

A

REPORT ON

BASELINE ENVIRONMENT DATA

&

ENVIRONMENT MANAGEMENT PLAN

FOR

M/s MARTHOMA GRANITES

QUARRY PROJECT AT

ALAKKODU VILLAGE, IDUKKI, KERALA

1. INTRODUCTION

The Building Stone Mining project (Minor Mineral) of M/s Marthoma Granites is situated at Survey No. 8/9, Alakkodu Village, Edavetty Panchayat, Thodupuzha Taluk, Idukki District, Kerala for an area of 7.4590 hectares.

The first step in the identification of impact assessment of a development project is the assessment of existing environment. The Environment Management Plan (EMP) is a site specific plan developed to ensure that the project is implemented in an environmentally sustainable manner and to understand the potential environmental risks arising from the proposed project and take appropriate actions to minimize those risks. EMP also ensures that the project implementation is carried out in accordance with the planned design and by taking appropriate mitigative actions to reduce adverse environmental impacts during the project's life cycle.

2. AREAS FOR IDENTIFICATION OF ENVIRONMENTAL ASPECTS AND IMPACTS

The environmental parameters likely to be affected by mining are related to many factors, i.e. physical, social, economic, agriculture. Opencast mining involves drilling, blasting, loading and transport of the mineral, stacking of topsoil & overburden. The excavated mineral will be crushed in a crusher and the final product from the crusher will be transported via trucks to the end user. The operations may disturb environment of the area in various ways, such as removal of mass, change of landscape, flora and fauna of the area, surface drainage, and change in air, water and soil quality. While for the purpose of development and economic up-liftment of people, there is need for establishment of mining industries, but these should be environment friendly. Therefore, it is essential to assess the impacts of mining on different environmental parameters, before starting the mining operations, so that abatement measures could be planned in advance for eco-friendly mining in the area.

BASELINE ENVIRONMENT DATA

The areas of environmental concerns for which the impacts and their predictions are taken into consideration are :-

- Air Environment
- Water Environment
- Noise Environment
- Land Environment
- Biological Environment
- Socio-Economic Environment

The baseline environmental status of the different environments mentioned above is assessed through primary data collection, field monitoring through NABL accredited laboratory and from secondary sources. The baseline environment status for different environments is given below:

✓ **AIR ENVIRONMENT**

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

METEOROLOGICAL PARAMETERS

The ambient air quality of an area has bearing on meteorological parameters of the area. Based on the Climate Zone Map of India by Bureau of Energy Efficiency (BEE), of district experiences warm humid type of climate. Further, the climatological data was referred from the nearest IMD Station and from CGWB district information booklet.

The district receives an average annual rainfall of about 3,677mm, ranging from less than 1,000 (Marayoor, Kanthloor, Chinnar areas and the areas north east of Anamudi) to around 5000 mm (Peerumedu, Neriya Mangalam etc). The rainfall increases from east to west. Eastern part of the district lies in the rain shadow region of the Western Ghats. The major rainfall contribution is from South West monsoon from June to September which contributes about 60% of the total annual rainfall. The North East monsoon from October to December contributes 24% of the annual rainfall and the balance during the period January to May.

The temperature is more during the months of March to May and is less during January and February. The average monthly maximum temperature ranges from 25.1

to 31.50 C and minimum temperature from 18.6 to 14.0°C.

The relative humidity is more during the morning hours and is less during evening hours. During morning hours it ranges from 85.0 to 98.45% and during evening hours it ranges from 40.8 to 87.3%.

(Source: Central Ground Water Information Booklet)

AMBIENT AIR MONITORING

Field monitoring studies for 24 hourly frequencies was carried out to evaluate the base line status of the project site in compliance with MoEF guidelines.

Ambient Air Quality Field Monitoring Values

PARAMETERS	Nr. West side boundary	Nr. East side boundary	Nr. SW side boundary	Nr. SE side boundary	LIMITS
	(µg/m ³)				(µg/m ³)
PM ₁₀	37.5	29.6	41.2	31.7	100
PM _{2.5}	18.2	12.1	23.6	15.9	60
Sulphur dioxide	3.8	3.8	4.5	4.1	80
Nitrogen dioxide	2.6	2.2	3.1	2.6	80

From the field measurement results of the ambient air, it is observed from the reports that the ambient air quality at site within the prescribed standards (NAAQS) with respect to PM₁₀, PM_{2.5}, NOx and SO₂.



WATER ENVIRONMENT

The purpose of this study is to:-

- Assess the water quality characteristics for critical parameters;
- Predict the likely impacts on water quality due to the project and related activities.

WATER MONITORING

To analyze the suitability of water for mining purpose, water sample from storm water pond and to analyze the suitability of water for domestic purpose, sample from bore well near to the project site were collected by NABL accredited laboratory and samples were analyzed for physical, chemical and biological parameters.

The sample was collected by grab sampling technique. The sample was analyzed as per the procedures specified in '*Standard Methods for the Examination of Water & Wastewater*' published by American Public Health Association (APHA).

Water Quality Monitoring Values

PARAMETERS & UNITS	RESULTS				LIMITS
	Open Well – Nr. North boundary	Open well – Nr. SE Boundary	Open well – Nr. NE Boundary	Open well – Nr. West Boundary	As per IS-10500
Colour (Hazen unit)	2.0	2.0	10	2.0	5
Odour	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
Turbidity (NTU)	1	2	3	1	5
pH	5.68	6.09	5.49	5.74	6.5-8.5
Total Dissolved solid (mg/l)	41	30	34	28	500
Total Hardness (mg/l)	11.88	9.9	11.88	11.88	300
Calcium as Ca (mg/l)	3.96	3.17	2.38	3.17	75
Magnesium as Mg (mg/l)	0.48	0.48	1.44	0.96	30
Chloride as Cl (mg/l)	20.78	10.88	8.91	8.91	250
Iron as Fe (mg/l)	0.068	0.134	0.106	0.062	0.3
Total Alkalinity (mg/l)	8.08	8.08	8.08	6.06	200
Fluoride as F (mg/l)	0.08	0.06	0.09	0.06	1
Sulphate (mg/l)	3.18	3.45	3.29	1.81	200
MICROBIOLOGICAL TEST					
Coliform bacteria (/100 ml)	Present	Present	Present	Present	Absent
E coli (/100 ml)	Absent	Absent	Absent	Absent	Absent

Results & Conclusion: - The water samples collected and analyzed from the locations discussed above it is observed that the water quality of pond water and bore well water is fit after filtration, disinfection & treatment for domestic consumption and for activities attached with the mining operations except pH & Coliform bacteria.

HYDROGEOLOGY

The important hydrogeological units encountered in the district are laterites, weathered crystallines and fractured crystallines.

Laterites constitute aquifers in the mid land regions of the district, mostly in Panchayats of Kumaramangalam, Muttom, Edavetty, Mannarkkad, Kodikulam, Karimannoor etc. In the plateau region, laterites are seen in the Panchayats of Adimali, Rajakkad, Nedumkandam, Kattappana, Chakkupallam, Vandanmedu etc. Laterites are

generally underlain by lithomargic clay, the thickness of which varies from about 0.5 to 4.0 meters. The depth to water level in the pre monsoon period is in the range of 1.4 to 9.5 m bgl. The depth to water level is shallower in valley portions and gentle slopes and deeper along the ridges. The water table fluctuation ranges from 0.5 to 4 m.

The weathered crystalline rock forms important aquifers throughout the district. The thickness of weathering ranges from less than 2.0 to around 20 meters. In the steep slopes and high ranges, where the weathered mantle is very thin or absent perennial phreatic aquifers are virtually non-existent. The thickness of weathered zone is more in weathered granitic terrains especially in parts of Devikulam, Adimali and Nedumkandam blocks. The depth to water level in the weathered crystalline rocks ranges from 1.4 to 9.5 m bgl in pre-monsoon period and 0.6 to 7.4 m bgl in post monsoon period. The water level is shallow in the valley areas. The fluctuation in water table ranges from 0.5 to 3.8 m.

(Source: District Ground Water Information Booklet, Kerala State)



NOISE ENVIRONMENT

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

Instant sound level meter is used for the collection of data related to noise at an interval of one hour per reading. Noise level for 24 hours was conducted in a day from four different locations. The details of the instrument used for the noise level sampling are as given below:-

Noise (Sound) Measuring Instrument

Instrument	Make	Model No.	Instrument Identification	Detection Limit
Integrated Sound Level Measurement Instrument Standard Accessories	Lutron	SL-4001	SAL/NOISE/INT/01	Lo 30-80dB Hi 80-130dB

Testing Method to be followed

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

AMBIENT NOISE MONITORING RESULTS IN dB (A)							
TIME (Hrs.)	RESULTS	Time (Hrs.)	Results	Time (Hrs.)	Results	Time (Hrs.)	Results
	Nr. NW Boundary		Nr. NE Boundary		Nr. SW Boundary		Nr. SE Boundary
06.00	38.5	06.00	38.1	06.00	39.9	06.00	39.1
07.00	40.2	07.00	38.9	07.00	41.2	07.00	42.2
08.00	42.6	08.00	41.4	08.00	43.5	08.00	42.9
09.00	43.9	09.00	42.7	09.00	45.1	09.00	43.6
10.00	46.1	10.00	45.9	10.00	47.9	10.00	45.9
11.00	47.7	11.00	46.3	11.00	49.2	11.00	46.7
12.00	50.5	12.00	49.6	12.00	47.8	12.00	48.2
13.00	48.6	13.00	47.2	13.00	46.2	13.00	49.5
14.00	49.2	14.00	44.9	14.00	45.7	14.00	44.2
15.00	45.4	15.00	48.2	15.00	48.5	15.00	45.8
16.00	46.3	16.00	46.6	16.00	49.9	16.00	48.1
17.00	48.2	17.00	45.1	17.00	46.2	17.00	47.4
18.00	44.1	18.00	42.1	18.00	48.7	18.00	45.6
19.00	43.2	19.00	40.8	19.00	44.1	19.00	42.5
20.00	40.7	20.00	37.9	20.00	40.9	20.00	41.3
21.00	37.5	21.00	38.6	21.00	38.6	21.00	39.9
22.00	37.9	22.00	38.1	22.00	36.9	22.00	38.2
23.00	38.1	23.00	35.9	23.00	37.3	23.00	36.7
00.00	36.3	00.00	36.4	00.00	35.5	00.00	38.9
01.00	35.4	01.00	36.7	01.00	36.0	01.00	35.7
02.00	37.9	02.00	38.2	02.00	37.8	02.00	37.0
03.00	39.1	03.00	37.4	03.00	38.3	03.00	38.4
04.00	36.9	04.00	35.7	04.00	36.9	04.00	36.6
05.00	37.2	05.00	36.8	05.00	39.1	05.00	37.0
Leq (day)	45.8	Leq (day)	44.6	Leq (day)	46.1	Leq (day)	45.3
Leq (Night)	37.4	Leq (Night)	36.8	Leq (Night)	37.4	Leq (Night)	37.3

Results and Conclusion:- It is seen from the monitoring results that the Noise levels at all monitoring stations are within the prescribed national standards.

✓ **LAND ENVIRONMENT****A. REGIONAL GEOLOGY**

A major part of the district falls in the hill ranges of Western Ghats except for Thodupuzha block and western part of Elamdesam block which fall in the mid land region of the State. The average elevation of the mid land region ranges from 40 – 60 m amsl. The mid land area is characterized by rugged topography formed by small hillocks separated by deep valleys. The general slope of the area is towards west. The hill ranges can be subdivided into foot hills, plateau region and high ranges. The foot hill region is a narrow strip of land where midland region grades into the plateau regions. The elevation of this region ranges from 80 to 500 m amsl and slope is very steep, ranging from 30 to 50% and occasionally up to 80%. The width of the foot hill ranges from 2 to 8 km. Plateau region is the most important physiographic unit of the district and is characterized by moderately sloping large land mass with a slope of less than 30 % and an elevation of less than 1500 m amsl. Major part of the district fall in this region. The region is incised by a number of deep cut streams. The area in the north eastern part of the district is characterized by high mountains with elevation more than 1500 m amsl. The highest peak in South India, Anamudi (2693 m amsl) is in the north central part of the district. There are several steep falls within the region. There are four major soil types encountered in the district. They are forest loams, lateritic soils, brown hydromorphic soils and alluvial soils. About 60 % of the district is covered under forest loams which are the product of weathering of the rock under forest cover. They are characterized by a surface layer very rich in organic matter. They are generally acidic, high in nitrogen and poor in bases, due to heavy leaching. They are dark reddish brown to black with loamy to silty loam texture. In denuded areas leaching and deposition of humus in the lower layer is common. The lateritic soils are derived from laterites and are encountered mainly in Elamdesam and Thodupuzha blocks of the district. They are well-drained and are low in plant nutrients and organic matter. The fertility of the soil is generally poor with low available nitrogen and phosphorous. Brown hydromorphic soils are confined to valley portions in undulating terrain. These soils are formed as a result of transportation and sedimentation of materials from adjoining hill slopes and are brownish black in colour. The surface texture varies from sandy loam to clay. Alluvial soils are seen as narrow strips along the banks of rivers in the district.

(Source: District Ground Water Information Booklet, Kerala State)

B. LOCAL GEOLOGY

The local geology belongs to the regional geology. Main rock type in the study area is charnockite. At places where they are exposed, the charnockite is medium to coarse grained with dark grey quartz. The soil & over burden thickness is varies from average 0.24 m to 0.45 m. Topographically, the area is undulating with slope towards SE.

✓ **BIOLOGICAL ENVIRONMENT**

Study of biological environment is one of the important aspects in Environmental Impact Assessment in view of the need for conservation of Environmental quality. A detailed enumeration of species was carried out. Occurrences of flora at various locations were observed and typical plant species were collected. The visual observations of plants were recorded with a view to obtain some idea about the relative density of certain species and their predominance.

FLORAL ASPECTS

The proposed quarry site is a midland area. Vegetation of the project area include rubber plantation and mixed natural vegetation.

Plants recorded from the proposed quarry site

Sl. No.	Species	Family	Status	Nos.
1	Acacia caesia (L.) Willd.	Fabaceae		
2	Acacia catechu (L.f.) Willd.	Fabaceae		5
3	Achyranthes bidentata Blume, Bijdr.	Amaranthaceae		
4	Aeschynomene aspera L	Fabaceae		
5	Ageratum houstonianum Mill.	Asteraceae		
6	Alloteropsis cimicina (L.) Stapf	Poaceae		
7	Alstonia scholaris (L.) R. Br.	Apocynaceae		5
8	Alternanthera brasiliana (L.) Kuntze, Rev.	Amaranthaceae		
9	Amaranthus tricolor L.	Amaranthaceae		
10	Amorphophallus paeoniifolius (Dennst.) Nicolson	Araceae		
11	Annona reticulata L.	Annonaceae		3
12	Apluda mutica L.	Poaceae		
13	Areca catechu L.	Arecaceae		9
14	Artocarpus heterophyllus Lam.	Moraceae		16
15	Artocarpus hirsutus Lam.	Moraceae	Endemic	7

16	Arundina graminifolia (D. Don) Hochr.	Orchidaceae		
17	Asystasia dalzelliana Sant.	Acanthaceae		
18	Bambusa bambos (L.) Voss.	Poaceae		3
19	Biophytum reinwardtii (Zucc.) Klotzsch.	Oxalidaceae		
20	Blumea belangeriana DC.	Asteraceae		
21	Bombax insigne Wall.	Bombacaceae		4
22	Brachiaria miliiformis (J. Presl ex C. Presl) A. Chase	Poaceae		
23	Brachiaria remota (Retz.) Haines	Poaceae		
24	Caesalpinia mimosoides Lam.	Fabaceae		
25	Carica papaya L.	Caricaceae		
26	Caryota urens L	Arecaceae		4
27	Catharanthus pusillus (Murr.) G. Don	Apocynaceae		
28	Chromolaena odorata (L.) King & Robins.	Asteraceae		
29	Cleome burmannii Wight & Arn.	Capparaceae		
30	Clerodendrum infortunatum L.	Verbinaceae		
31	Cocos nucifera L.	Arecaceae		9
32	Colocasia esculenta (L.) Schott	Araceae		
33	Commelina benghalensis L.	Commelinaceae		
34	Costus speciosus (Koenig) J.E. Smith, Trans	Costaceae		
35	Crassocephalum crepidioides (Benth.) S. Moore	Asteraceae		
36	Crotalaria pallida Dryand.	Fabaceae		
37	Crotalaria salicifolia Heyne ex Wight & Arn.	Fabaceae	Endemic	
38	Cyanotis cristata (L.) D. Don,	Commelinaceae		
39	Cyanotis papilionacea (Burm. f.) Schult. f.	Commelinaceae	Endemic	
40	Cyanotis thwaitesii Hassk.	Commelinaceae		
41	Cyclea peltata (Lam.) Hook. f. & Thoms.	Menispermaceae		
42	Cymbopogon citratus (DC.) Stapf	Poaceae		
43	Cyperus compressus L.	Cyperaceae		
44	Cyperus cyperinus (Retz.) Sur.	Cyperaceae		
45	Cyperus maderaspatanus Willd.	Cyperaceae		
46	Dalbergia lanceolaria L. f.	Fabaceae		
47	Dendrobium sp.	Orchidaceae		
48	Desmodium triflorum (L.) DC.	Fabaceae		
49	Digitaria ciliaris (Retz.) Koeler	Poaceae		
50	Drynaria quercifolia	Polypodiaceae		
51	Eragrostis nigra Nees ex Steud.	Poaceae		
52	Eulalia trispicata (Schult.) Henrard	Poaceae		
53	Euphorbia hirta L.	Euphorbiaceae		
54	Ficus exasperata Vahl	Moraceae		7
55	Ficus hispida L.	Moraceae		10
56	Helicteres isora L.	Sterculiaceae		

57	Hemidesmus indicus (L.) R. Br. var. pubescens	Periplocaecae		
58	Hibiscus hispidissimus Griff.	Malvaceae		
59	Hibiscus lunariifolius Willd.	Malvaceae		
60	Hyptis capitata Jacq.,	Lamiaceae		
61	Hyptis suaveolens (L.) Poit.	Lamiaceae		
62	Ipomoea eriocarpa R. Br.	Convolvulaceae		
63	Ipomoea hederifolia L.	Convolvulaceae		
64	Ipomoea pes-tigridis L.	Convolvulaceae		
65	Isachne globosa (Thunb.) O. Ktze.	Poaceae		
66	Knoxia sumatrensis (Retz.) DC.	Rubiaceae		
67	Kyllinga nemoralis (J. R & G. Forst.) Dandy ex Hutch.	Cyperaceae		
68	Lantana camara L.	Verbinaceae		
69	Leucas aspera (Willd.) Link, Enum.	Lamiaceae		
70	Macaranga peltata (Roxb.) Muell.-Arg. in DC.	Euphorbiaceae		15
71	Melhanian incana Heyne exWight & Arn.	Sterculiaceae		
72	Meliosma simplicifolia (Roxb.) Walp.	Sabiaceae		8
73	Melochia corchorifolia L.	Sterculiaceae		
74	Merremia vitifolia (Burm. f.) Hall. f.	Convolvulaceae		
75	Microstachys chamaelea (L.) Muell.-Arg.	Euphorbiaceae		
76	Mikania micrantha Kunth	Asteraceae		
77	Mimosa pudica L.	Fabaceae		
78	Mitracarpus hirtus (L.) DC.	Rubiaceae		
79	Momordica charantia L.	Cucurbitaceae		
80	Moringa pterygosperma Gaertn.	Moringaceae		5
81	Musa x paradisiaca L.	Musaceae		11
82	Mussaenda frondosa L.	Rubiaceae	Endemic	
83	Nephrolepis tuberosa	Oleandraceae		
84	Ocimum tenuiflorum L.	Lamiaceae		
85	Oldenlandia auricularia (L.) K. Schum.	Rubiaceae		
86	Oldenlandia herbacea (L.) Roxb.	Rubiaceae		
87	Osbeckia muralis Naud.	Melastomataceae	Endemic	
88	Osbeckia wynaadensis Clarke	Melastomataceae	Endemic	
89	Pennisetum pedicellatum Trin.	Poaceae		
90	Pennisetum polystachyon (L.) Schult.	Poaceae		
91	Phyllanthus amarus Schum. & Thonn.	Euphorbiaceae		
92	Phyllanthus emblica L.	Euphorbiaceae		10
93	Phyllanthus rheedei Wight, Ic. t.	Euphorbiaceae		
94	Phyllanthus urinaria L.	Euphorbiaceae		
95	Phyllanthus virgatus G. Forst. var. gardnerianus (Wight) Govaerts & Radcl.-Sm.	Euphorbiaceae		
96	Physalis peruviana L.	Solanaceae		

97	Plectranthus sp.	Lamiaceae		
98	Polyalthia korintii (Dunal) Benth. & Hook.f. ex Hook.f. & Thoms.	Annonaceae		
99	Pongamia pinnata (L.) Pierre	Fabaceae		
100	Pothos scandens L.	Araceae		
101	Pouzolzia zeylanica (L.) Bennett	Urticaceae		
102	Premna glaberrima Wight.	Verbinaceae	Endemic	
103	Pteris argyracea	Pteridaceae		
104	Pterygota alata (Roxb.) R. Br.	Sterculiaceae		
105	Pueraria phaseoloides (Roxb.) Benth.	Fabaceae		
106	Pytyrogrmma calomelanos	Hemionitidaceae		
107	Rotheca serrata (L.) Steane & Mabb.	Verbinaceae		
108	Scoparia dulcis L.	scrophulariaceae		
109	Selaginella delicatula	Selaginellaceae		
110	Senna occidentalis (L.) Link	Fabaceae		
111	Senna tora (L.) Roxb.	Fabaceae		
112	Sida acuta Burm. f.	Malvaceae		
113	Sida alnifolia L.	Malvaceae		
114	Stachytarpheta jamaicensis (L.) Vahl	Verbinaceae		
115	Synedrella nodiflora (L.) Gaertn	Asteraceae		
116	Tabernaemontana alternifolia L.	Apocynaceae	Endemic	
117	Tamarindus indica L.	Fabaceae		2
118	Tectona grandis L. f.	Verbinaceae		7
119	Terminalia elliptica Willd.	Combretaceae		27
120	Torenia bicolor Dalz.	scrophulariaceae	Endemic	
121	Urena lobata L.	Malvaceae		
122	Vernonia cinerea (L.) Less.	Asteraceae		
123	Vigna mungo (L.) Hepper	Fabaceae		
124	Vigna umbellata (Thunb.) Ohwi & Ohashi	Fabaceae		
125	Waltheria indica L.	Sterculiaceae		
126	Wattakaka volubilis (L. f.) Stapf	Asclepiadaceae		
127	Xenostegia tridentata (L.) Austin & Staples	Convolvulaceae		
128	Xylia xylocarpa (Roxb.) Taub.	Fabaceae		14
129	Ziziphus oenoplia (L.) Mill.	Rhamnaceae		
130	Ziziphus xylopyrus (Retz.) Willd.	Rhamnaceae		5

Faunal Diversity

Regarding the conservation status of the fauna, none of the animal species identified from the site belonged to the threatened categories identified by the International Union for Conservation of the Nature and Natural Resources (IUCN). Most of them are common and widely distributed and the range of occurrence extended to wide geographical area. No

Western Ghats endemic or endemic to the Kerala has been encountered from the study area during the present survey. The diversity recorded here was based on the direct/indirect evidences collected from the site.

Vertebrates

Mammals

Common name	Scientific name
Squirrels	<i>Funambuluspalmarum</i>

Aves (Birds)

Common crow	<i>Corvussplendens</i>
Myna	<i>Acridotherestrictis</i>
Chemboth(Greater Coucal)	<i>Centropussinensisparroti</i>
Balikkakka Large-billed Crow	<i>Corvusmacrorhynchos</i>
Black-hooded oriole	<i>Oriolusxanthornus</i>
Rufoustreepie	<i>Dendrocittavagabunda</i>
oriental magpie-robin	<i>Copsychussaularis</i>
Bronzed drongo	<i>dicrurusaeneus</i>

Reptiles

Rat snake	<i>Zamenissp</i>
Cobra	<i>Najanaja</i>
lizard	<i>Calotesversicolor</i>
Common skink	<i>Mabuyacarinata</i>

Amphibians

Frog	<i>Ranasp.</i>
Toad	<i>Bufo sp.</i>

Invertebrates

Termites	<i>Odontotermes sp.</i>
Millipede	<i>Phyllogonostreptussp</i>
Praying mantis	<i>Humbertiella sp.</i>
Scorpion	<i>Lychassp</i>

Insects

<u>Ants</u>	
1. Carpenter ant.	<i>Camponotussp</i>
2. Weaver ant.	<i>Oecophyllasmaragdina</i>
3. Yellow crazy ant.	<i>Anoplolepisgracilipes</i>

4. Trap-jaw ants. 5. Shield ant 6. Queenless ants	<i>Odontomachus</i> sp. <i>Meranoplus bicolor</i> <i>Diacamma</i> sp.
Dragonfly. 1. Pied Paddy Skimmer – male&female 2. Ruddy Marsh Skimmer 3. Blue Marsh Hawk 4. Wandering Glider 5. Crimson-tailed Marsh Hawk 6. Green Marsh Hawk 7. Common Picture Wing	<i>Neurothemistulla</i> <i>Crocothemisservilia</i>) <i>Orthetrum glaucum</i> <i>Pantala flavescens</i> <i>Orthetrum pruinatum</i> <i>Orthetrum Sabina</i> <i>Rhyothemis variegata</i>
Damselfly. 1. Orange-tailed Marsh Dart 2. Blue Grass Dartlet	<i>Ceragrion cerinorubellum</i> <i>Pseudagrion microcephalum</i>
House fly	<i>Musca</i> sp.
Flower Wasp	<i>Scolia</i> sp.
True honey bee	<i>Apis dorsata</i>
Grass hopper	<i>Mecopoda elongata</i>
Mole Cricket	<i>Meconema</i> sp.
Leaf hopper	<i>Eurybrachys</i> sp.
<u>Butterflies</u> 1. Common Crow 2. Dark Blue Tiger 3. Commander 4. Common Cerulean 5. Chocolate Pansy 6. Bush Hopper 7. Suffused Snow Flat 8. Common Grass Yellow 9. Common Emigrant 10. Common Bushbrown	<i>Euploea core</i> <i>Tirumalaseptentrionis</i> <i>Limenitis procris</i> <i>Jamides celeno</i> <i>Junonia iphita</i> <i>Ampittia dioscorides</i> <i>Tagiades gana</i> <i>Eurema hecabe</i> <i>Catopsilia Pomona</i> <i>Mycalesis perseus</i>

Social Economic Status

Edavetty Gram Panchayat

The Edavetty Gram Panchayat is a rural agrarian community. Agriculture is the back bone of its economy. The number of micro and macro industries is too low in the Panchayat. The social and institutional infrastructure is yet to be finished, it is due to the stumpy flow of own fund to the Panchayat. Plain lands, small and large hills, rubber plantations, reserved forest and deposit of granites are the main geographical features of the Gram panchayat.

Panchayat at a glance

Name of the Panchayat	Edavetty Gram Panchayat
Geographical area	17 Sq Km
Total ward	13
Block	Thodupuzha
Village	Karikodu
District	Idukky
Boundary	North – Karimanoor Gram Panchayat East – Alakodu Gram Panchayat South – Thodupuzhayar West – Thodupuzha Municipality

Demography

Total Population	15,762
Male	7,799
Female	7,963
Scheduled Caste	840
Scheduled Tribe	95

Transport

Thodupuzha – Veliyamattom is the main road passing along in the Panchayat. Meenmutty – Karimanoor is the nearest road to the project site. There is no bus conduct service along this road. To reach the destinations, the public is depends auto rickshaws and their own vehicles. Many roads of the Gram Panchayat need to be maintained well for a good transportation.

Lively hood

The Gram Panchayat is an agrarian community. Most of the population is engaging in agriculture activities for their livelihood. Rubber is the main cultivation, Coconut, paddy, pepper and vegetables are the other main cultivations in the Panchayat. Majority of population are daily wage earners. A small portion of population is in abroad. A portion of population is running shops and vehicles and other small scale business. NREGS and programme for self entrepreneurship and animal husbandry provides extra income to the families.

ENVIRONMENT MANAGEMENT PLAN (EMP)

The Environment Management Plan (EMP) for a development project prescribes the mitigation measures to be adopted to nullify or to minimize various anticipated environment impacts so as to ensure nil / low impact due to the project to the surrounding environment. This will ensure sustainable development and environment friendly mining operations. The Environment Management Plan for various facets of environment are given below : -

✓ AIR ENVIRONMENT

ANTICIPATED POTENTIAL IMPACTS

Drilling, Blasting & Transportation

Apart from the mining operations of drilling & blasting, movement of vehicles like dumpers, trucks, tankers etc. will generate dust. The transportation activities on unpaved area will result in fugitive emissions to the tune of 1.261 kg/VkmT for PM₁₀ and 0.126 kg/VkmT for PM_{2.5}. (*Calculation based on USEPA- AP 42 series.*)

Gaseous Emission rate due to transportation

CO	5.45 g/kWh
HC	0.78 g/kWh
NOx	5.0 g/kWh

MITIGATION MEASURES:

Mining activities will generate certain quantities of dust during drilling, blasting, loading and transportation operations. The following measures will be taken to mitigate the fugitive dust from these operations.

- Laying of haul road as per the standards, black topping of permanent haul road and service road to avoid or eliminate air – borne dust.
- To avoid the dust generation from the drilling operations, wet drilling method will be adopted.
- Drill machines will be equipped with dust collectors.
- Use of appropriate explosives for blasting and avoiding overcharging of blast holes.
- Controlled blasting techniques will be adopted.
- Watering of haul road and other road at regular intervals.
- Provision of dust filters/ mask to workers working at highly dust prone and affected areas.
- Provision of green belt all along the periphery of the lease area.
- Periodical monitoring of ambient air quality in and around the lease area.

The extracted mineral will be transported from the quarry to the end user by adopting following measures so as to minimize dust emissions.

- In case of long transportation the trucks after loading will be covered with tarpaulin sheets.
- Speed of the vehicles will be maintained within the prescribed limits.
- Trucks will not be over loaded and will be maintained to the body level.

The proposed mining activity is attached with a crusher operation. The following measures are being taken to control the dust emissions:-

- The unit is based on latest green technology and the entire unit is closed loop with proper control strategies
- The unit is well equipped with dust extraction system like bag filters at all traverse points to control the dust emissions.
- Closed conveyor system with water sprinkling arrangements are adopted in this unit
- Sufficient water is used to maintain the moisture content to control the fugitive emissions throughout the system

✓ **WATER ENVIRONMENT**

A. Water for Domestic Consumption

ANTICIPATED POTENTIAL IMPACTS

From the analysis report of the water sample collected from the bore well, it is observed the water from the bore well is having Coliform bacteria which are in excess of the permissible standard. The consumption of non potable water can lead to water borne diseases and which will affect the health of workers attached to project.

MITIGATION MEASURES:

It is suggested to adopt appropriate treatment / filtration / disinfection of water before consumption.

B. Domestic Sewage

ANTICIPATED POTENTIAL IMPACTS

The domestic sewage generation, if discharged untreated, can contaminate the ground water and other ground & surface water sources.

MITIGATION MEASURES:

The sewage to the tune of 0.8 KLD will be generated from the site and the same will be diverted to the septic tank followed by soak pit.

C. Storm water contamination with silt**ANTICIPATED POTENTIAL IMPACTS**

Mining activities may cause adverse impacts due to siltation due to runoff/ storm water. An impact due to soil erosion during monsoon period is also significant in nature. This also has the potential to clog the water channels and to spoil agriculture.

MITIGATION MEASURES:

Some of the control measures adopted for controlling water pollution due to the siltation of storm water by mining operations are as follows:-

- Storm water drains with silt traps will be suitably constructed all along the periphery of the pit area (Garland drains) to collect the run-off from the lease area and divert into the storm water pond/tanks proposed within the complex.
- Appropriate channelization of storm water with channels of sufficient width
- All measures will be taken not to disturb the existing drainage pattern adjacent to the other property.
- De-siltation traps and storm water collection pond proposed for silt removal.
- The storm water collected from the lease area will be utilized for dust suppression on haul roads, plantation within the premises, etc.
- The layout of channelization of storm water from the project site is shown in the environmental plan and in the storm water drainage plan which are attached at **Annexure No. A** respectively.
- Construction of check dams and collecting channel all around at the foot of the hill to prevent soil erosion during the monsoon season and also to collect the storm water for various use within the mine lease area.

D. Consumption of water – A Natural Resource**ANTICIPATED POTENTIAL IMPACTS**

The mining operations require large quantity of water for dust suppression, wetting of roads etc. Therefore, if appropriate measures are not adopted, it will lead to withdrawal of large quantity of ground water and which will deplete the ground water table.

MITIGATION MEASURES – CONSERVATION OF WATER

- The quarry site has got potential to store large quantity of storm water. The storing of surface run-off can be done in a storm water collection pond. Stored storm water can be used for dust suppression & greenbelt development which will reduce / eliminate the usage of fresh water. Therefore, the conservation of water is achieved. A storm

water collection pond of capacity 12,000 KL is available at site which is outside the mine lease area. This will be fenced so as to avoid accidents. The settled dust particles within the storm water collection pond will be removed periodically.

- Further, in the mine closure phase of the mine, a large area is proposed to be used as surface run-off storage structure. The stored rain water will be used for maintenance of eco-restoration carried out in the mine lease area.

✓ **NOISE ENVIRONMENT**

ANTICIPATED POTENTIAL IMPACTS

Drilling, blasting, compressors, plying of vehicles and loading & unloading of materials are the main sources of noise in the project area. The expected noise level from the above mentioned operations are given below:

S. No.	List of equipments	Range dB (A)
1.	Excavator	95-100
2.	Hydraulic Jack Hammer	95 -100
3.	Compressor	92-95
4.	Trucks/ Tippers	84-86

The nearest house is about 100m in East direction from the project site and predicted noise levels at different distances from the source is given below:-

Distance from the source	Predicted noise levels without EMP, dB(A)
50	65
100	60.5
200	58
300	54.5
400	52
500	50

MITIGATION MEASURES

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

- Proper maintenance of machinery, equipments and improvement on design of machines.
- Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas.
- Creation of wide green belt of dense foliage between mine areas and residential colonies.
- Regular medical check-up related health problems

- Proper training to personnel to create awareness about adverse noise level effects.
- Planned noise monitoring at suitable locations in the plant and outside location for proper effective remedial actions.

✓ **LAND ENVIRONMENT**

ANTICIPATED POTENTIAL IMPACTS

- A. Land use change
Any mining activity may alter the land use pattern in the lease area
- B. Loss of Top soil & overburden
- C. Soil erosion due to storm water

MITIGATION MEASURES

In order to minimize the adverse affects, the following suggestions have been made.

- Concurrent eco restoration will be carried out.
- Construction of check dams and collecting channel all around at the foot of the hill to prevent soil erosion during the monsoon season and also to collect the storm water for various use within the mine lease area.
- Green belt development along the boundary of the lease area.
- It is proposed to reclaim the pit area and this area will be suitably planted with local species for eco-restoration in all possible means.
- Proper barricading and monitoring of the water stored area will be taken up to prevent accidents (if any)
- The top soil will be generated from the proposed pit, which will be properly stacked and will be utilized for plantation over the reclaimed areas.
- The over burden is generated which will be utilized in developing internal roads.

D. OTHER ANTICIPATED POTENTIAL IMPACTS IN LAND ENVIRONMENT

1. GROUND VIBRATIONS

The only source of ground vibrations is due to blasting operations. Based on the ground vibration studies made earlier proper care will be taken during blasting.

2. BLASTING HAZARDS

Blasting in mining areas may give rise to ground vibrations. Fly rock is another problem that deserves attention. Based on the ground vibration studies made earlier,

proper precautions will be taken during blasting operations for controlling the ground vibrations.

MITIGATION MEASURES

The mitigation measures for addressing the various impacts due to blasting operation are presented below.

Controlled blasting technique will be adopted in this project in order to reduce blast vibrations. Further, charge per delay will be regulated to minimize blast vibrations. Proper hook-up will be adopted while firing the drill holes. Moreover the experience gained in other open cast mines would be gainfully utilized to limit the ground vibration levels within the prescribed limit of 15 mm/sec (as per DGMS). In practice, this is kept much less to about 10mm/sec.

In addition, the following guidelines will be adopted wherever required to check the ground vibrations:-

- The maximum charge per delay will not be more than 10 kg so as to limit the PPV values to 10mm/ sec. (As against the permissible 15 mm/ sec.).
- Optimum delay sequence and stem to column ratio will be maintained to minimize the fly rock distance and ground vibration intensity.
- Basing on the distance of the nearest sensitive areas from the epicenter of the blast, charge weight will be altered to meet the stipulated standards.
- Design of optimum blast hole geometry considering bench height, diameter of hole, type of explosive, nature of rock, level of fragmentation required etc.
- Divide total charge/ blast in several parts so as to keep minimum explosive per delay i.e. use of millisecond delay detonators & relays.
- Avoid concentration of explosive by using deck charging.
- Avoiding blasting in unfavorable weather conditions.

3. FLY ROCK CONTROL MEASURES

There are a large number of factors that influence fly rocks. Most important of these factors are long explosive columns with little stemming at the mouth of the hole, irregular shape of face, long water column in holes, loose stones on face of the surface blasting area, and strong wind.

MITIGATION MEASURES

Certain preventive measures will be taken to minimize the risks arising from flying fragments. These are given below:-

- **Marking of danger zone:** - The area falling within 250 m of the blasting area will be marked off as danger zone with red flags, or other appropriate signs, and entry of any unauthorized person into this zone will be prohibited during blasting operation.
- **Warning signals:** - An audible warning signal will be given, fifteen minutes before actual firing of blast to enable persons to move out of danger zone. For this purpose, a set of sirens/ hooters will be provided at appropriate places.
- **Providing blasting shelters:** - In order to protect the personnel engaged in blasting operations, blasting shelters will be provided for taking shelter during blasting.

4. AIR BLAST CONTROL MEASURES

The release of explosive energy through air and movement of fragmented rocks are primary causes for noise and air over pressure during blasting.

MITIGATION MEASURES

Adoption of the following measures while carrying out blasting operation will help in reducing the intensity of air blasts and will also minimize the noise level associated with the air blasts. The measures suggested are given below:-

- Avoiding overcharging of blast holes
- Adequate stemming
- Maintaining proper inter-hole & inter-row delays.

✓ BIOLOGICAL ENVIRONMENT

ANTICIPATED POTENTIAL IMPACTS

Clearing and cutting of trees, shrubs & herbs during the mining operations will have impact on biological environment by way of loss of habitat, loss of biodiversity. In order to compensate the anticipated impacts due to the mining activity, the following measures are proposed:

MITIGATION MEASURES

1. COMPENSATORY MASS PLANTATION PROGRAMME

An area equivalent to about 10% of the area proposed for quarrying is reserved in the area owned by the project proponent outside the proposed quarry for compensatory mass plantation. The area selected is such that there is enough depth of top soil and overburden and the quarrying in this area is not proposed in future. In the instant project site, about 10 % of total project area land is dedicated for compensatory mass plantation so as to minimize the loss of biodiversity due to the mining activity.

2. GREEN BELT DEVELOPMENT/ ECO-RESTORATION

In the concurrent eco-restoration of mine, about 5,000 trees will be planted in an area of 5.21 ha.

3. RECOMMENDED SPECIES FOR ECO-RESTORATION PROGRAM

The following recommendations were made for the sustainable development of the project so as to protect the biodiversity of the area. The following species of native plants can be planted in the area earmarked for green zone and also during mine closure.

Sl No.	Trees	Shrubs
1	<i>Pterocarpus marsupium</i>	<i>Dendrocalamus strictus</i>
2	<i>Alstonia scholaris</i>	<i>Bambusa bambos</i>
3	<i>Artocarpus heterophyllus</i>	<i>Helicteres isora</i>
4	<i>Wrightia tinctoria</i>	<i>Sida rhombifolia</i>
5	<i>Terminalia paniculata</i>	<i>Cycas circinalis</i>
6	<i>Tabernaemontana alternifolia</i>	<i>Chassalia curviflora</i>
7	<i>Tectona grandis</i>	<i>Mussaenda frondosa</i>
8	<i>Syzygium cumini</i>	<i>Ochlandra travancorica</i>
9	<i>Olea dioica</i>	<i>Bambusa vulgaris</i>
10	<i>Ficus hispida</i>	<i>Ixora coccinea</i>
11	<i>Dalbergia latifolia</i>	<i>Pseudarthria viscida</i>
12	<i>Cassia fistula</i>	<i>Glycosmis pentaphylla</i>
13	<i>Lannea coromandelica</i>	<i>Clerodendrum infortunatum</i>
14	<i>Terminalia bellirica</i>	--

✓ **SOCIO-ECONOMIC ENVIRONMENT**

INTRODUCTION

To identify the needs of the nearby community to the project site, a community need assessment study was carried out in Edavetty Gram Panchayat. The main purpose of the study was to assist the project proponent in delivering their Corporate Social Responsibility (CSR). As per the guidelines of *Company's Act (Amendment) 2013*, the study was mainly focused on the following areas.

1. Promotion of sports
2. Development of schools

3. Care for Vulnerable
4. Development of health care System
5. Ensuring Environmental Sustainability
6. Reduction in carbon footprint and CO₂ emission

Approach adopted

To conduct the study, primary and secondary data were used. Primary Data: Stake holder interviews, unstructured interview, field observation, and telephonic survey. Secondary data: Yearly Project Document and Development Charter of the Panchayat.

Stake Holders

As part of study the Socio Economic expert conducted interviews with different stakeholders of the Panchayat. The details of stake holders are given below.

Sl. No	Name	Designation	Ph. No
01	Jaseela Latheef	President, Gram Panchayat	9496045098
02	Dr. Resmi V R	Medical Officer, Edavetty PHC	9847931547
03	George VO	HI, PHC, Edavetty	9744171639
04	Indira Kumari	HM, Govt. LP School, Edavetty	9496711622
05	Mathachan Mathew	HM, UP School, Meenmutty	9495789944
06	Haleema KK	Anganwadi worker	9744225090

Identified Corporate Social Responsibility

The Socio - Economic expert conducted need assessment study in Edavetty Gram Panchayat and identified Corporate Social Responsibility (CSR) for the project proponent. The identified CSR activities are given below.

1. Promotion of sports

A. The project can conduct football coaching camp for children in association with Gram Panchayat. The project can also conduct a football tournament in the Panchayat. This initiation will enhance the physical fitness of children.

Particulars	Amount (in Rs.)	Total (in Rs.)	Type of Expense
Coaching camp	50 x 50 x 50	1,25,000	Recurring
Football tournament		80,000	Recurring
Total		2,05,000	

B. The project can appoint a special educator for the physical fitness of children. The educator will work in association with various schools in the Panchayat.

Particulars	Basis of calculation	Total (in Rs.)	Type of Expense
Special educator	Rs. 500 x 300 days	1,50,000	Recurring
Working cost	Rs. 2,500 x 12 months	30,000	Recurring
Total		1,80,000	

2. Development of schools

A. There is 135 children are studying in Mar Mathews U P School, Meenmutty. The project can support the school to improve its facilities.

Particulars	Total (in Rs.)	Type of Expense
Smart class room	80,000	Non Recurring
Water purifier	15,000	Non Recurring
To children's magazine	5,000	Non Recurring
Equipments for laboratory	10,000	Non Recurring
Recreational materials	5,000	Non Recurring
Total	1,15,000	

B. There is 38 children are studying in Govt. LP School. To improve the quality of education the project can provide necessary equipments and support to the school.

Particulars	Basis of calculation	Total (in Rs.)	Type of Expense
Smart class room		80,000	Non Recurring
Water purifier		15,000	Non Recurring
Tables and shelf		25,000	Non Recurring
Slider in children's park		15,000	Non Recurring
Nutritious food	Rs. 4,000 x 10 months	40,000	Recurring
Total		1,75,000	

3. Care for vulnerable

A. The project can start a scholarship and sponsorship programme for children from economically backward families. This initiation will encourage children to study well and chase higher education.

Particulars	Basis of calculation	Total (in Rs.)	Type of Expense
Scholarship for professional courses	Rs. 30,000 x 5	1,50,000	Recurring
School kit (bag, Uniform, books etc)	Rs. 1,000 x 100	1,00,000	Recurring
Total		2,50,000	

B. To detect cancer in early stage, the project can conduct a medical camp for the detection of cancer in association with the PHC. The project can also support the person from economically backward families for their treatment and medicine.

Particulars	Basis of calculation	Total (in Rs.)	Type of Expense
Medical camp		60,000	Recurring
Treatment support	Rs. 30,000 x 4	1,20,000	Recurring
Medical aid	Rs. 500 x 20 people x 12 months	1,20,000	Recurring
Total		3,00,000	

C. The project can contribute an amount in the relief fund of the District Collector or Chief Minister of Kerala during the time of natural calamities or other such important occasions.

Particulars	Total (in Rs.)	Type of Expense
To relief fund	2,00,000	Recurring
Total	2,00,000	

4. Development of Health care system

A. The infrastructure of the Primary Health center is inadequate for providing good service to the public. The Project can support the PHC to build a room for Lab and Palliative care in its compound.

Particulars	Total (in Rs.)	Type of Expense
To build rooms for PHC	6,50,000	Non Recurring
Total	6,50,000	

B. The project can support the Pain and Palliative Care Unit by providing adequate equipments for effective service.

Particulars	Total (in Rs.)	Type of Expense
Water bed, air bed, wheel chairs etc,	50,000	Non Recurring
Total	50,000	

5. Ensuring Environmental Sustainability

Due to the loss of ecological resources at site, the project proponent has reserved a recurring fund of Rs. 3 Lakhs per year for plantation of fruit bearing, flowering, medicinal & such native species of trees in coordination with the panchayat / District Administration in common areas like parks, road side etc.

6. Reduction in carbon footprint and CO₂ emission

The compressor used for drilling runs in diesel (fossil fuel) as fuel and which will have emissions containing CO₂. To compensate the CO₂ emissions, the project proponent proposed to have a 2.5 kW solar power plant to meet the energy requirements of the site office & labour quarters. An amount of Rs. 0.9 lakhs is reserved for installation of the solar power plant system.

Summary of CSR Activities

The summary of the above activities are given below :-

Sl. No	Areas of Intervention	No. of Intervention	Recurring Expenses (in Rs.)	Non Recurring Expenses (in Rs.)
01	Promotion of sports	02	3,85,000	Nil
02	Development of Schools	02	40,000	2,50,000
03	Care for Vulnerable	03	7,50,000	Nil
04	Development of Health care system	02	Nil	7,00,000
05	Ensuring environmental sustainability	01	3,00,000	--
06	Reduction in carbon footprint & CO ₂ emission	01	---	90,000
	Total	11	14,75,000	10,40,000

✓ MINE CLOSURE PLAN

Various works that are to be taken up under the mine closure plan includes:-

- (i) **Re-vegetation:** It is proposed to develop green belt to about 80 % which includes areas like along mine lease boundary (7.5 m width), all along the periphery of the mine lease area and the reclaimed area.

Grass and bushes will be planted in areas prone to erosion especially at the foot of the mine lease area. Other areas will be fertilized and planted with local species. The characteristics of this vegetation will resemble that of the natural environment except for the early growth, which may be a protective cover crop of non-seeding annuals.

Before re-vegetation, the land will be properly prepared by spreading the top soil which is rich in organic contents. Vegetation will be self-sufficient after planting and require no fertilization or maintenance.

(ii) Buildings and Infrastructure

a. Site office building, Rest Room and Toilets

These structures may be utilized for the mining project as the life of the mine is much more than the present lease period.

b. Support & Transport Infrastructures

As such there is no major infrastructure facilities planned in this project and does not call for importance. The main mining site and secondary access road will be kept in a

sufficient condition to allow access for monitoring till such time any other authorities wish to maintain and legally accept responsibility for the access roads.

c. Surface Equipment and Heavy Machinery

No heavy and surface equipment are proposed in this project. Open cast semi-mechanized method is used in this case. The equipments and small machinery if used will be taken out of the premises.

d. Hazardous substances

The hazardous materials and explosives will be totally evacuated from the mine site and the site will be cleared of any such materials and substances.

(iii) Water Resource Management

Prior to the commissioning of the project area the surface run-off used to flow naturally and used to join the nearby drainage nallahs/ streams. It is proposed to collect and hold this runoff/ storm water from the lease area including own property and use it for various purposes within the lease area. The grounding of the project will not be causing any alteration to the drainage pattern of the area. The quality of the water will be maintained in compliance with the general effluent standards / drinking water standards.

(iv) Monitoring:

The monitoring of the mine closure plan is an essential requirement for review of the efficacy of the mine closure and to take corrective actions. The monitoring consists of measuring the air quality, water quality, preservation of landscape, aesthetic and other land use values.

(v) Submission of detailed Mine Closure Plan

The detailed mine de-commissioning plan will be made on the above-mentioned principles, before the closure which will be submitted for approval. This plan will also provide the fund provision for the mine closure plan.

The map showing conceptual plan (post mine closure plan) of the proposed mine area is enclosed as **Annexure No. B**.

✓ **RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN**

FALL OF SIDES

- Flatter slopes angles are adopted where occurrences of loose earth are encountered.
- No disaster like land slide, flood or inundation or fire is anticipated in this case.
- Unmanageable heights are not created.
- Loose rocks are properly dressed.

- Nature and structure of the rocks are properly studied for their slips.
- The faces will slope at 70°.
- The hanging wall, footwall & mineralized zone are competent to stand safely for long time.

STORAGE AND USE OF EXPLOSIVES

- Proper and safe storage of explosives in approved and Licensed Magazine.
- Proper, safe and careful handling and use of explosives by competent Blasters having Blaster's Certificate of Competency issued by DGMS.
- Proper security system to prevent theft/ pilferage, unauthorized entry into Magazine area and checking authorized persons to prevent carrying of match box, lights, mobile phones, cigarette or Beedi, etc.
- The explosives of class 2 will be used in their original cartridge packing and such cartridge shall not be cut to remove explosive for making cartridge of different size.
- Detonators will be conveyed in special containers. These will not be carried with other explosives.
- The holes which have been charged with explosives will not be left unattended till blasting is completed.
- Before starting charging, clear audible warning signals by Sirens will be given so that people nearby can take shelter.
- Blasting operations will be carried out in day times only. However, in this project the mining operations are proposed to be carried out in day times.

STORAGE OF OIL AND FUEL

- Due care will be taken to avoid oil spillage.
- Storage will not be allowed beyond necessity.
- Fuel oil and lubricants will be stored only in approved containers in separate store rooms. Match box, lighters, mobile phone, dry wood, plastic paper sheets and smoking will not be allowed near the storage area.

WATER

- Due care will be taken to provide channel all around the foot of the hill to collect run off and also to avoid soil erosion.
- There is no danger of flood or inundation as the proposed working is above the normal ground level. The area is not susceptible to floods.

✓ **DISASTER MANAGEMENT PLAN**

During mining activities, proper measures will be taken to ensure safety at site. In order to handle disaster/ emergency situations, an organizational chart entrusting responsibility to various project personnel will be prepared with their specific roles during emergency.

The possible composition of the management team shall be:-

1. Mines Manager
2. Section In-charge
3. Site Controller
4. Incident Controller
5. Fire and Security Officer
6. Transport Coordinator
7. Medical Coordinator

INFRASTRUCTURE

Following infrastructure and operational system will be provided to meet any emergencies.

EMERGENCY CONTROL ROOM

This will be situated in an area away from the places of fire and will be provided with the following facilities:-

- a. Master plan of the mines.
- b. First aid boxes.
- c. Telephone line with STD facility.
- d. Loud hailers.
- e. Emergency lighting system.
- f. Stretchers.
- g. Transport facility.
- h. Emergency control room / site office will function as control base.

ASSEMBLY POINTS

Assembly points are to be set up farthest from the location of likely hazardous events, where pre-designated persons from the works, contractors and visitors would assemble in case of emergency. Up-to-date list of pre-designated employees of various departments must be available at these points so that roll call could be taken. Pre-designated persons would take charge of these points and mark presence as the people come into it.

COMMUNICATION SYSTEM

Different types of alarms to differentiate types of emergencies will be provided. Alarms will be followed by an announcement over Public Address System. In case of failure of alarm system, communication will be by telephone operator who will make announcement in industrial complex through Public Address System which should be installed. Walkie-talkie and paging systems, using predetermined codes of communication, are very useful during emergency. If everything fails, a messenger will be used for sending the information.

WARNING SYSTEM AND CONTROL

The Control Centers will be located at an area of minimum risk or vulnerability in the premises concerned, taking into account the wind direction, areas which might be affected by fire/explosion, toxic releases, etc. For promptness and efficiency, the premises/storage sites may be divided into number of zones, which should be clearly marked on the site plan.

EMERGENCY SERVICES

This includes the fire-fighting system, first aid center, hospital etc. Alternate sources of power supply for operating fire pumps, communication with local bodies, fire brigade etc., will also be clearly identified. Adequate number of external and internal telephone connections will be installed.

FIRE PROTECTION SYSTEM

The fire protection system for the proposed mine will consist of,

- a. Hydrant system for all the areas of the mine.
- b. Portable hand appliances of suitable types/ capacities for extinguishing small fires in selected areas of the mine/storage areas.

✓ **OCCUPATIONAL HEALTH AND SAFETY**

The main areas of concern for ensuring adequate occupational health and safety are:-

- All working places will have safe means of access, safe working platform and exit. Persons working in hazardous dust prone area will be provided with dust mask.
- Personal protective equipments like respirators, ear plug, noise muff, helmet etc. will be provided to the workers.
- Proper unit design and engineering controls in order to protect workers, including by control of process and fugitive emissions.
- Adequate arrangement of drinking water will be done.

- Education & training will be provided to the workforce about facilities, protective equipment, risk associated, potential health effects, etc.
- Display board will be provided showing the hazards associated and recommended precautionary measures.

Medical Surveillance

Following tests are proposed during Medical Surveillance conducted for employees:-

- Pre-employment medical check-up.
 - * Pulmonary Function Test
 - * Complete Physical Examination
 - * Blood Test
 - * Urine Test
 - * Chest X ray
- Once in Six months medical check-up of each employee.
- Form 27A Fitness Certificate will be obtained every year from certified surgeon.
- Form 25 Health Register of each employee will be obtained every year from certified surgeon.
- Individual medical record will be maintained.

OCCUPATIONAL HEALTH

Occupational health needs attention during mining activities. The problem of occupational health in the mining operation and maintenance phase is primarily due to dust and noise which could affect the workers from respiratory and hearing problems. The necessary personal protective equipments will be given to all the workers. The working personnel will be given the following appropriate personnel protective equipments.

- Industrial Safety Helmet;
- Face shield with replacement acrylic vision;
- Cylindrical type earplug;
- Dust mask;
- Leather apron;
- Safety belt/line man's safety belt;
- Leather hand gloves;
- Industrial safety shoes with steel toe.

Well equipped medical facilities will be available round the clock for attending emergency arising out of accidents, if any. All working personnel will be medically

examined at least once in every year and at the end of his term of employment. This is in addition to the pre-employment medical examination.

SAFETY PLAN

Safety of both men and materials during mining of operation phases is of concern. Safety plan will be prepared and implemented in the proposed site. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster is possible due to collapse of rock structures and fire/explosion etc. Keeping in view the safety requirement during mining a safety policy will be formulated with the following regulations:-

- To allocate sufficient resources to maintain safe and healthy conditions of work;
- To take steps to ensure that all known safety factors are taken into account in the operation and maintenance of men, machinery and equipment;
- To ensure that adequate safety instructions are given to all employees;
- To provide wherever necessary protective equipment, safety appliances and clothing and to ensure their proper use;
- To inform employees about materials, equipment or processes used in their work which are known to be potentially hazardous to health or safety;
- To keep all operations and methods of work under regular review for making necessary changes from the point of view of safety in the light of experience and upto date knowledge;
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work;
- To provide appropriate instruction, training, retraining and supervision to employees in health and safety, first aid and to ensure that adequate publicity is given to these matters;
- To ensure proper implementation of fire prevention methods and an appropriate fire fighting service together with training facilities for personnel involved in this service;
- To organize collection, analysis and presentation of data on accident, sickness and incident involving people injury or injury to health with a view to taking corrective, remedial and preventive action;
- To promote through the established machinery, joint consultation in health and safety matters to ensure effective participation by all employees;
- To publish / notify regulations, instructions and notices in the common language of

employees;

- To prepare separate safety rules for each type of occupation / processes involved in at site; and
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

SAFETY ORGANIZATION

Conceptual / Planning Phase

A qualified and experienced safety officer shall be appointed. The responsibilities of the safety officer include identification of the hazardous conditions and unsafe acts of workers and advice on corrective actions, conduct safety audit, organize training programs and provide professional expert advice on various issues related to occupational safety and health. He is also responsible to ensure compliance of Safety Rules/ Statutory Provisions.

SAFETY CIRCLE

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving safety and health, safety circles would be constituted in each area of work. The circle would consist of 3-5 employees from that area. The circle normally will meet for about an hour every week.

SAFETY TRAINING

A full-fledged training center will be set up at the plant. Safety training will be provided by the Safety Officers with the assistance of faculty members called from Professional Safety Institutions and Universities. In addition to regular employees, limited contractor labors will also be provided safety training. To create safety awareness safety films will be shown to workers and leaflets will be distributed. Some precautions and remedial measures proposed to be adopted to prevent fires are:-

- Spread of fire in horizontal direction would be checked by providing fire stops;
- Reliable and dependable type of fire detection system with proper zoning and interlocks for alarms are effective protection methods;
- Housekeeping of high standard helps in eliminating the causes of fire and regular fire watching system strengthens fire prevention and fire fighting; and
- Proper fire watching by all concerned would be ensured.

HEALTH AND SAFETY MONITORING PLAN

The health of all employees will be monitored once in a year for early detection of any ailment due to exposure of dust, heat and noise. The format of the Report of Medical Examination under Rule 29B is attached at **Annexure No. C**.

✓ **ENVIRONMENT MONITORING PROGRAMME**

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

The following routine monitoring programme as detailed below shall be implemented at site. Besides to this monitoring, the compliances to all environmental clearance conditions and consents / approvals from KSPCB / MoEF & CC / SEIAA will be monitored and reported periodically.

Sr. No.	Potential Impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring	Location
1.	Air Emissions	Ambient air quality within the premises of the proposed unit and nearby habitations to be monitored.	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x and CO.	Once in a year	Atleast one location at site and nearest habitation
		Exhaust from vehicles to be minimized by use of fuel efficient vehicles and well maintained vehicles having PUC certificate.	Vehicle logs to be maintained		-
		Vehicle trips to be minimized to the extent possible	Vehicle logs	Daily records	Main gate
2.	Noise	Noise generated from various mining operation like drilling / blasting/ vehicular to be optimized and monitored	Spot Noise Level recording; L _{eq} (day), L _{eq} (Night)	Once in a year	Noise measurements at site and nearby habitations
		Generation of vehicular noise	Maintain records of vehicles	Periodic during operation phase	-
3.	Wastewater Discharge	No untreated discharge to be made to surface water, groundwater or soil.	No discharge hoses in vicinity of watercourses.	Periodic during operation phase	-
4.	Drainage and effluent Management	Ensure drainage system and specific design measures are working effectively. Design to incorporate existing drainage pattern and avoid disturbing the same.	Visual inspection of drainage and records thereof	Periodic during operation phase	-
5.	Water Quality and Water Levels	Monitoring used water quality & groundwater quality and levels	Comprehensive monitoring as per IS:10500 & ground water level bgl	Periodic during operation phase	Three locations surrounding mine site

Sr. No.	Potential Impact	Action to be Followed	Parameters for Monitoring	Frequency of Monitoring	Location
6.	Energy Usage	Energy usage for air-conditioning and other activities to be minimized Conduct annual energy audit for the buildings	Energy audit report	Annual audits and periodic checks during operational phase	-
7.	Emergency preparedness, such as fire fighting	Fire protection and safety measures to take care of fire hazards, to be assessed and steps taken for their prevention.	Mock drill records, on site emergency plan, evacuation plan	Periodic during operation phase	--
8.	Maintenance of flora and fauna	Vegetation, greenbelt / green cover development	No. of plants, species	Periodic during operation phase	-
9.	Waste Management	Implement waste management plan that identifies & characterizes every waste arising associated with proposed activities which identifies the procedures for collection, handling & disposal of waste arising.	Records of solid waste generation, treatment and disposal	Periodic during operation phase	--
10.	Soil quality	Maintenance of good soil quality	Physio-chemical parameters and metals.	Periodical monitoring	Plantation areas
11.	Health	Employees and migrant labour health check ups	All relevant parameters including HIV	Regular check ups	-

Expenditure Proposed for Environmental protection activities:-

It is proposed to invest an amount of Rs. 9.0 Lacs per annum towards environmental action plan and the details of the same are given below:-

S. No.	Description of item	Recurring cost (in lac)
1	Air Pollution Control - Water sprinkling	2.0
2	Water Pollution Control	1.0
3	Environmental Monitoring and Management	5.0
4	Green belt Development	1.0
Total		9.0

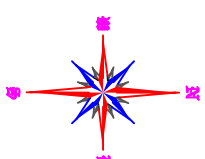
**CONCLUSION**

It is predicted that socio-economic impact due to this project will positively increase the chance of more employment opportunities for local inhabitants. There are no Resettlement and Rehabilitation issues involved in this project. The project infrastructures will be of use to people of the area. The revenue of the State Govt. will be definitely increase due to the proposed activity. The entire project area is devoid of any endemic / endangered flora and fauna. **It is proposed to reclaim the land and develop green cover for eco-restoration with native species to a maximum possible extent. Additionally, an area is earmarked outside the proposed mining area for compensatory mass plantation. Also, a large storm water pond is proposed outside the mining area for storage of rain water and for its subsequent use so as to conserve fresh water consumption.** Thus the proposed project is not likely to affect the environment or adjacent ecosystem adversely.

LIST OF ANNEXURES ATTACHED WITH THE REPORT

Sr. No.	Particulars	Remarks
1.	Environment Management Plan	Annexure No. A
2.	Conceptual (Post Mine Closure) Plan	Annexure No. B
3.	Format of Medical Certificate under Rule 29 (B)	Annexure No. C

Annexure No. A



Scale : 1:5000
Date Of Survey : 07.04.2015

Applicant :

M/S Marthoma Granites
Managing Partner Sir.U.I.John,
S/o.Sir Ulahaman Ittan, resident of,
Ullanukunnel House,
Mulappuram P.o,Neyyasseri,
Thodupuzha,Idukki-D.t,
Kerala State.

Location Of Quarry :

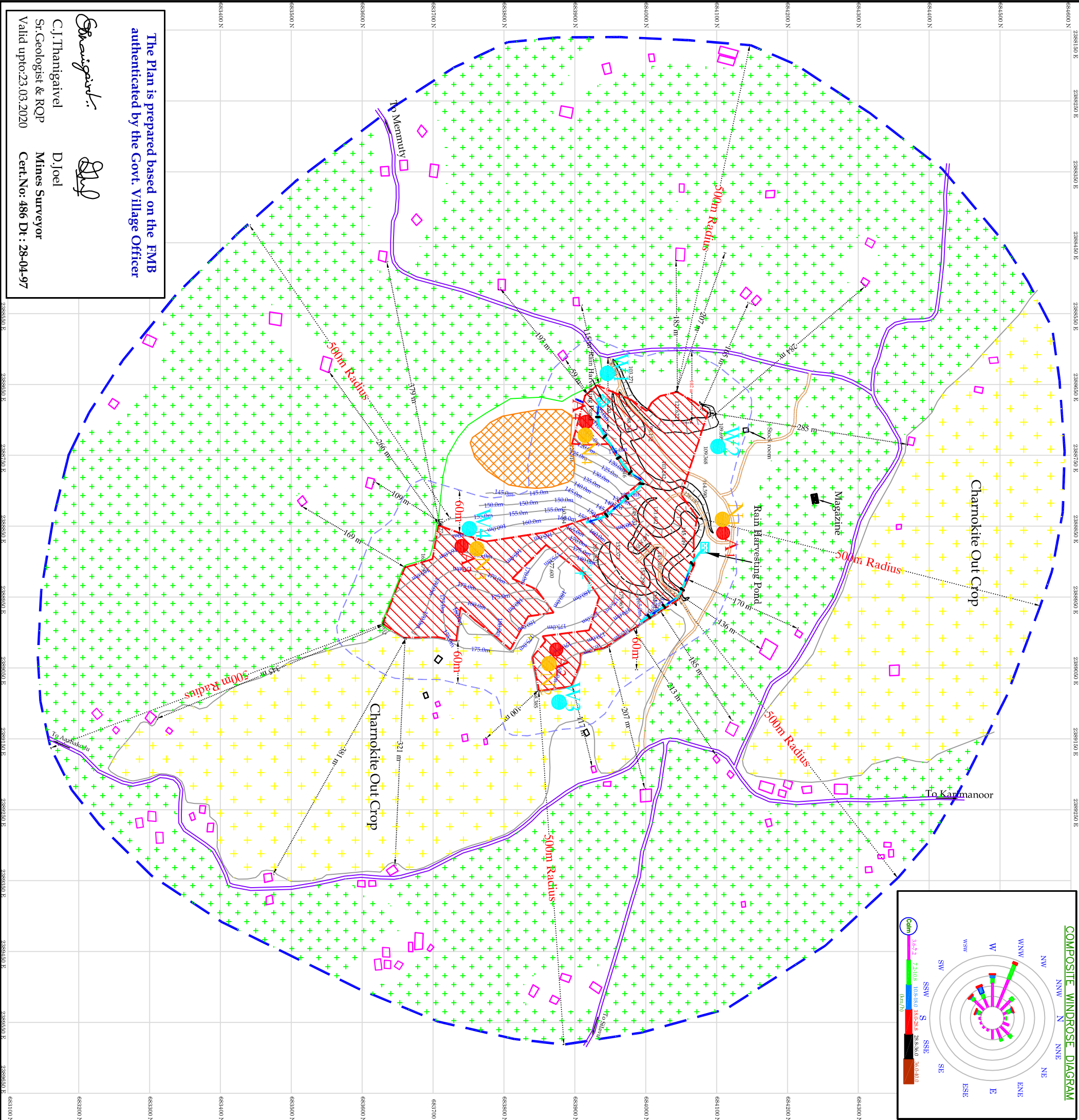
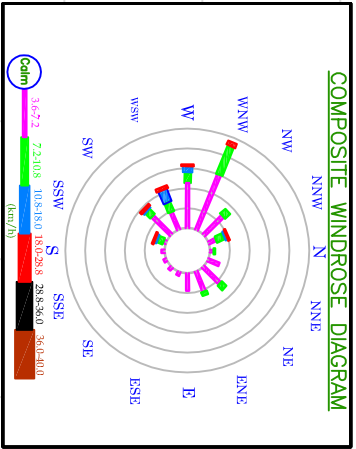
S.F.NO : 8/9 Block No:32.
EXTENT : 07.45.90 Hect
VILLAGE : Alakode
TALUK : Thodupuzha
DISTRICT : Idukki
STATE : Kerala

Index

-  Quarry Application Boundary
-  Private Road
-  Public Road
-  Charnokite Out Crop
-  Magazine
-  Structure Not Belong To Owner
-  Contour Line
-  500 mtr Radius
-  60 mtr Radius
-  Rubber / Tree Plantation
-  Air Sampling Station
-  Noise Level Monitoring
-  Water Sampling Station
-  Adjacent Quarry
-  Rain Water Harvesting Pond
-  Rain Water Channel with Check Dam

MARTHOMA GRANITES

Environmental Plan



The Plan is prepared based on the FMB
authenticated by the Govt. Village Officer

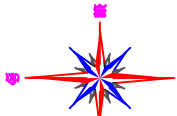


C.J.Thanigaivel
Sr.Ceologist & RQP
Valid upto:23.03.2020



D.Joel
Mines Surveyor
Cert.No: 486 Dt : 28-04-97

Annexure No. B



Date Of Survey : 07.04.2015
Scale : 1:1000

Applicant :

M/S Marthoma Granites
Managing Partner Sir. U.I.John,
S/o.Sir Ulahannan Ittan, resident of,
Ullanukkunnel House,
Muliappuram P.o,Neyyasseri,
Thodupuzha,Idukki-D,t,
Kerala State.

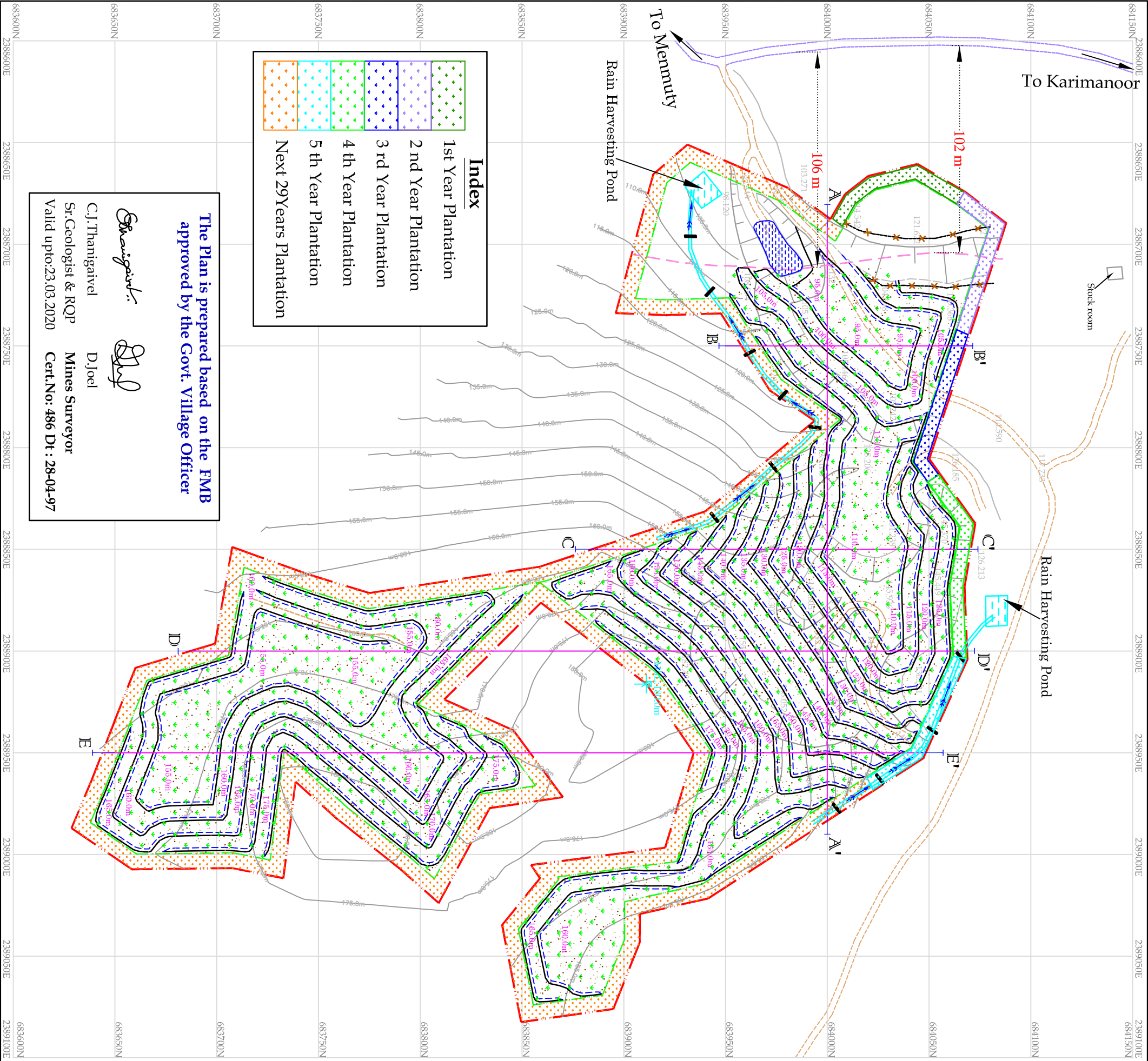
Location Of Quarry :

S.F.NO : 8/9 Block No:32
EXTENT : 07.45.90 Hect
VILLAGE : Alakode
TALUK : Thodupuzha
DISTRICT : Idukki
STATE : Kerala

Index

	Quarry Lease Boundary
	7.5 mtr Safety Distance
	100mtr Safety Distance
	Quarry working
	Proposed Quarry working
	Private Road
	Panchayat Road
	Contour Line
	Bench Mark
	Existing Elevation in mtr
	Proposed Elevation in mtr
	Proposed Barbed Fencing
	Refilling and Plantation in the Quarry Area
	Water Reservoir (.04 Hect)
	Rain Water Harvesting Pond

MARTHOMA GRANITES
Conceptual Plan
(Post Mine Closure Plan)



Index	
	1st Year Plantation
	2 nd Year Plantation
	3 rd Year Plantation
	4 th Year Plantation
	5 th Year Plantation
	Next 29Years Plantation

The Plan is prepared based on the FMB
approved by the Govt. Village Officer

C.J.Thanigaivel

D.Joel

Sr.Geologist & RQP
Valid upto:23.03.2020

Mines Surveyor
Cert.No: 486 Dt : 28-04-97

Form - O

[(See Rule 29 F (2) & 29 L)]

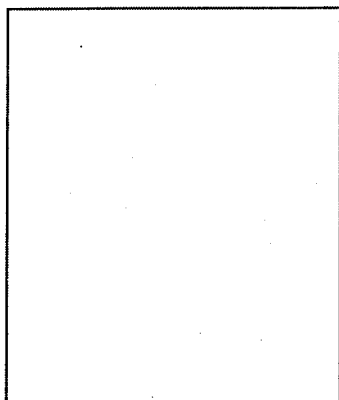
Report of Medical Examination under rule 29 B

(to be issued in triplicate)

Certificate No. _____

Certified that Shri/Smt. _____ employed
as _____ in _____ Mine,
form B. No. _____ has been Examined for an initial / periodical
Medical Examination, He / She appears to be _____ Years of age.
The findings of the examining authority are given in the attached sheet, it is considered
that Shri / Smt. _____

- a) Is medically fit for any employment in mines.
- b) Is suffering from _____ and is medically unfit for.
- i. Any employment in mine or
- ii. any employment below ground or
- iii. any employment or work _____
- c) Is suffering from _____ and should get
this disability cure / controlled and should be again examined within a period of
_____ months
He / She will appear for Re-examination with the result of test of _____ and
the opinion of _____ specialist
from _____ he / she may be permitted / not
permitted to carry on this duties during the period.



Signature of the
Examining authority

Place : _____

Date : _____

Report of the examining authority

(To be filled in for every medical examination whether initial or periodical or Re-Examination of after cure / control of debility)

Annexure to certificate No. _____ as a Result of medical examination on _____

Identification mark _____ Left thumb impression of the candidate _____

1. General Development

Good / Fair / Poor

2. Height _____ Cms

3. Weight _____ Kgs

4. Eyes:

(i) Visual acuity distance vision (With or without glasses.)

Right Eye _____

Left Eye _____

(ii) Any organic disease of eyes

(iii) Night blindness _____

(iv) Colour blindness _____

(iv) Squint (*to be tested in special case)

5. Ears:

(i) Hearing right ear _____

Left ear _____

(ii) Any organic disease.

6. Respiratory system:

Chest measurement

(i) After full Inspiration _____ Cms.

(ii) After Full expiration _____ Cms.

7. Circulatory system:

Blood Pressure _____

Pulse _____

8. Abdomen:

Tenderness

Liver

Spleen

Tumor

9. Nervous System:

History of fits or epilepsy

Paralysis

Mental health

10. Locomotor system

11. Skin

12. Hernia

13. Hydrocela

14. Any other abnormality

15. Urine

Reaction

Albumin

Sugar

16. Ski gram of chest:

17. Any other chest considered necessary by the examining authority.

18. Any opinion of specialist considered necessary.

Place _____

Date _____

Signature of the examining authority