.
2. The Deputy Commissioner, Jaintia Hills District, Jowai with reference to letter No.REV/Min-23/2008/200 dated 14.05.2009.
3. The Chairman, Meghalaya State Pollution Control Board, "ARDEN" Lumpyngngad, Shillong – 793014.

By Order Etc.,
Sd/-
Under Secretary to the Govt. of Meghalaya,
Mining and Geology Department