EXECUTIVE SUMMARY

KOTTATHUR & NADUVALUR GARNET SAND MINES

P1	
PROJECT LOCATION	**PROPONENT NAME**
S.F.Nos. 95/2A, 2B, 4B, 4C, 5A, 5B, 6A, 6B, 97/2B & 2E Kottathur Village, Musiri Taluk, Tiruchirappalli District **Extent: 2.10.0 Ha**	**Tvl. S.S. Minerals,** **Thiru.L. Samuel Baskaran – Partner** No.6/9, Kasthuri Esate, III Street, Poes Garden, Chennai – 600 086, Tamil Nadu State
P2	
PROJECT LOCATION	**PROPONENT NAME**
S.F.Nos. 137/7, 348/1A, 1B, 1C1, 1C2, 1C3, 2B1, 3A, 4, 5, 6B, 7A, 8, 9, 11, 12 & 13, Naduvalur Village, Thuraiyur Taluk, Tiruchirappalli District **Extent: 3.07.0 Ha**	**Tvl. Riverwaays Mines & Minerals Ltd.,** **Thiru.K. Balasubramaniyan – Partner** Admin. Office: No.20/4, "Naveed Castle", Balakrishna Street, Mylapore, Chennai – 600 004, Tamil Nadu State

ToR Obtained Vide

SEIAA-TN/F.No.6261/SEAC/1(a)ToR-2025 Dated.03.03.2025 – P1

SEIAA-TN/F.No.6260/SEAC/ToR-1565/2018 Dated.19.09.2023 – P2

"B1" CATEGORY/ MINOR MINERAL / NON-FOREST LAND/ PATTA LAND-CLUSTER

*** CLUSTER EXTENT = 29.12.5 ha**

* Cluster Calculated as per MoEF & CC Notification – S.O. 2269(E) Dated: 01.07.2016

Environmental Consultant

GEO EXPLORATION AND MINING SOLUTIONS

Old No. 260-B, New No. 17,
Advaitha Ashram Road, Alagapuram,
Salem – 636 004, Tamil Nadu, India
Accredited for sector 1 Category 'A', 31 & 38 Category 'B'
Certificate No : NABET/EIA/2225/RA 0276
Phone: 0427-2431989,
Email: ifthiahmed@gmail.com, geothangam@gmail.com
Web: www.gemssalem.com

Baseline Monitoring Period – OCTOBER TO DECEMBER 2024

Laboratory

CREATIVE ENGINEERS & CONSULTANTS
NABET ACCREDITED, NABL ACCREDITED TESTING LABORATORY &
ISO 9001: 2008 CERTIFIED COMPANY
Chennai–600 059
Ph: 044-22395170, Cell: 09444133619

1. INTRODUCTION

Garnet is one of the best Natural abrasives and is preferred over other natural abrasives like Silica Sand, Mineral Sands & Flint.

This specific Garnet is used for the following major industries

1. Abrasive Blast Cleaning (Dry Blasting)
2. Water jet cutting (Abrasives injected into water)
3. Water filtration
4. Manufacture of coated abrasives
5. Micronized Garnet powder for polishing Glass, Ceramics & Plastics

The purpose of the report is to obtain environmental clearance for the proposed 5 nos of Garnet Sand Deposit Mines of Tvl.Riverways Mines and Minerals Ltd and Tvl.S.S.Minerals located in Musiri taluk, Trichy district, Tamil Nadu . Tvl.Riverways Mines and Minerals Ltd & Tvl.S.S.Minerals are associated companies with the same promoters & the 2 Mining leases are located within 500m radius. The leases details are given below:

***PROPOSED QUARRIES**				
CODE	**Name of the Owner**	**S.F. Nos**	**Extent**	**Status**
P1	**Tvl.S.S.Minerals,**	95/2A, 2B, 4B, 4C, 5A, 5B, 6A, 6B, 97/2B & 2E	2.10.0 ha Kottathur village	Lr.No. SEIAA-TN/F.No.6261/SEAC/l(a)ToR-2025 Dated: 03.03.2025
P2	**Tvl.Riverways Mines and Minerals Ltd**	137/7, 348/1A, 1B, 1C1, 1C2, 1C3, 2B1, 3A, 4, 5, 6B, 7A, 8, 9, 11, 12 & 13	3.07.0 ha Naduvalur Village	Tor obtained vide Lr. No SEIAA TN/F.No.6260/ SEAC/ToR-1565/2018 Dated: 19.09.2023
P3	**Tvl.Riverways Mines and Minerals Ltd**	390(P)	4.80.0 Ha Kottathur village	Tor obtained vide Lr. No. SEIAA-TN/F.No.6508/SEAC/1(a)ToR-1497/2023 Dated: 22.06.2023
P4	**M\s. Riverways Mines and Minerals Ltd**	390(P)	4.90.0 Ha	Tor obtained vide Lr. No. SEIAA-TN/F.No.6510/SEAC/ToR-1490/2023 Dated: 22.06.2023
P5	**Tvl.Riverways Mines and Minerals Ltd**	390(P)	4.75.0 Ha	Tor obtained vide Lr. No. SEIAA-TN/F.No.6511/SEAC/1(a)/ToR-1478/2023 Dated: 22.06.2023
P6	**Tvl.Riverways Mines and Minerals Ltd**	390(P)	4.75.5 Ha	Tor obtained vide Lr. No. SEIAA-TN/F.No.6507/SEAC/1(a)/ToR-1487/2023 Dated: 22.06.2023
P7	**Tvl.S.S.Minerals**	390(P)	4.75.0 Ha	Tor obtained vide Lr. No. SEIAA-TN/F.No.6509/SEAC/1(a)/ToR-1493/2023 Dated: 22.06.2023
		Total	**29.12.50 ha**	
TOTAL CLUSTER EXTENT*			**29.12.50 Ha**	

The proponent has obtained necessary statutory clearances from the Indian Bureau of Mines (IBM) and The Commissioner of Geology and Mining Guindy (Statutory Clearance Documents are enclosed along with Mining plan as Annexure Volume 1). In this Combined Draft EIA report the proposals are taken as P1 & P2 for the easy understanding. P1 = Tvl. S.S. Minerals File No 6261 & P2 = File No 6260 - Tvl. Riverwaays Mines and Minerals Ltd.,

"Draft EIA report prepared on the basis of ToR Issued for carrying out public hearing for the grant of Environmental Clearance from SEIAA, Tamil Nadu"

1.1 DETAILS OF PROJECT PROPONENT

Name of the Project Proponent	**Tvl.S.S. Minerals Managing Partner – Thiru. L. Samuel Baskaran**	**Tvl. Riverways Mines and Minerals Ltd Managing Director – Thiru. L. Samuel Baskaran**
Address	No. 204 Naveed Castle Balakrishna Street, Mylapore Chennai	No. 204 Naveed Castle Balakrishna Street, Mylapore Chennai
Status	Partnership	Partnership

1.2 QUARRY DETAILS WITHIN 500 M RADIUS

***PROPOSED QUARRIES**				
CODE	**Name of the Owner**	**S.F. Nos**	**Extent**	**Status**
P1	**Tvl.S.S.Minerals,**	95/2A, 2B, 4B, 4C, 5A, 5B, 6A, 6B, 97/2B & 2E	2.10.0 ha Kottathur village	Lr.No. SEIAA-TN/F.No.6261/SEAC/l(a)ToR-2025 Dated: 03.03.2025
P2	**Tvl.Riverways Mines and Minerals Ltd**	137/7, 348/1A, 1B, 1C1, 1C2, 1C3, 2B1, 3A, 4, 5, 6B, 7A, 8, 9, 11, 12 & 13	3.07.0 ha Naduvalur Village	Tor obtained vide Lr. No SEIAA TN/F.No.6260/ SEAC/ToR-1565/2018 Dated: 19.09.2023
P3	**Tvl.Riverways Mines and Minerals Ltd**	390(P)	4.80.0 Ha Kottathur village	Tor obtained vide Lr. No. SEIAA-TN/F.No.6508/SEAC/1(a)ToR-1497/2023 Dated: 22.06.2023
P4	**M\s. Riverways Mines and Minerals Ltd**	390(P)	4.90.0 Ha	Tor obtained vide Lr. No. SEIAA-TN/F.No.6510/SEAC/ToR-1490/2023 Dated: 22.06.2023
P5	**Tvl.Riverways Mines and Minerals Ltd**	390(P)	4.75.0 Ha	Tor obtained vide Lr. No. SEIAA-TN/F.No.6511/SEAC/1(a)/ToR-1478/2023 Dated: 22.06.2023
P6	**Tvl.Riverways Mines and Minerals Ltd**	390(P)	4.75.5 Ha	Tor obtained vide Lr. No. SEIAA-TN/F.No.6507/SEAC/1(a)/ToR-1487/2023 Dated: 22.06.2023
P7	**Tvl.S.S.Minerals**	390(P)	4.75.0 Ha	Tor obtained vide Lr. No. SEIAA-TN/F.No.6509/SEAC/1(a)/ToR-1493/2023 Dated: 22.06.2023
		Total	**29.12.50 ha**	
TOTAL CLUSTER EXTENT*			**29.12.50 Ha**	

TABLE 1.3: BRIEF DESCRIPTION OF THE PROJECT – P1

Name of the Mine	Tvl.S.S. Minerals garnet Sand Mine
Land Ownership	It is a Patta land, S.F.No. 95/2A, 2B, 5A, 5B, 6A, 6B, registered in the name of Tvl.S.S. Minerals Managing Partner vide patta no. 1183 and S.F.No. 95/4B, 97/2B, 97/2E, registered in the name of Tvl.S.S. Minerals Sundaramoorthyvide patta no. 2643 & S.F.No. 95/4C, registered in the name of Balasubramaniyan vide patta no. 2644 The lease deed was executed hence the land is under mining lease.
Land classification	It is a Patta Land-Punjai (Barren Land)
SF No & Area (Ha)	95/2A, 2B, 5A, 5B, 6A, 6B, 4B, 4C, 97/2B & 97/2E & 2.10.0 Ha
Village,Taluk & District	Kottathur village, Musiri Taluk and Trichy District

Toposheet No	58-I/12	
Latitude between	11°06.197'N to 11°06.097'N	
Longitude between	78°39.590'E to 78°39.506'E	
Highest Elevation	126-127m MSL	
Proposed Depth of Mining	2.5m below the ground level	
Geological Resources	**Garnet in Tonnes**	
	78,242	
Mineable Reserves	**Garnet in Tonnes**	
	39,544	
Yearwise Production	**Garnet in Tonnes**	
	39,544	
Yearwise Production @35% Garnet Recovery	**Garnet in Tonnes**	
	13,840	
Peak production Capacity	19,780 Tonnes of ROM	
Ultimate Pit Dimension	162m (L) x 78m (W) x 2.5m (D) bgl	
Water Level in the surrounds area	33-35 m bgl	
Method of Mining	Non-Conventional Opencast Mining Method without drilling and blasting	
Topography	The lease is a patta land dry and unirrigated land. Only thorny bushes are found around the lease area. The main crops in the adjacent area being maize, cereals etc which are grown as seasonal crops.	
Machineries	Front and Back hoe loader	1 No
	Trucks	1 Nos
Proposed Manpower Deployment	12 Nos	
Project Cost	Rs. 13,50,000/-	
EMP cost	Rs. 3,80,000/-	
CER Cost	Rs. 2,00,000/-	
Nearby Water Bodies	Vari	30m South
	Eri	100m SE
	Tank	2.9km West
	Tank	6.0km NE
Greenbelt Development Plan	It is proposed to plant 1000 Nos of trees in the safety barrier and village road.	
Proposed Water Requirement	1.2 KLD	
Nearest Habitation	580m South West	

Source: Approved Mining Plan

TABLE 1.3A: BRIEF DESCRIPTION OF THE PROJECT – P2

Name of the Mine	Tvl. Riverways Mines and Minerals Ltd
Land Ownership	It is a Patta land, registered in the name of Riverways Mines and Minerals Ltd vide.1438
Land classification	It is a Patta Land-Punjai (Barren Land)
SF No & Area (Ha)	137/7, 348/1A, 1B, 1C1, 1C2, 1C3, 2B1, 3A, 4, 5, 6B, 7A, 8, 9, 11, 12 & 13
Village,Taluk & District	Naduvalur village, Thuraiyur Taluk and Trichy District
Toposheet No	58-I/12
Latitude between	11°06.013'N to 11°06.136'N
Longitude between	78°39.368'E to 78°39.613'E
Highest Elevation	125-127m MSL
Proposed Depth of Mining	2.5m below the ground level
Geological Resources	**Garnet in Tonnes**
	1,19,474
Mineable Reserves	**Garnet in Tonnes**

	49,366	
Yearwise Production	**Garnet in Tonnes**	
	49,366	
Yearwise Production @35% Garnet Recovery	**Garnet in Tonnes**	
	17,278	
Peak production capacity	24,948 Tonnes	
Existing pit dimension (As per Approved mining plan)	Pit-I: 70m (L) x 17m (W) x 2.0m (D) bgl	
Ultimate Pit Dimension	Pit – I: 142m (L) x 82m (W) x 2.5m (D) bgl Pit – II : 95m (L) x 36m (W) x 2.5m (D) bgl	
Water Level in the surrounds area	33-35 m bgl	
Method of Mining	Non-Conventional Opencast Mining Method without drilling and blasting	
Topography	The lease applied area for lease is a patta land dry and unirrigated land. Only thorny bushes are found around the lease area. The main crops in the adjacent area being maize, cereals etc which are grown as seasonal crops.	
Machineries	Front and Back hoe loader	1 No
	Trucks	1 Nos
Proposed Manpower Deployment	16 Nos	
Project Cost	Rs. 14,60,000/-	
EMP cost	Rs. 3,80,000/-	
CER Cost	Rs. 2,00,000/-	
Nearby Water Bodies	Vari	10m Safety -North
	Eri	50m Safety-East
	Tank	2.5km West
	Tank	6km NE
Greenbelt Development Plan	It is proposed to plant 1500 Nos of trees in the safety barrier and village road.	
Proposed Water Requirement	1.0 KLD	
Nearest Habitation	320m Southwest	

1.3 STATUTORY DETAILS

As per MoEF & CC notification vide S.O.1533(E) dated 14.09.2006 and its subsequent amendments, non-coal mining projects are divided into the following categories as mentioned in belw table

MoEF & CC Notification reference	**Project or Activity**		**Category with threshold limit**		**Conditions if any**
			A	**B**	
S.O. 1886(E) dated 20.04.2022	1 (a)	Mining of Minerals	> 250 Ha of mining lease area in respect of non-coal mine lease	All mining lease area in respect of minor minerals leases and < 250 Ha mining lease area in respect of major mineral mining lease other than coal.	General condition shall apply

Source: MoEF&CC Notifications S.O.1533(E) dated 14.09.2006, S.O.3977(E) dated 14.08.2018, S.O.3194(E) dated 14.07.2022

Considering that this is a Garnet sand mining project which is a major mineral, this project falls under Sector 1(a) i.e.; Mining of Minerals under Category B1 and as per MoEF & CC notification, this proposal necessitates preparation of EIA/EMP report along with public hearing.

Since the 2 leases belong to 2 associate companies of the same promoters and are in cluster situation within 500m radius, a common EIA report for the two leases having separate EMP Plan for individual projects has been

prepared. As such this combined EIA report is prepared based on standard and additional Terms of Reference issued by SEIAA, Tamil Nadu and is in conformance of the generic structure prescribed by MOEF&CC and approved mining plan.

SCOPING & SCOPING – P1 (Tvl. S.S. Minerals – File No 6261)

Meeting No	SEAC Meeting & Remarks	SEIAA Meeting
341st SEAC Meeting Dated 29.12.2022 & 586th SEIAA Meeting Dated 25.01.2023	Proposal Defer Reason: PP should submit the G.O Copy to permit the Garnet mine & Cluster Letter from Department of Geology and Mining.	Communicate the SEAC minutes to Proponent
382nd SEAC Meeting Dated 09.06.2023 632nd SEIAA Meeting Dated 21.06.2023 & 22.06.2023	Recommended for Terms of Reference	Refer back the Proposal to SEAC for want of additional particulars
404th SEAC Meeting Dated 25.08.2023	Re iterate the recommendations already taken during the 382nd SEAC Meeting	Approved the proposal for the Terms of Reference

SCREENING & SCOPING – P2 (Tvl. Riverwaays Mines & Minerals Ltd)

Meeting No	SEAC Meeting & Remarks	SEIAA Meeting
341st SEAC Meeting Dated 29.12.2022 & 586th SEIAA Meeting Dated 25.01.2023	Proposal Defer Reason: PP should submit the G.O Copy to permit the Garnet mine & Cluster Letter from Department of Geology and Mining.	Communicate the SEAC minutes to Proponent
382nd SEAC Meeting Dated 09.06.2023 632nd SEIAA Meeting Dated 21.06.2023 & 22.06.2023	Recommended for Terms of Reference	Refer back the Proposal to SEAC for want of additional particulars
404th SEAC Meeting Dated 25.08.2023	Re iterate the recommendations already taken during the 382nd SEAC Meeting	Approved the proposal for the Terms of Reference

1.4 PROJECT DESCRIPTION

The Project site specific and there is no additional area required for this project. There is no effluent generation/discharge from proposed project. It is an existing mine, mining lease granted by the Government of India. The mining operation will be carried out by opencast Mining method involving excavating of Garnet by using Excavator and tippers no processing is involved in the lease area.

2.1 SITE CONNECTIVITY TO THE PROJECT AREA

Nearest Roadway	National Highway (NH-38) Trichy - Villupuram – 18 km-E State Highway (SH-142) Thuraiyur - Perambalur Road – 5 km-North Major District Road (MDR 144) Manachanallur- Perambalur – 4.30 NE
Nearest Village	Kottathur – 1.25 Km East
Nearest Town	Thuraiyur 8 km – Northwest
Nearest Railway Station	Tiruchirappalli Railway station – 33 Km – SE
Nearest Airport	Tiruchirappalli –38 km – South East
Seaport	Chennai -278 km – South East

2.2 LAND USE PATTERN OF THE PROPOSED PROJECT-P1

Description	Present area (Ha)	Area at the end of this Mining period (Ha)
Mining Pit	0.07.0	1.26.3
Infrastructure	Nil	0.35.0
Afforestation	Nil	0.01.00
Mine Roads	0.01.00	0.03.0
Unutilized Area	2.02.0	0.44.7
Grand Total	**2.10.0**	**2.10.0**

2.2A LAND USE PATTERN OF THE PROPOSED PROJECT-P2

Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
Mining Pit	0.11.9	1.59.1
Infrastructure	Nil	0.01.0
Afforestation	Nil	Nil
Mine Roads	0.01.00	0.03.0
Unutilized Area	2.94.1	1.35.4
Grand Total	**3.07.0**	**3.07.0**

2.3 OPERATIONAL DETAILS OF LEASE APPLIED AREA-P1

PARTICULARS	DETAILS
	Garnet (5Year Plan period)
Geological Resources	78,242 Ts
Mineable Reserves	39,544 Ts
Production for five-year plan period	38,914 Ts
Mining Plan Period	5 years
Number of Working Days	300 days
Production per day	25 Ts
Total Depth of Mining	2.5m below the ground level

2.3A OPERATIONAL DETAILS OF LEASE APPLIED AREA-P2

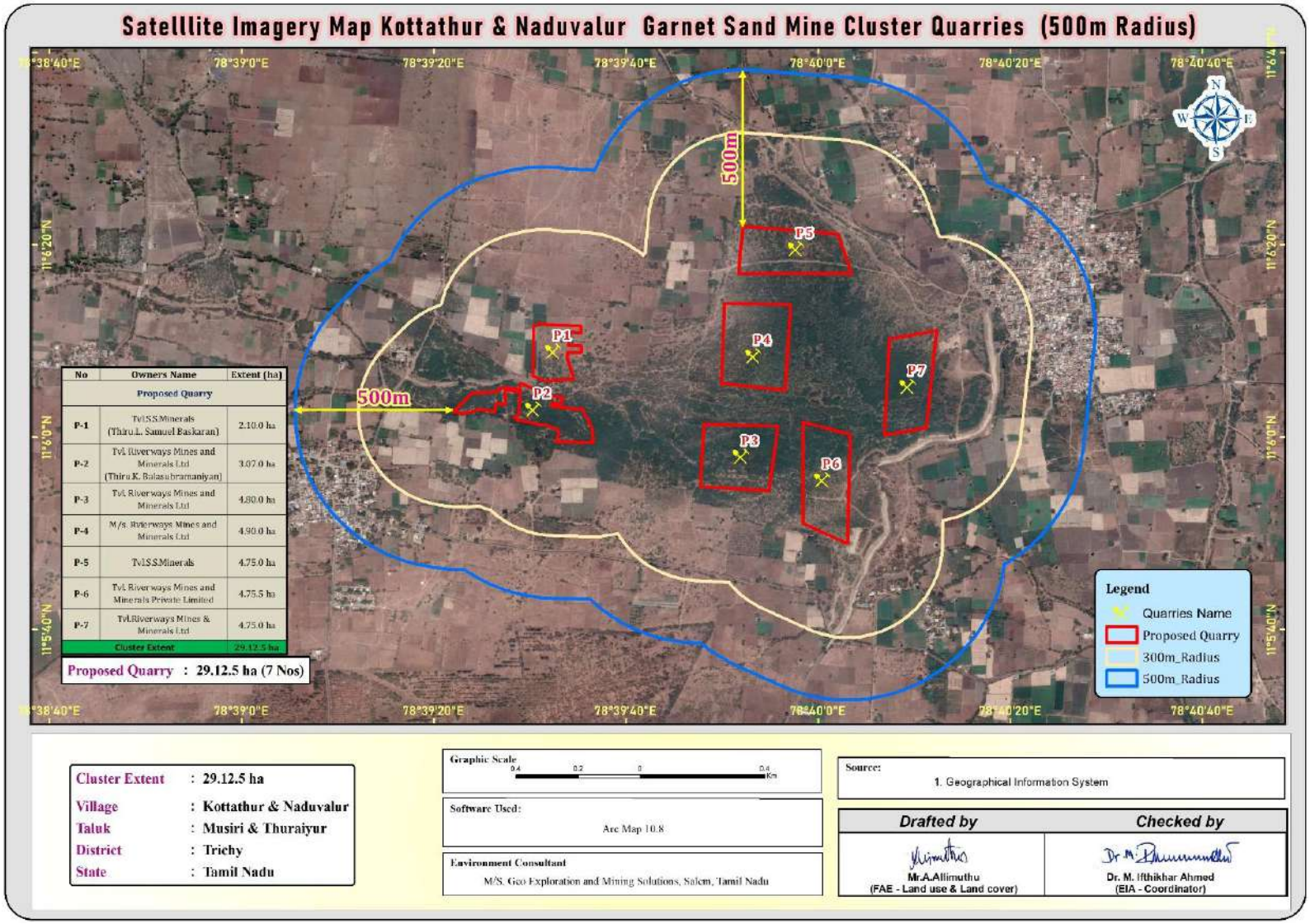
PARTICULARS	DETAILS
	Garnet (5Year Plan period)
Geological Resources	1,19,474 Ts
Mineable Reserves	49,366 Ts
Production for five-year plan period	49,366 Ts
Mining Plan Period	5 years
Number of Working Days	300 days
Production per day	32
Total Depth of Mining	2.5m below the ground level

Source: Mining plan

FIGURE 1: GOOGLE IMAGE OF THE PROJECT AREA- P1

FIGURE 2: GOOGLE IMAGE OF THE PROJECT AREA- P2

FIGURE – 3: GOOGLE IMAGE SHOWING CLUSTER (500 m QUARRIES)



No	Owners Name	Extent (ha)
	Proposed Quarry	
P-1	TvlS.S.Minerals (Thiru.L. Samuel Baskaran)	2.10.0 ha
P-2	Tvl. Riverways Mines and Minerals Ltd (Thiru.K. Balasubramaniyan)	3.07.0 ha
P-3	Tvl. Riverways Mines and Minerals Ltd	4.80.0 ha
P-4	M/s. Rivierways Mines and Minerals Ltd	4.90.0 ha
P-5	TvlS.S.Minerals	4.75.0 ha
P-6	Tvl. Riverways Mines and Minerals Private Limited	4.75.5 ha
P-7	Tvl.Riverways Mines & Minerals Ltd	4.75.0 ha
	Cluster Extent	29.12.5 ha

FIGURE – 4: TOPOSHEET MAP COVERING 10 KM RADIUS

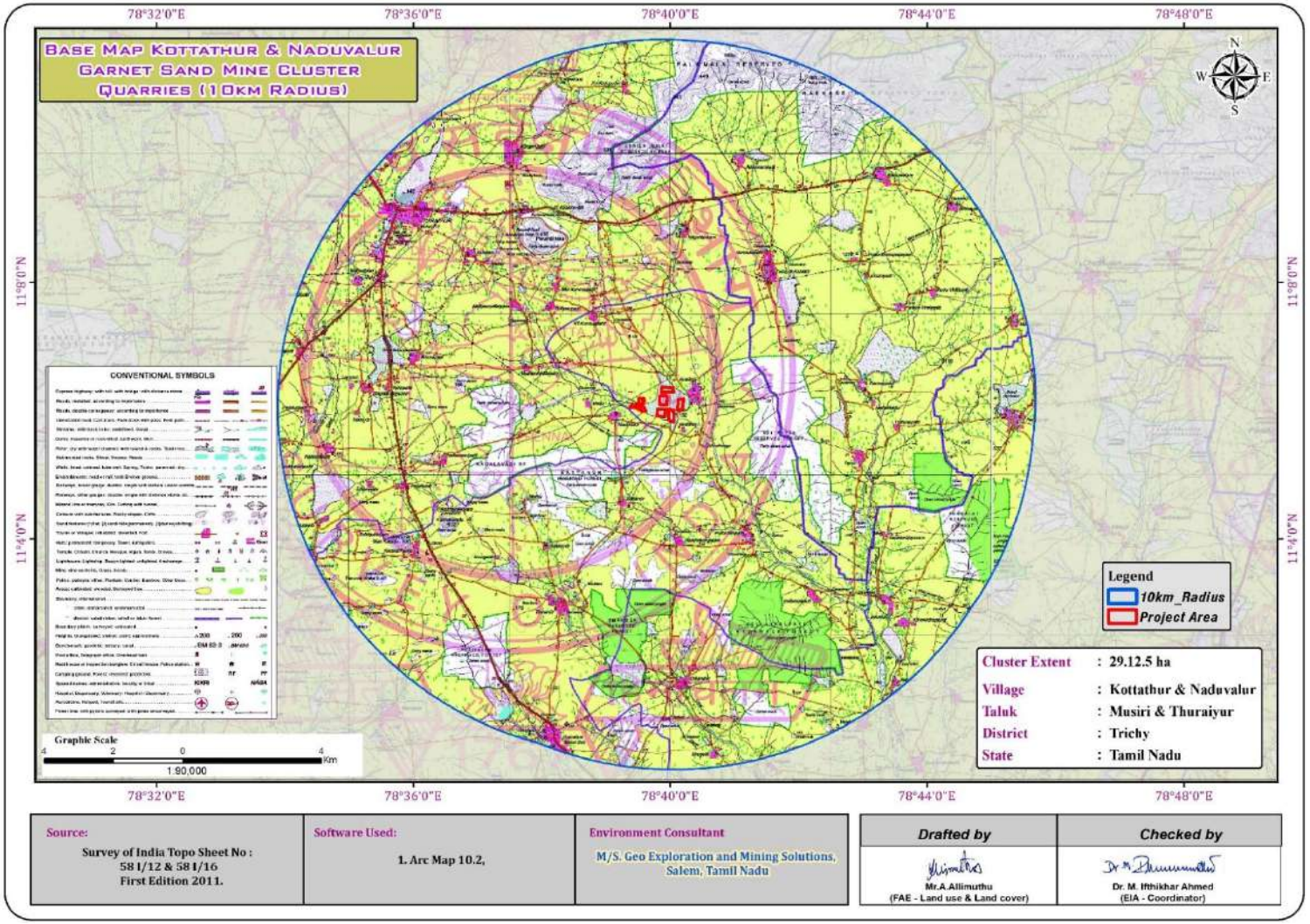
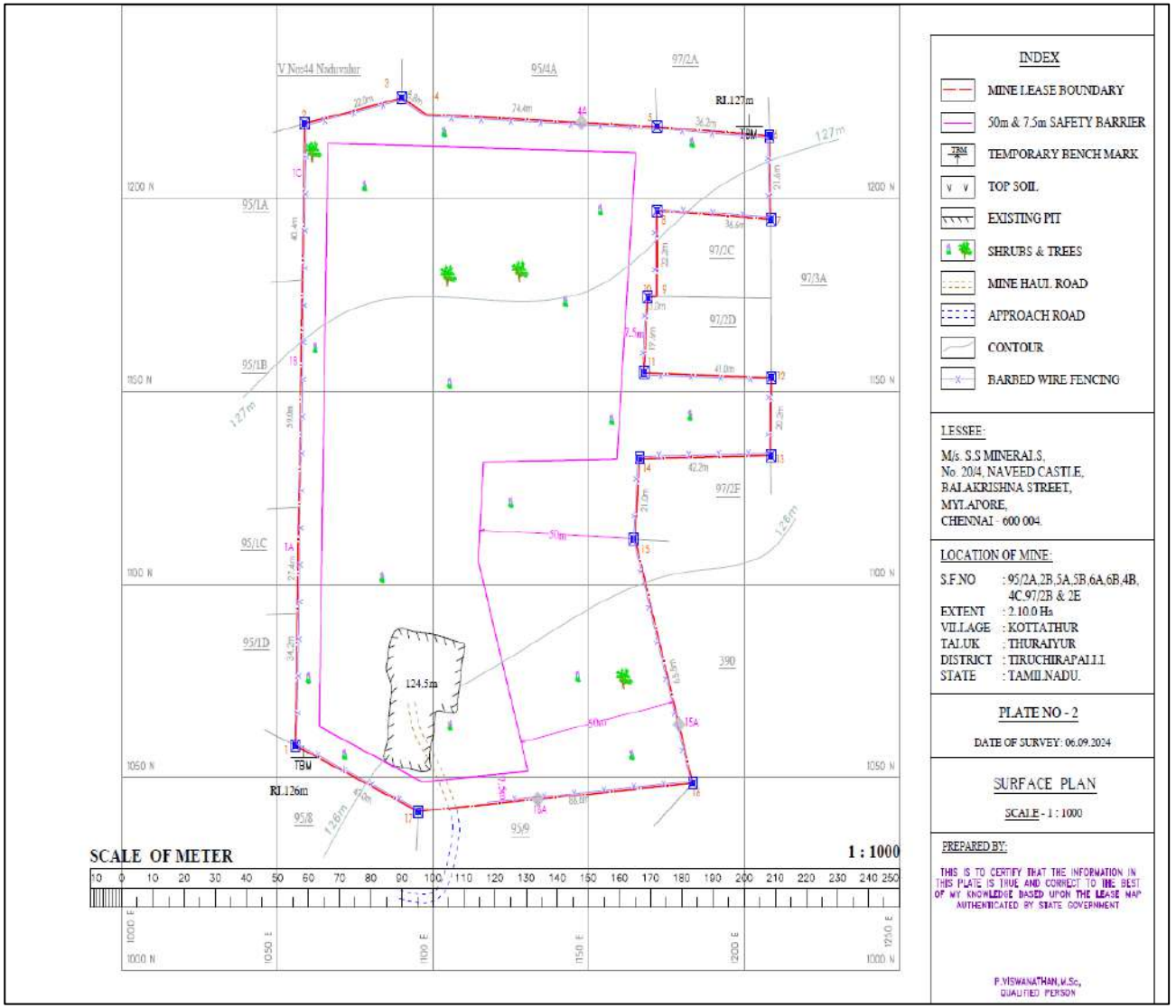


FIGURE 5: QUARRY LEASE PLAN / SURFACE PLAN



2.4 METHOD OF MINING

Opencast manual mining method using spades axes & baskets, loading it in to trucks/tippers and transportation. No drilling and blasting involved

Initially, top clayey soil will be removed and dumped temporarily in the earmarked dump site based on the requirement and later spread over backfilled area for reclamation purposes. Mined garnet rich stream sediments (ROM) will be transported to the pre-concentration plant for separation of garnet sand. The waste/mineral reject generated in the plant will be brought back and backfilled in the mined-out void. Top soil will be spread over the backfilled area and the mined-out pit will be restored back to pre-mining condition. After creation of sufficient floor width simultaneous production and backfilling & reclamation will be resorted. No Drilling and Blasting Activities has been proposed. No Excavators, Poclains will be involved in this project.

2.5 CONCEPTUAL MINING PLAN/ FINAL MINE CLOSURE PLAN

The ultimate pit size is designed based on certain practical parameters such as economical depth of mining, safety zones, permissible area, etc.,

2.6 ULTIMATE PIT DIMENSION

PROPOSAL - P1			
Pit	**Length (Max) (m)**	**Width (Max) (m)**	**Depth (Max)**
I	162	78	2.5 m bgl
PROPOSAL – P2			
Pit	**Length (Max) (m)**	**Width (Max) (m)**	**Depth (Max)**
I	142	82	2.5 m bgl
II	95	36	2.5 m bgl

3.0 DESCRIPTION OF THE ENVIRONMENT

This chapter presents a regional background to the baseline data at the very onset, which will help in better appreciation of micro-level field data, generated on several environmental and ecological attributes of the study area. The baseline status of the project environment is described section wise for better understanding of the broad-spectrum conditions. The baseline environment quality represents the background environmental scenario of various environmental components such as Land, Water, Air, Noise, Biological and Socio-economic status of the study area. Field monitoring studies to evaluate the base line status of the project site were carried out covering October 2024 – December 2024 with CPCB guidelines. Environmental data has been collected with reference to cluster quarries by Creative Engineers & Consultants, – An accredited by ISO/IEC 17025:2017 (NABL) Laboratory

3.1 ENVIRONMENT MONITORING ATTRIBUTES

Attribute	**Parameters**	**Frequency of Monitoring**	**No. of Locations**	**Protocol**
Land-use Land cover	Land-use Pattern within 10 km radius of the study area	Data's from census handbook 2011 and from the satellite imagery	Study Area	Satellite Imagery Primary Survey

*Soil	Physio-Chemical Characteristics	Once during the study period	3 (1 core & 2 buffer zone)	IS 2720 Agriculture Handbook - Indian Council of Agriculture Research, New Delhi
*Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the study period	5 (5 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
*Ambient Air Quality	PM10 PM2.5 SO2 NOX Fugitive Dust	24 hourly twice a week (October to December 2024)	5 (1 core & 4 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	5 (1 core & 4 buffer zone)	IS 9989 As per CPCB Guidelines
Ecology	Existing Flora and Fauna	Through field visit during the study period	Study Area	Primary Survey by Quadrate & Transect Study Secondary Data – Forest Working Plan
Socio Economic Aspects	Socio–Economic Characteristics, Population Statistics and Existing Infrastructure in the study area	Site Visit & Census Handbook, 2011	Study Area	Primary Survey, census handbook & need based assessments.

3.2 LAND ENVIRONMENT

To study the land use pattern of the core as well as a buffer zone, land use/land cover details have been identified/ maps have been prepared in accordance with the Standard ToR point**.** A visual interpretation technique has been adopted for land use supervised classification based on training site by Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through **LISSIII, Bhuvan, NRSC**. The 10 km radius map of study area was taken for analysis of **Land use/Landcover.**

TABLE 3.1: LAND USE / LAND COVER TABLE 10 KM RADIUS

S.No	CLASSIFICATION	AREA_HA	AREA_%
	BUILTUP		
1	URBAN	500.01	1.41
2	RURAL	265.57	0.75
3	MINING	12.65	0.04
	AGRICULTURAL LAND		
4	CROP LAND	23554.23	66.43
5	FALLOW LAND	2887.37	8.14
6	PLANTATION	135.79	0.38
	FOREST		
7	FOREST	3747.82	10.57

	BARREN/WASTE LANDS		
8	SCRUB LAND	2451.79	6.91
9	SALT AFFECTED LAND	152.39	0.43
	WETLANDS/ WATER BODIES		
10	WATER BODIES/LAKE/RIVER	1748.80	4.93
TOTAL		**35456.41**	**100.00**

Interpretation & Conclusion

From the above table, pie diagram and land use map it is inferred that the majority of the land in the study area is Agriculture and fallow land (includes crop land) 74.95% followed by Built-up Lands – 2.16%, Scrub & Forest land – 6.91 to 10.57%, and Water bodies 4.93%. The total mining area within the study area is 12.65 ha i.e., 0.04%.

3.3 SOIL ENVIRONMENT

The samples were analysed as per the standard methods prescribed in "Soil Chemical Analysis (M.L. Jackson, 1967) & Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India". The important properties analysed for soil are bulk density, porosity, infiltration rate, pH and Organic matter, kjeldahi Nitrogen, Phosphorous and Potassium

Physical Characteristics –

Results of the soil samples show that the Electrical Conductivity values were ranging between 35.97 – 110.2 µmhos/cm. Soils are generally clay, silt loam, loam and sandy loam type. Organic matter values were ranging between 0.56 – 1.25 %.

Chemical Characteristics –

- The soil of pH values ranging between 6.65 to 7.19
- The available Nitrogen content range between 136 to 522 mg/kg
- The available Phosphorus content range between 0.86 to 1.12 µg/g
- The available Potassium range between 715 to 1172 mg/kg
- The available Sodium range between 860 to 1032 mg/kg

3.4 WATER ENVIRONMENT

Ground Water

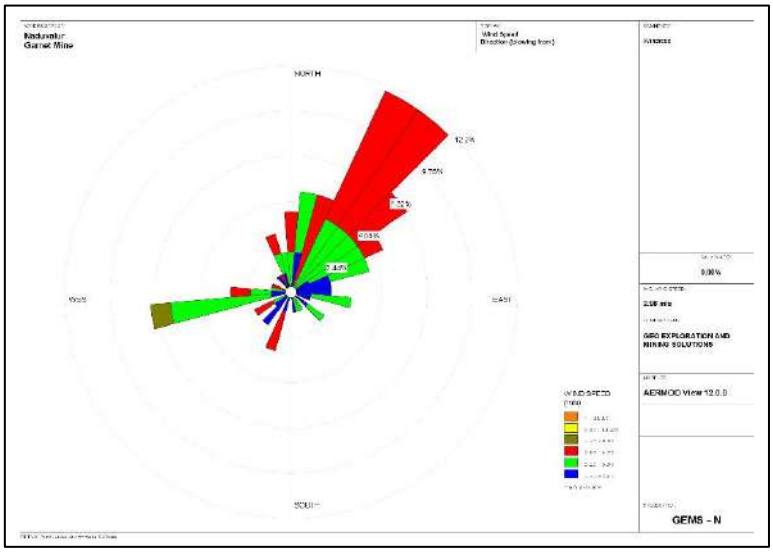
The pH of the water samples collected ranged from 6.97 to 7.58 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are ranged from 94.5 – 415 mg/l. On Turbidity, the water samples meet the requirement. The Total Dissolved Solids were found in the range of 440 - 930 mg/l in all samples. The Total Iron Content varied between 0.04 – 0.09 mg/l for all samples.

On Microbiological parameters, the water samples from all the locations meet the requirement. The parameters thus analysed were compared with IS 10500:2012 and are well within the prescribed limits.

3.5 AIR ENVIRONMENT

The baseline studies on air environment include identification of specific air pollution parameters and their existing levels in ambient air. The ambient air quality with respect to the study zone of 10 km radius around the proposed quarry forms the baseline information.

FIGURE – 6: WIND ROSE DIAGRAM



3.6 SUMMARY OF AMBIENT AIR QUALITY

In the Core zone locations, it is observed that, in the ambient air, the PM10 values were in the range of 42.4 – 52.1 µg/m3. PM2.5 values were in the range of 19.5 – 24.0 µg/m3. SO2 levels were ranging from 4.6 – 6.9 µg/m3. NO2 levels were ranging from 7.5 – 9.8 µg/m3.

In the five buffer zone locations, it is observed that, in the ambient air, the PM_{10} values were in the range of 41.1 – 60.1 µg/m^3. $PM_{2.5}$ values were in the range of 18.6 – 27.6 µg/m^3. SO_2 levels were ranging from 4.4 – 7.8 µg/m^3. NO2 levels were ranging from 7.2 – 11.2 µg/m^3.

While comparing with the NAAQ Norms, all monitored values of PM_{10}, $PM_{2.5}$, SO_2, and NO_2 values were found to be well within the prescribed standards. The CO values in the all locations found to be below detectable limit (DL – 1144 µg/ m^3). Silica values in the study area are found to be below detectable limit (DL – 0.05 mg/ m^3) which is well within the prescribed limit of 5 mg/m^3.

3.7 NOISE ENVIRONMENT

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at five (5) locations. The noise level monitoring locations were carried out by covering commercial, residential, rural areas within the radius of 10km. A noise monitoring methodology was chosen such that it best suited the purpose and objectives of the study.

3.8 ECOLOGICAL ENVIRONMENT

The study involved in the collection of primary data by conducting a survey in the field, examination of floral and faunal records in previously published reports and records. Analysis of the information is the view of the possible alteration in the environment of the project site. For the survey of fauna, both direct and indirect observation methods were used.

There is no schedule I species of animals observed within study area as per Wildlife Protection Act 1972 as well as no species is in vulnerable, endangered or threatened category as per IUCN. There is no endangered red list species found in the study area. Hence this small operation over short period of time will not have any significant impact on the surrounding flora and fauna.

3.9 SOCIO ECONOMIC ENVIRONMENT

It includes demographic structure of the area, provision of basic amenities viz., housing, education, health and medical services, occupation, water supply, sanitation, communication, transportation, prevailing diseases pattern as well as feature like temples, historical monuments etc., at the baseline level. This will help in visualizing and predicting the possible impact depending upon the nature and magnitude of the project.

The socio-economic study of surveyed villages gives a clear picture of its population, average household size, literacy rate and sex ratio etc. It is also found that a part of population is suffering from lack of permanent job to run their day-to-day life. Their expectation is to earn some income for their sustainability on a long-term basis.

The proposed projects will aim to provide preferential 28 persons to the local people there by improving the indirect employment opportunity for 50 persons and in turn the social standards will improve.

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

In order to maintain the environmental commensuration with the mining operation, it is essential to undertake studies on the existing environmental scenario and assess the impact on different environmental components. This would help in formulating suitable management plans sustainable resource extraction.

4.1 LAND ENVIRONMENT:

ANTICIPATED IMPACT

- Permanent or temporary change on land use and land cover.
- Change in Topography: Topography of the ML area will change at the end of the life of the mine.
- Movement of heavy vehicles sometimes cause problems to agricultural land, human habitations due to dust, noise and it also causes traffic hazards.
- Due to degradation of land by pitting the aesthetic environment of the core zone may be affected.
- Earthworks during the rainy season increase the potential for soil erosion and sediment laden water entering the water ways.
- If no due care is taken wash off from the exposed working area may choke the water course & can also cause the siltation of water course.

MITIGATION MEASURES

- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development of greenbelt etc.
- Construction of garland drains
- Green belt development along the boundary within safety zone. The small quantity of water stored in the mined-out pit will be used for greenbelt.
- Thick plantation will be carried out on unutilized area, top benches of mined out pits, on safety barrier, etc.,
- At conceptual stage, the land use pattern of the Mine will be changed into Greenbelt area and temporary reservoir
- In terms of aesthetics, natural vegetation surrounding the Mine will be retained (such as in a buffer area i.e., 7.5 m safety barrier and other safety provided) so as to help minimise dust emissions.
- Proper fencing will be carried out at the conceptual stage, Security will be posted round the clock, to prevent inherent entry of the public and cattle.

4.2 SOIL ENVIRONMENT

IMPACT ON SOIL ENVIRONMENT

Erosion and Sedimentation (Removal of protective vegetation cover; Exposure of underlying soil horizons that may be less pervious, or more erodible than the surface layers; Reduced capacity of soils to absorb rainfall; Increased energy in storm-water runoff due to concentration and velocity; and Exposure of subsurface materials which are unsuitable for vegetation establishment).

MITIGATION MEASURES FOR SOIL CONSERVATION

- Run-off diversion – Garland drains will be constructed all around the project boundary to prevent surface flows from entering the quarry works areas. And will be discharged into vegetated natural drainage lines, or as distributed flow across an area stabilised against erosion.
- Sedimentation ponds - Run-off from working areas will be routed towards sedimentation ponds. These trap sediments and reduce suspended sediment loads before runoff is discharged from the quarry site. Sedimentation ponds should be designed based on runoff, retention times, and soil characteristics. There may be a need to provide a series of sedimentation ponds to achieve the desired outcome.
- Retain vegetation – Retain existing or re-plant the vegetation at the site wherever possible.
- Monitoring and maintenance – Weekly monitoring and daily maintenance of erosion control systems so that they perform as specified specially during rainy season

4.3 WATER ENVIRONMENT

ANTICIPATED IMPACT

- The major sources of water pollution normally associated due to mining and allied operations are:
    - Generation of waste water from vehicle washing.
    - Washouts from surface exposure or working areas
    - Domestic sewage
    - Disturbance to drainage course in the project area
- Increase in sediment load during monsoon in downstream of lease area
- This being a mining project, there will be no process effluent. Waste from washing of machinery may result in discharge of Oil & grease, suspended solids.
- The sewage from soak pit may percolate to the ground water table and contaminate it.
- Surface drainage may be affected due to Mining

MITIGATION MEASURES

- Garland drain, settling tank will be constructed along the project area. The Garland drain will be connected to settling tank and sediments will be trapped in the settling traps and only clear water will be discharged out to the natural drainage
- Providing benches with inner slopes and through a system of drains and channels, allowing rain water to descent into surrounding drains, so as to minimize the effects of erosion & water logging arising out of uncontrolled descent of water
- ;
- Periodic (every 6 month once) analysis of quarry pit water and ground water quality in nearby villages
- Domestic sewage from site office & urinals/latrines provided in ML is discharged in septic tank followed by soak pits
- Waste water discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes
- De-silting will be carried out before and immediately after the monsoon season
- Regular monitoring (every 6 month once) and analysing the quality of water in open well, bore wells and surface water.

4.4 AIR ENVIRONMENT

ANTICIPATED IMPACT

During mining, at various stages activities such as excavation, transportation of materials, loading, hauling operation and handling of mineral Garnet. particular matter (PM),

The fugitive dust released from the mining operations may cause effect on the mine workers who are directly exposed to the fugitive dust.

MITIGATION MEASURES

Haul Road & Transportation –

- Water will be sprinkled on haul roads twice a day to avoid dust generation during transportation.
- Transportation of material will be carried out during day time and material will be covered with tarpaulin.
- The speed of tippers plying on the haul road will be limited below 20 km/hr to avoid generation of dust.
- Water sprinkling on haul roads & loading points will be carried out twice a day.
- Main source of gaseous pollution will be from vehicle used for transportation of mineral; therefore, weekly maintenance of machines improves combustion process & makes reduction in the pollution.
- The un-metalled haul roads will be compacted weekly before being put into use.
- Over loading of tippers will be avoided to prevent spillage.
- It will be ensured that all transportation vehicles carry a valid PUC certificate
- Grading of haul roads and service roads to clear accumulation of loose materials.

Green Belt –

- Planting of trees all along main mine haul roads and regular grading of haul roads will be practiced to prevent the generation of dust due to movement of dumpers/trucks
- Green belt of adequate width will be developed around the project areas.

Occupational Health –

- Dust mask will be provided to the workers and their use will be strictly monitored.
- Annual medical check-ups, trainings and campaigns will be arranged to ensure awareness about importance of wearing dust masks among all mine workers & tipper drivers.
- Ambient Air Quality Monitoring will be conducted six months once to assess effectiveness of mitigation measures proposed.

4.5 NOISE ENVIRONMENT

ANTICIPATED IMPACT

Noise level will be increase due to excavation and transportation of mineral. However, the expected noise levels are not likely to have any adverse effect from the occupational health point of view.

MITIGATION MEASURES

- Proper maintenance, oiling and greasing of machines will be done every week to reduce generation of noise;
- Provision of sound insulated chambers for the workers working on machines (HEMM) producing higher levels of noise;
- Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured though training and awareness.

- Periodical monitoring of noise level in and around mine site will be carried out & records are maintained.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects.

4.6 BIOLOGICAL ENVIRONMENT

ANTICIPATED IMPACT

The developmental programs, policies, and projects operated or managed by government or private bodies can cause potentially significant changes in the physical, biological, and socio-economic environment. In some cases, the changes may be beneficial while in others it may be detrimental to the environment. Accordingly, environmental impact studies are required for systematic identification, qualification, and interpretation of the anticipated changes. The main environmental problems associated with mining activities are deforestation, land degradation (change in topography, soil erosion), visual intrusion, disturbance to the hydrological system, and water, air, and noise pollution which ultimately impact upon the floral and faunal status of the project area.

MITIGATION MEASURES

Keeping all this in mind the mitigations have been suggested under environmental management plan. With the understanding of the role of plant species as bio-filter to control air pollution, appropriate plant species (mainly tree species) have been suggested conceding the area/site requirements and needed performance of specific species. The details of year wise proposed plantation program.

The main objective of the green belt is to provide a barrier between the source of pollution and the surrounding areas

In order to compensate the loss of vegetation cover, it is suggested to carry out afforestation program mainly in proposed areas falls in the cluster earmarked for plantation program as per Approved Mining Plan in different phases. This habitat improvement program would ensure the faunal species to re-colonize and improve the abundance status in the core zone.

The objectives of the green belt cover will cover the following:

- Noise abatement
- Ecological restoration
- Aesthetic, biological and visual improvement of area due to improved vegetative and plantations cover.

GREENBELT DEVELOPMENT PLAN

No of Trees proposed to be planted	Name of the Species	Area to be covered sq.m
1420	Neem, Vilvam, Ashokha, Panai, etc	Near 7.5m safety distance, panchayat road and village road

4.7 SOCIO ECONOMIC ENVIRONMENT

ANTICIPATED IMPACT

- Dust generation from mining activity can have negative impact on the health of the workers and people in the nearby area.
- Approach roads can be damaged by the movement of tippers
- Increase in Employment opportunities both direct and indirect thereby increasing economic status of people of the region.

MITIGATION MEASURES

- Good maintenance practices will be adopted for all machinery and equipment, which will help to avert potential noise problems.
- Green belt will be developed in and around the project site as per Central Pollution Control Board (CPCB) guidelines.
- Air pollution control measure will be taken to minimize the environmental impact within the core zone.
- For the safety of workers, personal protective appliances like hand gloves, helmets, safety shoes, goggles, aprons, nose masks and ear protecting devices will be provided as per mines act and rules.
- Benefit to the State and the Central governments through financial revenues by way of royalty, tax, duties, etc.., from this project directly and indirectly.
- From above details, the quarry operations will have highly beneficial positive impact in the area.

5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

No alternatives are suggested as all the mine sites are mineral specific.

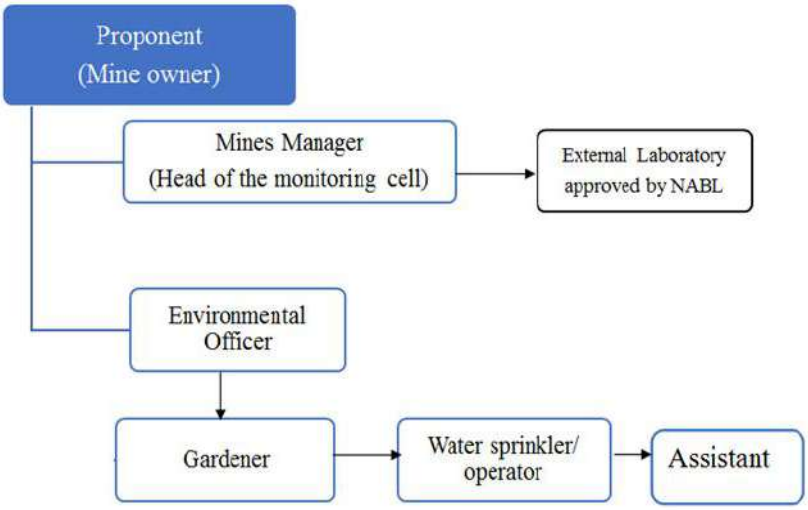
6. ENVIRONMENT MONITORING PROGRAM

An Environment monitoring cell (EMC) will be constituted to monitor the implementation of EMP and other environmental protection measures in all the proposed quarries.

The responsibilities of this cell will be:

- Implementation of pollution control measures
- Monitoring programme implementation
- Post-plantation care
- To check the efficiency of pollution control measures taken
- Any other activity as may be related to environment
- Seeking expert’s advice when needed.

6.1 ENVIRONMENTAL MONITORING CELL



6.2 POST ENVIRONMENTAL CLEARANCE MONITORING SCHEDULE

S. No.	Environment Attributes	Location	Monitoring		Parameters
			Duration	Frequency	
1	Air Quality	2 Locations (1 Core & 1 Buffer)	24 hours	Once in 6 months	Fugitive Dust, PM2.5, PM10, SO2 and NOx.
2	Meteorology	At mine site before start of Air Quality Monitoring & IMD Secondary Data	Hourly / Daily	Continuous online monitoring	Wind speed, Wind direction, Temperature, Relative humidity and Rainfall
3	Water Quality Monitoring	2 Locations (1SW & 1 GW)	-	Once in 6 months	Parameters specified under IS:10500, 1993 & CPCB Norms
4	Hydrology	Water level in open wells in buffer zone around 1 km at specific wells	-	Once in 6 months	Monitoring water level depth variations
5	Noise	2 Locations (1 Core & 1 Buffer)	Hourly – 1 Day	Once in 6 months	Leq, Lmax, Lmin, Leq Day & Leq Night
6	Vibration	At the nearest habitation (in case of reporting)	–	-	-
7	Soil	2 Locations (1 Core & 1 Buffer)	–	Once in six months	Physical and Chemical Characteristics
8	Greenbelt	Within the Project Area	Daily	Monthly	Maintenance

7. ADDITIONAL STUDIES

7.1 RISK ASSESSMENT

The methodology for the risk assessment has been based on the specific risk assessment guidance issued by the Directorate General of Mine Safety (DGMS), Dhanbad, vide Circular No.13 of 2002, dated 31st December, 2002. The DGMS risk assessment process is intended to identify existing and probable hazards in the work environment and all operations and assess the risk levels of those hazards in order to prioritize those that need immediate attention. Further, mechanisms responsible for these hazards are identified and their control measures, set to timetable are recorded along with pinpointed responsibilities.

The whole quarry operation will be carried out under the direction of a Qualified Competent Mine Manager holding certificate of competency to manage a metalliferous mine granted by the DGMS, Dhanbad for proposed project. Risk Assessment is all about prevention of accidents and to take necessary steps to prevent it from happening.

7.2 DISASTER MANAGEMENT PLAN

Natural disasters like Earthquake, Landslides have not been recorded in the past history as the terrain is categorized under seismic zone II. The area is far away from the sea hence the disaster due to heavy floods and tsunamis are not anticipated.

The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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

- Rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

7.3 CUMULATIVE IMPACT STUDY

CUMULATIVE PRODUCTION LOAD OF GARNET IN CLUSTER

Mie Code	Production for five-year plan period in Tonnes	Per Year Production in Tonnes	Per Day Production in Tonnes	Number of Load Per Day
P1	39,544	7,909	26	1
P2	49,366	9,873	33	2
P3	42,048	8,410	28	1
P4	20,736	4,147	14	1
P5	29,700	5,940	20	1
P6	28,800	5,760	20	1
P7	36,000	7,200	24	1
Total	**2,46,194**	**49,239**	**165**	**8**

EMPLOYMENT BENEFITS FROM CLUSTER MINES

Description	Employment
P1	12
P2	16
P3	14
P4	14
P5	14
P6	7
P7	10
Total	**87**

Allocation for Corporate Environment Responsibility (CER) shall be made as per Government of India, MoEF & CC Office Memorandum F.No.22-65/2017-IA.III, Dated: 01.05.2018 by all the mines.

8. PROJECT BENEFITS

The Proposed Project for Mining of Garnet at Kottathur and Naduvalur Villages aims to produce 88,280m^3 ROM over a period of 5 Years. This will enhance the socio-economic activities in the adjoining areas and will result in the following benefits Increase in Employment Potential

- Improvement in Socio-Economic Welfare
- Improvement in Physical Infrastructure
- Improvement in Social infrastructure

9. ENVIRONMENT MANAGEMENT PLAN

The Environment Monitoring cell discussed formed by the mine management will ensure effective implementation of environment management plan and to ensure compliance of environmental statutory guidelines through Mine Management Level.

The said team will be responsible for:

- Monitoring of the water/ waste water quality, air quality and solid waste generated
- Analysis of the water and air samples collected through external laboratory
- Implementation and monitoring of the pollution control and protective measures/ devices which shall include financial estimation, ordering, installation of air pollution control equipment, waste water treatment plant, etc.
- Co-ordination of the environment related activities within the project as well as with outside agencies.
- Collection of health statistics of the workers and population of the surrounding villages.
- Green belt development.
- Monitoring the progress of implementation of the environmental monitoring programme.
- Compliance to statutory provisions, norms of State Pollution Control Board, Ministry of Environment and Forests and the conditions of the environmental clearance as well as the consents to establish and consents to operate.

10. CONCLUSION

Various aspects of mining activities were considered and related impacts were evaluated. Considering environmental impacts are associated, EMP will be under regular review. Senior Management responsible for the project will conduct a review of EMP and its

implementation to ensure that the EMP remains effective and appropriate. Thus, the proper steps will be taken to accomplish all the goals mentioned in the EMP and the project will bring the positive impact in the study area. All the possible ways to mitigate the environmental concerns Environmental Management Plan was prepared and fund has been allocated for the same. The EMP is dynamic, flexible and subjected to periodic review.

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