

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENT MANAGEMENT PLAN FOR OBTAINING

Environmental Clearance under EIA Notification – 2006
Schedule Sl. No. 1 (a) (i): Mining Project

“B” CATEGORY – MAJOR MINERAL – NON-FOREST – PATTA LAND

KOTTATHUR & NADUVALUR GARNET SAND MINES

Over all Cluster Extent – 29.12.5 Ha (7 Mines)

PROJECT PROPONENTS	
Tvl. S.S. Minerals, Thiru.L. Samuel Baskaran - Partner No.6/9, Kasthuri Esate, III Street, Poes Garden, Chennai - 86, Tamil Nadu State.	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
LOCATION DETAILS	
S.F No. 95/2A, 2B, 4B, 4C, 5A, 5B, 6A, 6B, 97/2B & 2E, Kottathur village, Musiri Taluk, Tiruchirappalli District Extent: 2.10.0 Ha	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
PROPOSED PRODUCTION	
Production Details 39,544 Ts of ROM 13,840 Ts of Garnet Sand @35% Recovery Peak Production = 19,780 Ts of ROM 6,923 Ts @ 35% Garnet Sand Recovery Proposed Depth = 2.5m	Production Details 49,366 Ts of ROM 17,278 Ts of Garnet Sand @ 35% Recovery Peak Production = 24,948 Ts of ROM 8,731 Ts @ 35% Garnet Sand Recovery Proposed Depth = 2.5m
ToR Identification	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
Environmental Consultant GEO EXPLORATION AND MINING SOLUTIONS Old No. 260-B, New No. 17, Advaita Ashram Road, Alagapuram, Salem – 636 004, Tamil Nadu, India Accredited for sector 1 Cat ‘A’, sector 31 & 38 Cat ‘B’ Certificate No : NABET/EIA/2225/RA 0276 Phone: 0427-2431989, Email: info@geoexploration@gmail.com Web: www.gemssalem.com	  Laboratory Creative Engineers & Consultants NABET ACCREDITED, NABL ACCREDITED TESTING LABORATORY & ISO 9001: 2008 CERTIFIED COMPANY Chennai-600 059 Ph: 044-22395170, Cell: 09444133619 Email: cecgiri@yahoo.com, Web: www.creativeengineers.co.in
Baseline Monitoring Period	
OCTOBER to DECEMBER 2024	
MAY 2025	

UNDERTAKING

I, Tvl.S.S. Minerals given undertaking that this EIA & EMP report prepared for our Garnet Sand Mines situated in over an extent of 2.10.0 Ha S.F.Nos. 95/2A, 2B, 4B, 4C, 5A, 5B, 6A, 6B, 97/2B & 2E, Kottathur Village Musiri Taluk, Trichy District, based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide SEIAA-TN/F.No.6261/SEAC/1(a)ToR-2025 Dated.03.03.2025

I hereby assured that the Data's submitted and information given by me is true and correct to the best of my knowledge.

Signature of the Project Proponent

Thiru.L. Samuel Baskaran
(Partner)

Place: Trichy

Dated:

DECLARATION

I Dr. M. Ifthikhar Ahmed – EIA Coordinator declare that the EIA & EMP report prepared for Garnet sand mines situated in over an extent of 2.10.0 Ha S.F.Nos. 95/2A, 2B, 4B, 4C, 5A, 5B, 6A, 6B, 97/2B & 2E, Kottathur Village Musiri Taluk, Trichy District has been prepared by Geo Exploration and Mining Solutions, Salem, Tamil Nadu.

The Data's provided in the EIA report are true and correct to the best of my knowledge.

Signature of the EIA Coordinator



Dr. M. Ifthikhar Ahmed

Managing Partner

M/s. Geo Exploration and Mining Solutions

Place: Salem

Dated:

UNDERTAKING

I, Tvl.RIVERWAYS MINES AND MINERALS LTD given undertaking that this EIA & EMP report prepared for our Garnet Sand Mines situated in over an extent of 3.07.0 Ha 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, Trichy District based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide SEIAA-TN/F.No.6260/SEAC/ToR-1565/2018 Dated.19.09.2023

I hereby assured that the Data's submitted and information given by me is true and correct to the best of my knowledge.

Signature of the Project Proponent

Thiru.K. Balasubramanian
(Partner)

Place: Trichy

Dated:

DECLARATION

I Dr. M. Ifthikhar Ahmed – EIA Coordinator declare that the EIA & EMP report prepared for Garnet Sand Mines situated in over an extent of 3.07.0 Ha 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, Trichy District has been prepared by Geo Exploration and Mining Solutions, Salem, Tamil Nadu.

The Data's provided in the EIA report are true and correct to the best of my knowledge.

Signature of the EIA Coordinator



Dr. M. Ifthikhar Ahmed

Managing Partner

M/s. Geo Exploration and Mining Solutions

Place: Salem

Dated:

The following mines are situated in the cluster. An EIA/EMP has been prepared to assess the cumulative impacts of the mines and to develop an individual Environmental Management Plan.

*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/1(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	

TERMS OF REFERENCE (ToR) COMPLIANCE

P1- Tvl.S.S. Minerlas

Lr.No. SEIAA-TN/F.No.6261/SEAC/I(a)ToR-2025 Dated: 03.03.2025

ToR Amendment

File No.11858 TOR Identification No. TO25B0107TN5320575A Dated:16.05.2025

STANDARD TERMS OF REFERENCE		
1	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not applicable.
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	Noted and agreed The project site is a Patta Land and the lease was granted in the Name of Tvl. S.S. Minerals vide G.O. (Ms). No. 173 Industries (MMD.1) Department Dated 17.09.2013. The document pertaining is the rightful lessee of the mine is enclosed along with the Mining plan as Annexure.
3	All documents including Approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	Noted & agreed. All the documents including Approved mine plan, EIA report is compatible with one another in terms of the mine lease area.
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	Noted & agreed The Mine lease area has been superimposed on a high-resolution imagery using GIS tool. The Geomorphology and geology of the area has been detailed in the Chapter No.3.
5	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Map showing – Geology map of the project area covering 10km radius - Figure No. 2.11. Geomorphology of the area is given in Chapter No 2 Figure No 2.10.
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	Noted and agreed The lease has been granted in the year of 2013 by the Industrial Department its confirming the lease area is under the land use policy by the concerned authority.
7	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	Noted and agreed The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.

8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	Noted and agreed It is an opencast Mining operation proposed to operate in Mechanized method. The depth of the mine is 2.5m bgl only, the mining operation will be carried out without drilling and blasting.
9	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc., should be for the life of the mine / lease period.	Noted & agreed. The study area considered for this study is 10 km radius and all data contained in the EIA report such as waste generation etc., is for the Life of the Mine / lease period.
10	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Noted & agreed. Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
11	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given	Not Applicable. The material is transported to the processing plant after upgrading in the pre-concentration plant. Processing of ROM sand and production of Garnet concentrate is done by dry separation process using Rare Earth Drum magnetic separators. The waste silica tailings generated during the processing are in dry state and stored in a silo at the pre-concentration plant from where it is periodically discharged into tractor and transported back to the mines for backfilling or sold in the domestic market for construction purpose after obtaining permission from the concerned authorities.
12	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	Not Applicable. There is no Forest Land involved in the proposed project area. The proposed project area is a Patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13	Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	Not Applicable. The entire project area is an own patta land.
14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable. The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest within the Study Area.
16	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves

	area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	within 10 km Radius from the periphery of the project area.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any Scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3. 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. Detailed in Chapter No. 3.
19	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range'.
20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL. HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not Applicable. The project doesn't attract The C. R. Z. Notification, 2018. Nearest Coastal area is 116Km.
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	Not Applicable. It is an existing project and does not require reclamation and rehabilitation of peoples, there are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.

22	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM ₁₀ , particularly for free silica, should be given.	Baseline Data were collected for One Season October – December 2024 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
23	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Noted and agreed. Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD view 9.6.1 Model. The Details of the Air dispersion modelling is given in the Chapter No.4.
24	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Noted and Agreed. The mining operation is not required water, the water will be used for the dust suppression and greenbelt development will be sourced from the water vendors.
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Water for dust suppression, greenbelt development and domestic use will be sourced from the water vendors. Total Water requirement for this project is about 1.0 KLD.
26	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	The rain water collected in the pits after spell of rain will be used for greenbelt development and dust suppression.
27	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Noted and agreed The depth of the mine is 2.5m bgl and the mining operation will not have impact on the surface and ground water.
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	Noted and agreed The depth of the mine is 2.5m bgl and the proposed depth of the mine will not intersect the ground water table.

29	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	Noted and agreed There is no stream, seasonal passing through the lease area.												
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and BGL. A schematic diagram may also be provided for the same.	Noted and agreed <table border="1"> <thead> <tr> <th>Description</th><th>MSL in m</th><th>BGL in m</th></tr> </thead> <tbody> <tr> <td>Highest Elevation</td><td>127</td><td>0</td></tr> <tr> <td>Working depth</td><td>124.5</td><td>2.5m</td></tr> <tr> <td>Ground water table</td><td>92</td><td>35m</td></tr> </tbody> </table>	Description	MSL in m	BGL in m	Highest Elevation	127	0	Working depth	124.5	2.5m	Ground water table	92	35m
Description	MSL in m	BGL in m												
Highest Elevation	127	0												
Working depth	124.5	2.5m												
Ground water table	92	35m												
31	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no much significant impact due to the proposed transportation from the project area. Details in Chapter 2.												
32	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	Noted and agreed. The Traffic study has been carried out by Indian Road Congress Guidelines and the incremental load is within the limit. Due to this project there is no significant incremental in the existing traffic.												
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Noted and agreed The lease was granted in the year of 2013, after the execution of mining lease mining operation was not carried out, after commencing the mining operation the necessary infrastructures will be constructed as per the Mines Rules, 1955.												
34	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Noted and agreed. The details of the reclamation and restoration of mined out area's is given in the Mining plan and got approval.												
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Noted and agreed Occupational health impact and details of the medical examination to the workers given in the Details in Chapter 10.												
36	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the	Noted and agreed The details of the Public health and its implications is given in the Chapter No.7. There is no processing and separation will be carried out												

	proposed remedial measures should be detailed along with budgetary allocations.	in the lease area hence the public health will not be get affected.
37	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Noted and agreed The project will give employment opportunity to the local village peoples and Government will get revenue by the way of seigniorage fees and Royalty.
38	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	Noted and Agreed. The Environmental Management plan has been prepared inter alia include the impact and changes of the land use etc., the details are given in the EIA report, Chapter No.3.
39	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	Noted and agreed The public hearing will be carried out as per the EIA Notification, 2006 and the points raised by the Public hearing along with commitment with budgetary provisions will be submitted in the final EIA.
40	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending in any court against this project.
41	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Project Cost is given in the Chapter No 2, Table No 2.15.
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	The Disaster Management plan is given in the EIA/EMP report, Chapter No.7.
43	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Noted and agreed. The project will reduce demand and supply gap of the Garnet to the refractory industries and provide employment opportunities to the local village peoples.

TERMS OF REFERENCE (ToR) COMPLIANCE

P2- Tvl.Riverwaays Mines & Minerals Ltd

Lr.No. SEIAA-TN/F.No.6260/SEAC/ToR-1565/2018 Dated: 19.09.2023

ToR Amendment

File No.11801 TOR Identification No. TO25B0107TN5447737A Dated:08.04.2025

STANDARD TERMS OF REFERENCE		
1	The PP shall furnish a copy of the document in support of the fact that the proponent is the rightful lessee of the mine	The lease was granted in the name of Tvl. Riverwaays Mines & Minerals Ltd vide G.O. No 1453/MM7/2008 dated 16.11.2009. It is inferred that the Proponent is rightful lessee of the mine and the same is enclosed along with the Annexures.
2	The PP shall furnish a copy of approved Mining Plan / Scheme of Mining plan by the competent authority during the time of EIA appraisal	Noted and agreed The Review of Mining plan approved by the IBM for the period of 2025-26 to 2029-30 is enclosed along with this document and the same will be present during the EIA appraisal.
3	The PP shall furnish an affidavit that mining approved AMD used for Public Hearing and the Mining Plan approved by the Competent Authority (IBM/DGM) are the same	Noted and agreed
4	The analysis of the minerals of Garnet to be mined out from the mining lease area shall be carried out by the competent authority before conducting EIA study and the proponent shall ensure that the threshold value 0.00% monazite in heavy minerals, irrespective of monazite grade as per the Atomic minerals concession rules 2016 issued by ministry of mines notification dated 20.02.2019	Noted and agreed
5	The proponent shall furnish the scientific proof to ensure the non hazardous nature of the waste generated from the mineral pre-concentrated plant since the said waste proposed to dump into the mined out void. In this connection proponent has no detailed plan bring back the non hazardous nature of the waste generated from the mineral pre concentrated plant to the mined out area	Noted and agreed The mineral analysis has been carried out and the report furnished along with the Review of Mining plan and the same has been approved by the IBM.
6	The PP shall evaluate the environmental aspects and their possible associated impacts that would arise due to the proposed Garnet sand mining and mineral separation and to work out environmental monitoring programme to prevent, control, minimise or eliminate the adverse environmental impact envisaged from the proposed garnet mining and mineral separation	Noted and agreed The anticipated impact due to the mining and mitigation measures are given in the Chapter No. IV.
7	The PP shall provide all documents including approved mining plan / approved scheme of mining, EIA and public hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management and mining technology and should be in the name of the lessee.	Noted and agreed All the documents including approved mining plan / approved scheme of mining, EIA and public hearing is compatible with one another.
8	The PP shall provide all corner coordinates of the mine lease area superimposed on a high Resolution Imagery/ toposheet. Such an Imagery of the proposed area should clearly show the land and other ecological features of the study area (core and the buffer zone).	Noted and agreed The coordinates of the mine lease area are superimposed on a high-resolution topo sheet map, which indicates the ecological features of the study area.
9	The PP shall indicate the level of impact on local transport infrastructure due to project. Projected increase in truck traffic as a result of project in the present road network (including those outside the project area) should be worked out. Indicating	Noted and agreed The Traffic density study has been carried out and the details are given in the Chapter No.3.

	whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated action to be taken by other agencies such as state government) should be covered	
10	The PP shall furnish a letter from VAO stating details of structures & habitations located within 300m from the boundary of the project site.	Noted and agreed
11	The structures within the radius of (i) 100m, (ii) 300m, and (iii) 500m shall be enumerated with details such as dwelling houses with number of occupants, whether a belongs for the owner (or) not, places of worship, industries, factories, sheds, etc.,	Noted and agreed The structural study has been conducted in accordance with the Terms of Reference (ToR) conditions, and the details of the structures are presented in Chapter 3.
12	The PP shall submit a report on replenishment of Garner sand (or) its geological formation as indicated in the DSR.	Noted and agreed
13	The PP shall furnish the details of the tank, depth of de siltation, extent of the tank and Ownership of the tanks, details of cultivation, distance from the site, etc, within 1km radius around the proposed mining area from the Govt records	Noted and agreed
14	The PP shall furnish Copy of the NOC obtained from PWD/WRD-TN for the proposed mining activity.	Noted and agreed
15	The PP carry out the geological assessment to identify mineralization, to establish continuity, quality, and quantity of mineral deposit, particularly, the presence of Atomic minerals in the Garnet sand. Hence the PP shall furnish the report through the systemic sampling in the proposed site with showing geological coordinates as per the procedures laid in accordance with the provisions of Atomic Mineral Concessional Rules, 2016 and the mineralogical analysis obtained from the laboratory of IREL (India) Limited, Research Centre, Beach Road, Kollam, Kerala	Noted and agreed Five samples were collected for mineral analysis, and the sampling reports are incorporated into the Review of Mining Plan in accordance with the established procedure.
16	Details of the land for storage of Overburden/Waste Dumps (or) Rejects outside /inside the mine lease, such as extent of land area, distance from mine lease, its land use R&R issues, if any, should be provided	Noted and agreed There is no proposal for the dumping of mineral rejects in side the lease area. The entire ROM will be transported to the Plant for the processing. The Garnet will be separated by Rare Earth Drum Magnetic Separators. The waste silica tailings generated during the processing are in dry state and stored in a silo at the pre-concentration plant from where it is periodically discharged into tractor and transported back to the mines for backfilling or sold in the domestic market for construction purpose after obtaining permission from the concerned authorities.
17	The study area will comprise of 10km zone around the mine lease from lease periphery and the data contained in EIA such as waste generation etc, should be for the life of the mine / lese period.	Noted and agreed The Environmental Impact Assessment (EIA) study has been conducted within a 10km radius from the periphery of the lease area, in accordance with the Terms of Reference (ToR) conditions.
18	The PP shall indicate the land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national parks, migratory routes of fauna, water bodies, human settlements and other ecological features. Land use plan of the post operation all phases and submitted, impact, if any, of change of land use should be given.	Noted and agreed The Land use Land cover of the project site covering forest area, agricultural land, grazing land, wildlife sanctuary, national parks, migratory routes of fauna, water bodies, human settlements and other ecological features upto the radius of 10km is given in the Chapter No.3.

19	The PP shall indicate the details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA report.	Noted and agreed The Infrastructure facilities will be provided in the lease area after resuming of mining operation and the same will be submitted along with Half yearly compliance report (HYCR).
20	The PP shall anticipate the Occupational and health impacts of the project and accordingly the proposed preventive measures spelt out in detail. Details of pre placement medical examination and periodical medical examination schedules should be incorporated in the EMP.	Noted and agreed The mining operation will involve removal of Garnet Sand using Excavator into the tippers to the processing plant. There is no processing of ROM inside the lease area hence the occupational health impacts to the workers will not arise. The details of the other occupational impacts and mitigation measures are given in the Chapter No.7.
21	The PP shall evaluate the Public health implications of the project and related activities for the population in the impact zone systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	Noted and agreed The Public health implications and mitigation measures are given in the Chapter No.7.
22	The PP shall provide the measures of socio-economic significance and influence to the local community. As far as possible, quantitative dimensions may be given with the time frames for implementations.	Noted and agreed The Socio Economic study has been carried out and the details are given in the Chapter No.3.
23	The PP shall disclose the details of litigation / violation case pending against the project (or) the PP pertaining to this mining proposal, if any, with the direction/order passed by any court of law against the project proponent in the past or now.	There is no litigation pending against this project.
24	Proponent shall furnish the letter received from DFO concerned stating the proximity details of Reserve Forests, Protected area, Sanctuaries, Tiger reserve etc, up to a radius of 25 km from the proposed site.	There is no Reserve forest within the radius of 1km from the project site. No wild life Sanctuary within the radius of 10km from the project site.
25	Detailed study report on flora and fauna in and nearby the quarry site.	Noted and agreed The detailed flora and Fauna Study has been carried out and the details are incorporated in the Chapter No.3
26	The Proponent shall develop greenbelt and garland drain around the boundary of the proposed quarry and the photographs indicating the same shall be shown during the EIA appraisal.	Noted and agreed.
27	The Proponent shall carry our Bio diversity study through reputed institution and the same shall be included in EIA Report.	Noted and agreed. The biodiversity study has been conducted by a NABET-accredited consultant, with expertise in this domain, and the details of the study are presented in Chapter 3.
28	The PP shall carry out the air-quality monitoring for prediction of impact on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of minerals. The details of the model used and the input parameters used for modelling should be provided. The air quality contours may be plotted on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind rose showing pre-dominant wind direction may also be indicated on the map	Noted and agreed The Air quality monitoring has been carried out and the details are given in the Chapter No.3 The modeling has been done using AERMOD and the details of the modelling is given in the Chapter No.4.
29	The PP shall furnish the water requirement for the project, the availability and source. A detailed	Noted and agreed The total water requirement for this project site is 1.0KLD.

	water balance should be provided. Fresh water requirement for the project should be indicated.	The water will be sourced from the water vendors from nearby villages.
30	The PP shall assess the impact of project on water quality, both surface and groundwater and necessary safeguard measures, if any required should be provided.	Noted and agreed The water quality analysis has been carried out and the details are given in the Chapter No.3. Since the depth of the mine is 2.5m there is no significant impact on both ground and surface water.
31	The EIA Coordinators shall obtain and furnish the details of quarry/quarries operated by the proponent in the past, either in the same location or elsewhere in the State with video and photographic evidences.	Noted and agreed Apart from this proposal there are other 6 quarries falls in this cluster and the details are given in this EIA report.
32	If the proponent has already carried out the mining activity in the proposed mining lease area after 15.01.2016, then the proponent shall furnish the following details from AD/DD, mines i. What was the period of the operations and stoppage of the earlier mines with last work permit issued by the AD/DD mines? ii. Quantity of minerals mined out. iii. Highest production achieved in any one year. iv. Detail of approved depth of mining. v. Actual depth of the mining achieved earlier vi. Name of the person already mined in that lease area. vii. If EC and CTO already obtained, the copy of the same shall be submitted.	Noted and agreed The mining operations was carried out from the year of 2010-11 to 2012-13 During the period the excavated quantities are given below: ROM - 1,750 Tonnes Garnet - 600.95 Tonnes Waste Silica Sand- 1149.95 Tonnes The approved depth of the mining is 2.5m bgl The mine has reached a maximum of 1.5m depth bgl.
33	All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/Topo sheet, topographic sheet, geomorphology, lithology and geology of the mining lease area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	The coordinates of the mine lease area are superimposed on a high-resolution topo sheet map, which indicates the ecological features of the study area.
34	The Proponent shall carry out Drone video survey covering the cluster, Green belt, fencing etc.,	Noted and agreed
35	The proponent shall furnish photographs of adequate fencing, green belt along the periphery including replantation of existing trees & safety distance between the adjacent quarries & water bodies nearby provided as per the approved mining plan	Noted and agreed The fencing and plantation photographs will be submitted during the appraisal.
36	The Project Proponent shall provide the details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology with justifications, the anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same.	Noted and agreed Total Mineable Reserves ROM - 49,366 Tonnes of ROM Garnet - 17,278 Tonnes @ 35% Recovery Peak production of ROM – 24,948 Tonnes of ROM Peak production of Garnet – 8,731 Tonnes Life of the mine – 5 years Opencast Mechanized method is followed for this mining operation.
37	The Project Proponent shall provide the Organization chart indicating the appointment of various statutory officials and other competent persons to be appointed as per the provisions of Mines Act 1952 and the MMR, 1961 for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment.	Noted and agreed The organization chart including the competent/Statutory person is given in the Review of Mining plan and enclosed as annexure.

38	The Project proponent shall conduct the hydro-geological study considering the contour map of the water table detailing the number of ground water pumping & open wells, and surface water bodies such as rivers, tanks, canals, ponds etc, within 1 km (radius) along with the collected water level data for both monsoon and non-monsoon seasons from the PWD / TWAD so as to assess the impacts on the wells due to mining activity. Based on actual monitored data, it may clearly be shown whether working sill intersect groundwater. Necessary data and documentation in this regard may be provided.	Noted and agreed The Hydrogeological study has been carried out in accordance with the ToR condition. The depth of the mine is 2.5m bgl and the proposed depth will not intersect the ground water table.
39	The Proponent shall furnish the baseline data for the environmental and ecological parameters with regard to surface water/ground water quality, air quality, soil quality & flora/fauna including traffic/vehicular movement study.	Noted and agreed Baseline datas taken for the one season October – December 2024 is given in the EIA report covering the Air, water, Soil quality & Flora/Fauna study including traffic vehicular movement study.
40	The Proponent shall carry out the Cumulative impact study due to mining operations carried about in the quarry specifically with reference to the specific environment in terms of soil health, biodiversity, air pollution, climate change and food control & health impacts. Accordingly, the Environment Management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	Noted and agreed Cumulative impact study due to mining operation carried out and the details are given in the Chapter No. 7.
41	Rain Water harvesting management with recharging details along with water balance (both monsoon & non-monsoon) be submitted.	Noted and agreed The void space of the mine pit will act as recharge structure.
42	Land use of the study area delineating forest area, agricultural land, gazing land wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phase and submitted. Impact if any, of change of land use should be given.	The Land use Land cover of the project site covering forest area, agricultural land, grazing land, wildlife sanctuary, national parks, migratory routes of fauna, water bodies, human settlements and other ecological features upto the radius of 10km is given in the Chapter No.3.
43	Proximity to Areas declared as ‘Critically Polluted’ (or) the Project areas which attracts the court restrictions for mining operations, should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the TNPCB (or) Dept. of Geology and Mining should be secured and furnished to the effect that the proposed mining activities could be considered.	Noted and agreed There are no critically polluted areas near the project site and the project is not attracts the court restriction for the mining operations.
44	Description of water conservation measures proposed to be adopted in the project should be given. Details of rainwater harvesting proposed in the project, if any, should be provided.	Noted and agreed The mining operation is not required water, the water will be used for the dust suppression and greenbelt development will be sourced from the water vendors.
45	Impact on local transport infrastructure due to the Project should be indicated.	Noted and agreed The traffic study is detailed in the Chapter No.3.
46	A tree survey study shall be carried out (nos., name of the species, age, diameter etc..) both within the mining lease applied area & 300m buffer zone and its management during mining activity.	Noted and agreed. There are no major trees within the project site; however, Juliflora is present inside the lease area and will be cut down
47	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	Noted and agreed. The Mine closure plan has been prepared as a part of Mining plan and got approval. The summary of the mine closure plan is given in this EIA report.

48	Public Hearing Points raised and commitments of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project and to be submitted to SEIAA/SEAC with regard to the Office Memorandum of MoEF & CC accordingly.	Noted and agreed The Points raised during the public hearing along with commitments of the project proponent including budgetary provisions will be submitted along with Final EIA/EMP report.
49	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	Noted and agreed
50	The Proponent shall produce / display the EIA report, Executive summary and other related information with respect to public hearing in Tamil Language also.	Noted and agreed The Executive Summary and other related documents are submitted in the Tamil language.
51	As a part of the study of the flora and fauna around the vicinity of the proposed site, the EIA coordinator shall strive to educate the local students on the importance of preserving local flora and fauna by involving them in the study, wherever possible.	Noted and agreed Local students were educated during the EIA study, and the importance of flora and fauna was emphasized to them.
52	The purpose of Greenbelt around the Project is to capture the fugitive emissions, carbon sequestration and to attenuate the noise generated, in addition to improving the aesthetics. A wide range of indigenous plant species should be planted as given in the Appendix-I in consultation with the DFO, & Tamil Nadu Agriculture University. The plant species with dense/moderate canopy of native origin should be chosen. Species of small/medium/tall trees alternating with shrubs should be planted in a mixed manner.	Noted and agreed
53	Taller/one year old Saplings raised in appropriate size of bags, preferably eco-friendly bags should be planted as per the advice of local forest authorities/botanist/Horticulturist with regard to site specific choices. The Proponent shall earmark the greenbelt area with GPS coordinates all along the boundary of the project site with at least 3 meters wide and in between blocks in an organized manner.	Noted and agreed
54	A Disaster management plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	Noted and agreed The Disaster Management plan has been prepared and included in the Chapter No.7.
55	A Risk Assessment and management Plan shall be prepared and included in the EIA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	Noted and agreed The Risk Assessment and Management plan has been prepared and included in the Chapter No.7.
56	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of Pre-Placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The Project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Noted and agreed The periodical Medical Examinations to the workers are detailed in the Chapter No.7.
57	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	Noted and agreed

58	The Socio-economic studies should be carried out within a 5 km buffer zone from the mining activity. Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Noted and agreed The Socio Economic study has been carried out in 5km radius and the details are given in the Chapter No 3.
59	Details of litigation pending against the project, if any, with direction/order passed by any Court of Law against the Project should be given.	No litigation pending against the project right now.
60	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.,	The project will reduce the demand and supply gap of almandine garnet to the refractory industries. The project will provide employment opportunities to the local peoples.
61	If any quarrying operations were carried out in the proposed quarrying site for which now the EC is sought, the Project Proponent shall furnish the detailed compliance to EC conditions given in the previous EC with the site photographs which shall duly be certified by MoEF & CC, Regional Office, Chennai (or) the concerned DEE/TNPCB.	Not applicable The Mining operation was carried out during the year of 2010-2013, after that there is no mining operation was carried out and No Environmental Clearance was obtained hence CCR is not applicable to this project.
62	The Proponent shall prepare the EMP for the entire life of mine and also furnish the sworn affidavit stating to abide the EMP for the entire life of mine	Noted and agreed The life of the mine is computed as 5 years and the EMP prepared for the life of the mine.
63	Concealing any factual information or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this Terms of Conditions besides attracting penal provisions in the Environment.	Noted and agreed
STANDARD TERMS OF REFERENCE		
1	Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.	Not applicable. The project is Not a violation category. This proposal falls under B1 Category (Cluster situation).
2	A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.	Noted and agreed The project site is a Patta Land and the lease was granted in the Name of Tvl. Riverwaays Mines & Minerals Ltd., vide proceeding No.1453/MM7/2008, Dated: 06.11.2009. The document pertaining is the rightful lessee of the mine is enclosed along with the Mining plan as Annexure....
3	All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.	Noted & agreed. All the documents including Approved mine plan, EIA report is compatible with one another in terms of the mine lease area.
4	All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).	Noted & agreed The Mine lease area has been superimposed on a high-resolution imagery using GIS tool. The Geomorphology and Geology of the area has been detailed in the Chapter No.3.
5	Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of	Map showing – Geology map of the project area covering 10km radius - Figure No. 2.11.

	the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.	Geomorphology of the area is given in Chapter No 2 Figure No 2.10.
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	Noted and agreed The lease has been granted in the year of 2010 by the Industrial Department its confirming the lease area is under the land use policy by the concerned authority.
7	It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1.
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	Noted and agreed It is an opencast Mining operation proposed to operate in Mechanized method. The depth of the mine is 2.5m bgl only, the mining operation will be carried out without drilling and blasting.
9	The study area will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc., should be for the life of the mine / lease period.	Noted & agreed. The study area considered for this study is 10 km radius and all data contained in the EIA report such as waste generation etc., is for the Life of the Mine / lease period.
10	Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.	Noted & agreed. Land use and land cover of the study area is discussed in Chapter No. 3. Land use plan of the project area showing pre-operational, operational and post-operational phases are discussed in Chapter No. 2, Table No 2.3.
11	Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given	Noted and agreed The material is transported to the processing plant after upgrading in the pre-concentration plant. Processing of ROM sand and production of Garnet concentrate is done by dry separation process using Rare Earth Drum magnetic separators. The waste silica tailings generated during the processing are in dry state and stored in a silo at the pre-concentration plant from where it is periodically discharged into tractor and transported back to the mines for backfilling or sold in the domestic market for construction purpose after obtaining permission from the concerned authorities.
12	A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status	Not Applicable. There is no Forest Land involved in the proposed project area.

	of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.	The proposed project area is a Patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13	Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.	Not Applicable. The entire project area is an own patta land.
14	Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.	Not Applicable. The project doesn't attract Recognition of Forest Rights Act, 2006.
15	The vegetation in the RF / PF areas in the study area, with necessary details, should be given.	No Reserve Forest within the Study Area.
16	A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
17	Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/ Elephant Reserves/ (existing as well as proposed), if any, within 10 KM of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished	Not Applicable. There are No National Parks, Biosphere Reserves, Wildlife Corridors, and Tiger/Elephant Reserves within 10 km Radius from the periphery of the project area.
18	A detailed biological study of the study area [core zone and buffer zone (10 KM radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.	Detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] was carried out and discussed under Chapter No. 3. 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. Detailed in Chapter No. 3.
19	Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravalli Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.	Not Applicable. Project area / Study area is not declared in 'Critically Polluted' Area and does not come under 'Aravalli Range'.

20	Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).	Not Applicable. The project doesn't attract The C. R. Z. Notification, 2018. Nearest Coastal area is 116Km.
21	R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.	Not Applicable. It is an existing project and does not required reclamation and rehabilitation of peoples, there are no approved habitations within a radius of 300 meters. Therefore, R&R Plan / Compensation details for the Project Affected People (PAP) is not anticipated and Not Applicable for this project.
22	One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season); December-February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.	Baseline Data were collected for One Season October – December 2024 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
23	Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.	Noted and agreed. Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD view 9.6.1 Model. The Details of the Air dispersion modelling is given in the Chapter No.4.
24	The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.	Noted and Agreed. The mining operation is not required water, the water will be used for the dust suppression and greenbelt development will be sourced from the water vendors.
25	Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.	Water for dust suppression, greenbelt development and domestic use will be sourced from the water vendors. Total Water requirement for this project is about 1.2 KLD.

26	Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.	The rain water collected in the pits after spell of rain will be used for greenbelt development and dust suppression.												
27	Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.	Noted and agreed The depth of the mine is 2.5m bgl and the mining operation will not have impact on the surface and ground water.												
28	Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.	Noted and agreed The depth of the mine is 2.5m bgl and the proposed depth of the mine will not intersect the ground water table.												
29	Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be brought out.	Noted and agreed There is no stream, seasonal passing through the lease area.												
30	Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and BGL. A schematic diagram may also be provided for the same.	Noted and agreed <table border="1"> <thead> <tr> <th>Description</th><th>MSL in m</th><th>BGL in m</th></tr> </thead> <tbody> <tr> <td>Highest Elevation</td><td>127</td><td>0</td></tr> <tr> <td>Working depth</td><td>124.5</td><td>2.5m</td></tr> <tr> <td>Ground water table</td><td>92</td><td>35m</td></tr> </tbody> </table>	Description	MSL in m	BGL in m	Highest Elevation	127	0	Working depth	124.5	2.5m	Ground water table	92	35m
Description	MSL in m	BGL in m												
Highest Elevation	127	0												
Working depth	124.5	2.5m												
Ground water table	92	35m												
31	A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.	Traffic density survey was carried out to analyse the impact of Transportation in the study area as per IRC guidelines 1961 and it is inferred that there is no much significant impact due to the proposed transportation from the project area. Details in Chapter 2.												
32	Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.	Noted and agreed. The Traffic study has been carried out by Indian Road Congress Guidelines and the incremental load is within the limit. Due to this project there is no significant incremental in the existing traffic.												
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Noted and agreed The lease was granted in the year of 2010, after the execution of mining lease mining operation												

		was not carried out, after commencing the mining operation the necessary infrastructures will be constructed as per the Mines Rules, 1955.
34	Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.	Noted and agreed. The details of the reclamation and restoration of mined out area's is given in the Mining plan and got approval.
35	Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.	Noted and agreed Occupational health impact and details of the medical examination to the workers given in the Details in Chapter 10.
36	Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.	Noted and agreed The details of the Public health and its implications is given in the Chapter No.7. There is no processing and separation will be carried out in the lease area hence the public health will not be get affected.
37	Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.	Noted and agreed The project will give employment opportunity to the local village peoples and Government will get revenue by the way of seigniorage fees and Royalty.
38	Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.	Noted and Agreed. The Environmental Management plan has been prepared inter alia include the impact and changes of the land use etc., the details are given in the EIA report, Chapter No.3.
39	Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.	Noted and agreed The public hearing will be carried out as per the EIA Notification, 2006 and the points raised by the Public hearing along with commitment with budgetary provisions will be submitted in the final EIA.
40	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No litigation is pending in any court against this project presently.
41	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Project Cost is given in the Chapter No 2, Table No 2.15.
42	A Disaster management Plan shall be prepared and included in the EIA/EMP Report.	The Disaster Management plan is given in the EIA/EMP report, Chapter No.7.
43	Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.	Noted and agreed. The project will reduce demand and supply gap of the Garnet to the refractory industries and provide employment opportunities to the local village peoples.

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1. INTRODUCTION

1.0 PREAMBLE

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:

S.No	Name of the Owner	S.F. Nos	Extent	Status
1	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/I(a)ToR-2025 Dated: 03.03.2025
2	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

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 Table No.1.1.

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

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.

The Method of mining is by mechanized open cast mining without drilling and blasting operations involving excavation & direct loading into tippers. The stream placer sand will be loaded directly to the tractor/tippers for transportation to the mineral pre-concentration plant. The material is transported to the processing plant after upgrading in the pre-concentration plant. Processing of ROM sand and production of Garnet concentrate is done by dry separation process using Rare Earth Drum magnetic separators. The waste silica tailings generated during the processing are in dry state and stored in a silo at the pre-concentration plant from where it is periodically discharged into tractor and transported back to the mines for backfilling.

Total Extent of the proposed and existing quarries falls in the cluster category is 29.12.5 ha, the Environmental impact assessment study carried out considering these Mining and Environmental Management plan is prepared individually for this project.

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.,

Project History P1: -(File No 6261 – Tvl. S.S. Minerals)

The project proponent Tvl.S.S. Minerals Having Garnet Sand mine over an extent of 2.10.0 Ha in S.F. No 95/2A, 2B, 4B, 4C, 5A, 5B, 6A, 6B, 97/2B & 2E Kottathur Village, Musiri Taluk, Trichy District.

- Proponent applied for Garnet Sand Mining lease and obtained Precise area communication letter received vide Letter No. 10379/MM7/2002 Dated 04.01.2010
- The Mining plan has been prepared by the Recognized Qualified person and got approval by IBM (Indian Bureau of Mines) vide Letter RC. No. TN/TCR/GNT/MP-1696/MDS Dated.20.10.2008
- The lease deed was executed on 04.01.2010 and the lease period is valid upto 31.03.2030
- The mining plan (2010-11 to 2014-15) was prepared and approved by the Indian Bureau of mines, Chennai got expired in 31.03.2015
- The first Scheme of Mining (2015-16 to 2019-20) was Prepared and submitted and same approved by Indian Bureau of Mines, Chennai Vide Lr No.TN/TCR/GNT/MS-1191. MDS dated 06.05.2015
- The proponent applied for the Environmental Clearance vide Online Proposal No ISA/TN/MIN/24168/2018 Dated 11.04.2018 after the detailed Screening, Scoping the ToR Was granted vide Letter No. SEIAA-TN/F.No. 6261/SEAC/1 (a)/ToR/2025 Dated 03.03.2025
- The Review of Mining Plan has been prepared by the qualified person and got approved by IBM (Indian Bureau of Mines) vide Letter No. Rc.No. TN/TCR/GNT/ROMP-1769-MDS Dated.19.02.2024.
- The Review of Mining Plan has been approved for the quantity of 39,544 Ts of ROM and 13,840 Ts of 35% Garnet Recovery up to the depth of 2.5m bgl for the period of five years. The Peak production capacity is 19,780 Ts of ROM.

This EIA & EMP report is prepared for the Peak production capacity of 19,780 Tonnes of ROM upto the depth of 2.5m bgl.

Project History P2: --(File No 6260 – Tvl. Riverwaays Mines and Minerals Ltd)

The project proponent Tvl. Riverwaays Mines and Minerals Ltd Having Garnet Sand Mine over an extent of 3.07.0 Ha in S.F. No 137/7, 348/1A, 1B, 1C1, 1C2, 1C3, 2B1, 3A, 4, 5, 6B, 7A, 8, 9, 11, 12 & 13 Naduvalur Village, Thuraiyur Taluk, Trichy District.

- Proponent applied for Garnet Sand Mining lease on 07.03.2002 and obtained Precise area communication letter.
- The Mining plan has been prepared by the Recognized Qualified person and got approval by IBM (Indian Bureau of Mines) vide Letter RC. No. TN/TCR/ MP/GNT/-1696/MDS Dated.20.10.2008 (Mining plan period 2010-2015)
- The Lease was granted for the period of twenty years vide proceedings of the Commissioner of Geology and Mining, Guindy, Chennai vide Proc. No 1453/MM7/2008 Dated 06.11.2009- Lease period 31.03.2010 to 30.03.2030

- The Scheme of Mining Plan has been prepared by the Qualified person and got approved by IBM (Indian Bureau of Mines) vide Letter No TN/TCR/GNT/MS-1240-MDS (Scheme of Mining plan period 2015-2020)
- The Review of Mining Plan has been prepared by the qualified person and got approved by IBM (Indian Bureau of Mines) vide Letter No. TN/TCR/GNT/ROMP-1784.MDS Dated 23.12.2024
- The Review of Mining Plan has been approved for the quantity of 49,366 Ts of ROM and 17,278 Ts of 35% Garnet Recovery up to the depth of 2.5m bgl for the period of five years. The Peak production capacity is 24,948 Tonnes.
- Proponent applied for ToR for Environmental Clearance to SEIAA, Tamil Nadu and obtained ToR vide letter no. SEIAA-TN/F.No.6260/SEAC/ToR-1565/2018 Dated: 19.09.2023 for carrying out EIA and EMP studies.

The proponent has engaged M/s. Geo Exploration and Mining Solutions, Salem, Tamil Nadu for carrying out EIA / EMP Study. The Baseline Monitoring study has been carried out during post-monsoon season (October 2024 to December 2024).

Environmental Impact Assessment (EIA) study is a process, used to identify the Environmental, Social and Economic impacts of a project prior to decision-making. EIA systematically examines both beneficial and adverse consequences of the proposed project and ensure that these impacts are considered during the project designing.

1.1 PURPOSE OF THE REPORT

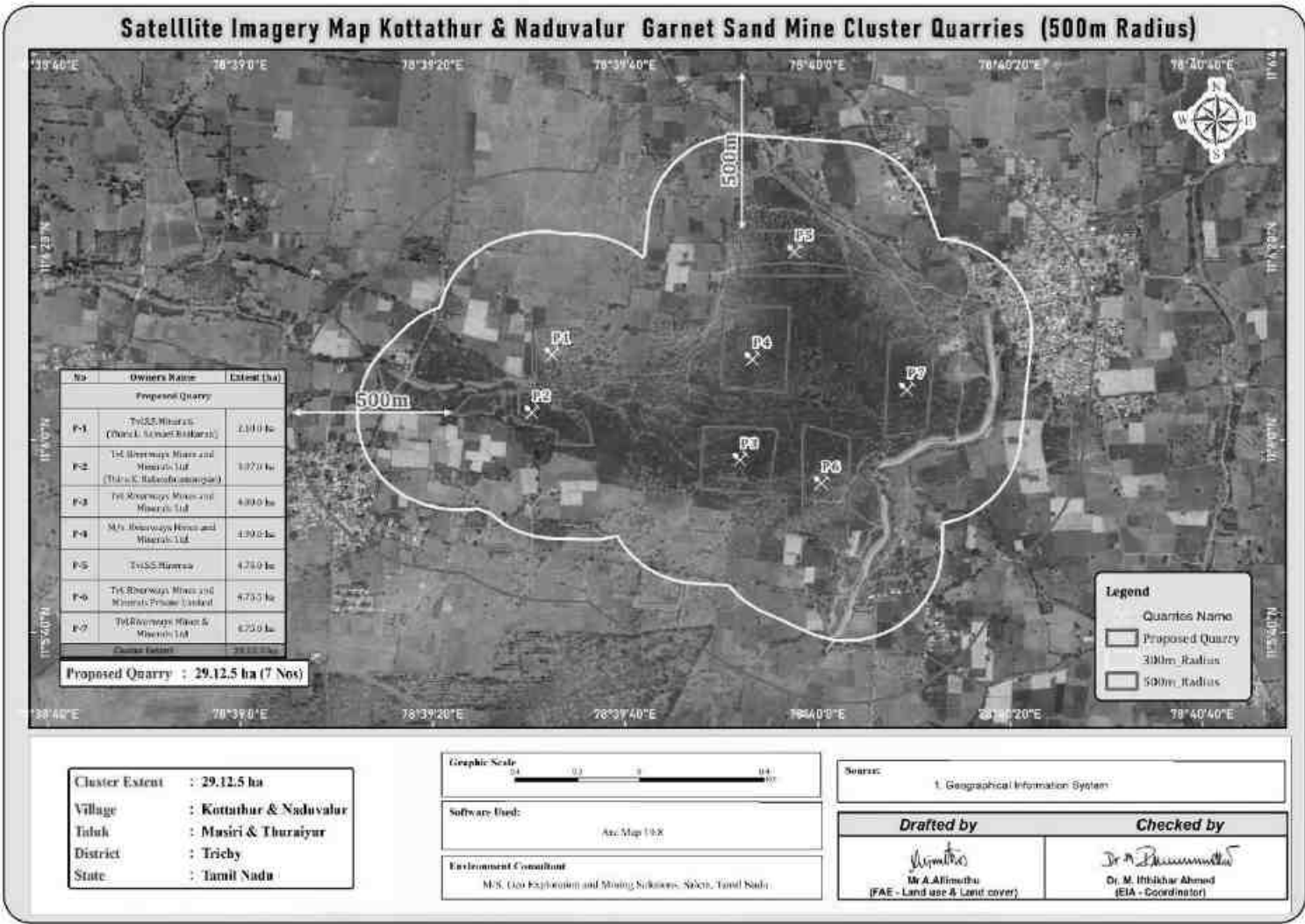
The sole purpose of this Environmental Impact Assessment report is to assess the beneficial and adverse impacts of the project on the existing environmental systems and to propose appropriate control measures. Thus, the report is a presentation of environmental consequences of the project activity so that all the factors are considered tactfully in eventually claiming a decision. The main objectives are described as follows:

- Evaluation of current level of pollution (Air, Soil, Water & Noise) in and around the mine under the existing conditions.
- Assessment of existing Environmental Status of Water, Air, Flora, Fauna, Demography and Land use pattern.
- Suggested measures, recommendations for pollution control, monitoring equipment's and organizational set up for maintenance of pollution control.

The ToR was issued by SEIAA – TN for preparation of Environmental Impact Assessment report (EIA) and Environmental Management plan EMP by the accredited consultant.

“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”

FIGURE 1.1 SATELLITE IMAGERY QUARRIES IN THE CLUSTER



1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT

TABLE 1.1: SALIENT FEATURES OF THE PROPOSED PROJECT – P1

Name of the Project	Tvl.S.S.Minerals Garnet Sand Mine
S.F. No.	95/2A, 2B, 4B, 4C, 5A, 5B, 6A, 6B, 97/2B & 2E
Extent	2.10.0 ha
Land Type	Patta Land
Village Taluk and District	Kottathur Village, Musiri Taluk, Tiruchirapalli District

TABLE 1.1A: SALIENT FEATURES OF THE PROPOSED PROJECT – P2

Name of the Project	Tvl. Riverways Mines and Minerals Ltd
S.F. No.	137/7, 348/1A, 1B, 1C1, 1C2, 1C3, 2B1, 3A, 4, 5, 6B, 7A, 8, 9, 11, 12 & 13
Extent	3.07.0 ha
Land Type	Patta Land
Village Taluk and District	Naduvalur Village, Thuraiyur Taluk, Tiruchirapalli District

Source: Approved Mining Plan

1.2.2 Identification of Project PropONENT

TABLE 1.2: DETAILS OF PROJECT PROPONENT – P1

Name of the Project PropONENT	Tvl.S.S. Minerals Managing Partner – Thiru. L. Samuel Baskaran
Address	No. 204 Naveed Castle Balakrishna Street, Mylapore Chennai.
Status	Managing Partner

TABLE 1.2A: DETAILS OF PROJECT PROPONENT – P2

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

Source: Approved Review of Mining Plan of the respective propoals.

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Nature and Size of the Project

The Mining operation is proposed to be carried out by Non – Conventional Opencast Mining method with 2.5m Depth (0.5m Clay + 2.0m Garnet Sand) No drilling and Blasting has been involved only front and back hoe loader, tippers has been deployed for the excavation and transportation of the minerals

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 Review of Mining Plan

TABLE 1.3A: BRIEF DESCRIPTION OF THE PROJECT – P2

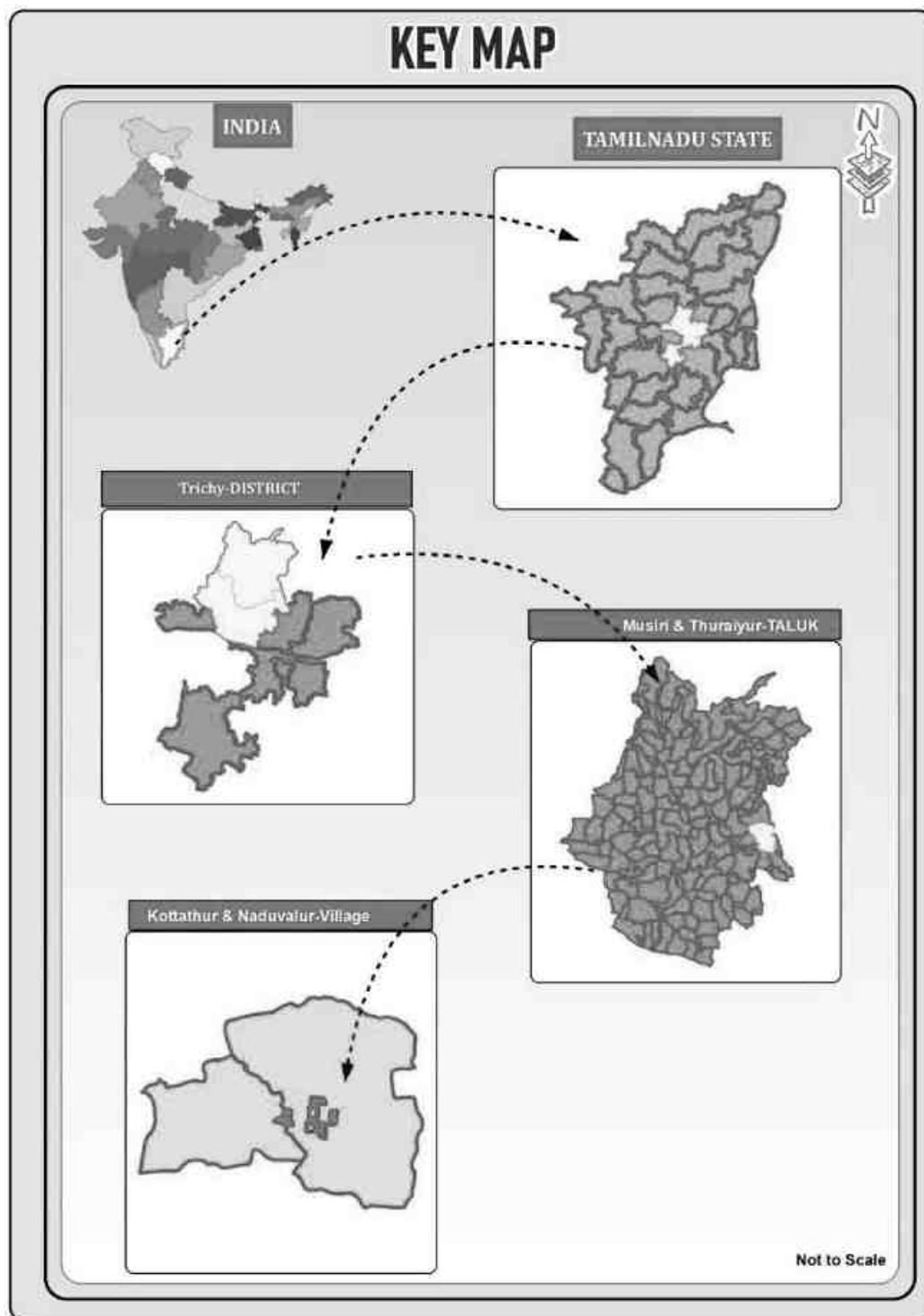
Name of the Mine	Tvl. Riverways Mines and Minerals Ltd
Land Ownership	It is a Patta land, registered in the name of Riverways Mines and Minerals Ltd vide.1438
Land classification	It is a Patta Land-Punjai (Barren Land)
SF No & Area (Ha)	137/7, 348/1A, 1B, 1C1, 1C2, 1C3, 2B1, 3A, 4, 5, 6B, 7A, 8, 9, 11, 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
	Garnet in Tonnes

Yearwise Production @35% Garnet Recovery	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	

1.3.2 Location of the Project

- The Mining lease area falls in Kottathur & Naduvalur Village, Musiri & Thuraiyur Taluk and Tiruchirapalli District.
- The project is located about 1.33 km west of Naduvalur and 1.36 km West of Kottathur, 8 km South East of Thuraiyur & 26.77km North East.

FIGURE 1.2 KEY MAP SHOWING THE LOCATION OF THE CLUSTER SITE



Source: Survey of India Toposheet 58-I/12

FIGURE 1.3: TOPOSHEET MAP OF THE STUDY AREA 10 KM RADIUS

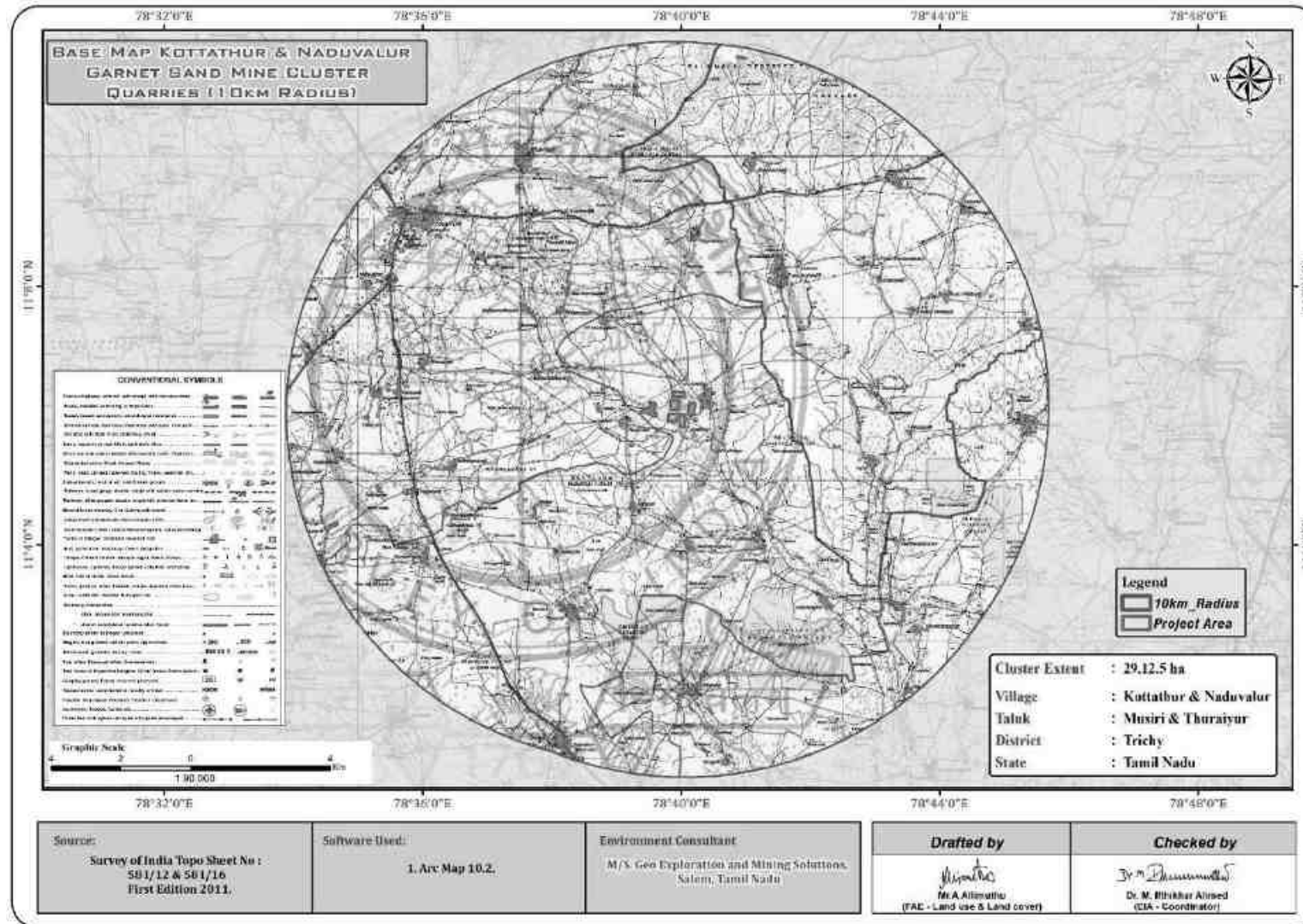
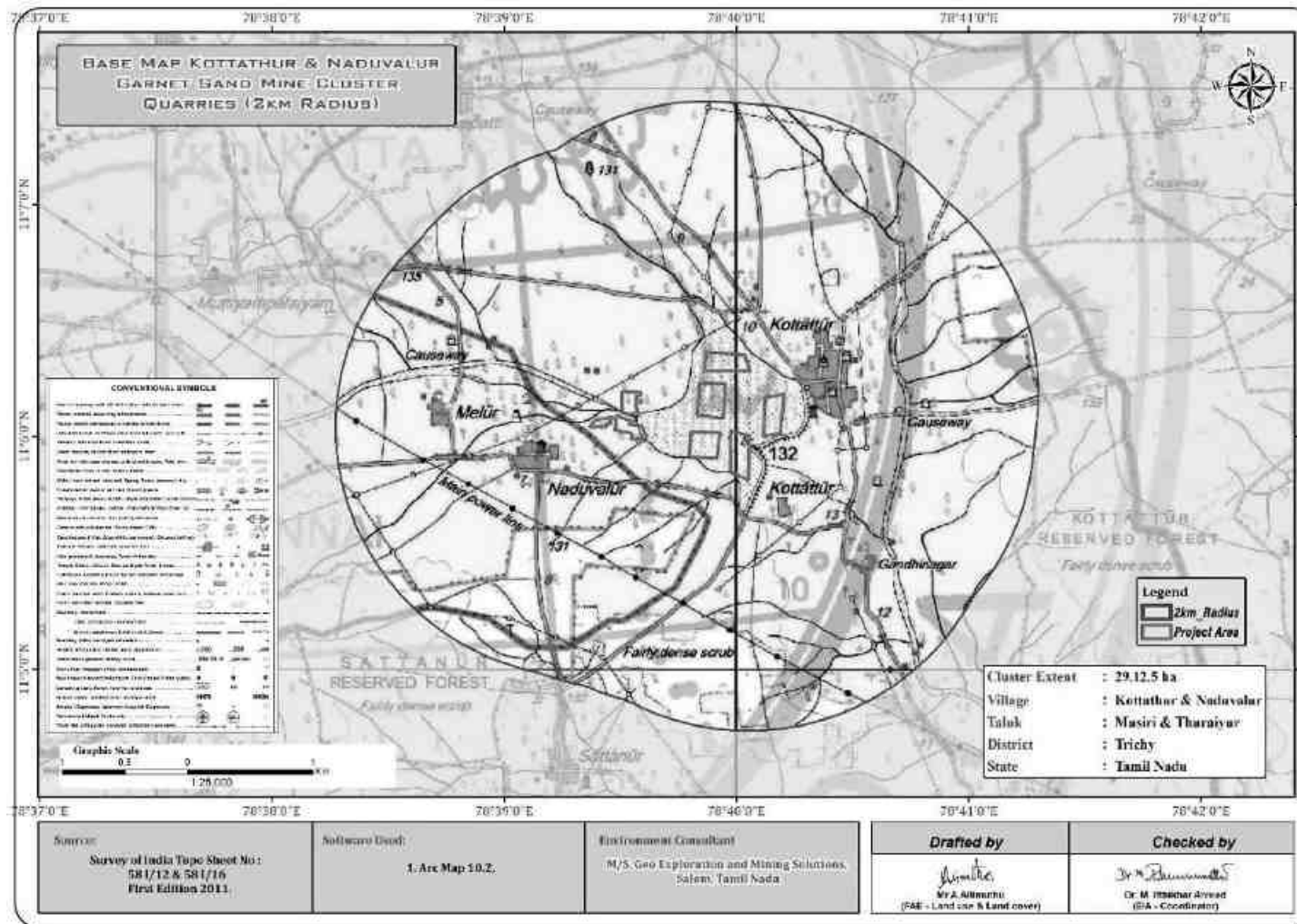


FIGURE 1.3A: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS



Source: Survey of India Toposheet 58-I/12

1.4 ENVIRONMENTAL CLEARANCE

The Environmental Clearance process for the project will comprise of four stages. These stages in sequential order are given below: -

- Screening,
- Scoping
- Public consultation &
- Appraisal

SCREENING

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 below 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
341 st SEAC Meeting Dated 29.12.2022 & 586 th 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
382 nd SEAC Meeting Dated 09.06.2023 & 632 nd 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
404 th SEAC Meeting Dated 25.08.2023	Re iterate the recommendations already taken during the 382 nd 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
341 st SEAC Meeting Dated 29.12.2022 & 586 th 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
382 nd SEAC Meeting Dated 09.06.2023 632 nd 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
404 th SEAC Meeting Dated 25.08.2023	Re iterate the recommendations already taken during the 382 nd SEAC Meeting	Approved the proposal for the Terms of Reference

PUBLIC CONSULTATION –

Application to The Member Secretary of the Tamil Nadu Pollution Control Board (TNPCB) to conduct Public Hearing in a systematic, time bound and transparent manner ensuring widest possible public participation at the project site or in its close proximity in the district was submitted.

APPRAISAL –

- Appraisal is the detailed scrutiny by the State Expert Appraisal Committee (SEAC) of the application and other documents like the final EIA & EMP Report, outcome of the Public Consultations including Public Hearing Proceedings, submitted by the proponent to the regulatory authority concerned for grant of environmental clearance.
- The report has been prepared using the following references:
 - Guidance Manual of Environmental Impact Assessment for Mining of Minerals, Ministry of Environment and Forests, 2010
 - EIA Notification, 14th September, 2006
 - ToR Letter No SEIAA-TN/F.No.6261/SEAC/l(a)ToR-2025 Dated: 03.03.2025 – P1
 - ToR Letter No SEIAA-TN/F.No.6260/SEAC/l(a)ToR-1565/2018 Dated: 19.09.2023– P2
 - Approved Mining Plan

1.5 TERMS OF REFERENCE (ToR)

Compliance to ToR issued vide –

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

The ToR Was granted by not including of Production quantity hence proponent applied for the Amendment in ToR vide Proposal No SIA/TN/MIN/522153/2025 Dated 01.03.2025. The proposal was placed in the 538th SEAC Meeting Dated 01.03.2025 and recommended the Amendment.

The Terms of Reference (ToR) for the Amendment, including the production quantity, was obtained from the State Environmental Impact Assessment Authority (SEIAA) Vide File No.11858 TOR Identification No. TO25B0107TN5320575A Dated;16.05.2025

- ToR Letter No SEIAA-TN/F.No.6260/SEAC/l(a)ToR-1565/2018 Dated: 19.09.2023– P2

The ToR Was granted by not including of Production quantity hence proponent applied for the Amendment in ToR vide Proposal No SIA/TN/MIN/523816/2025 Dated 28.02.2025. The proposal was placed in the 548th SEAC Meeting Dated 05.04.2025 and recommended the Amendment.

The Terms of Reference (ToR) for the Amendment, including the production quantity, was obtained from the State Environmental Impact Assessment Authority (SEIAA) Vide File No.11801 TOR Identification No. TO25B0107TN5447737A Dated;08.04.2025

1.6 POST ENVIRONMENT CLEARANCE MONITORING

The project proponents shall submit a half-yearly compliance report in respect of stipulated Environmental Clearance terms and conditions to MoEF & CC Regional Office & SEIAA after grant of EC on 1st June and 1st December of each calendar year as per MoEF & CC Notification S.O. 5845 (E) Dated: 26.11.2018.

1.7 GENERIC STRUCTURE OF EIA DOCUMENT

The overall contents of the EIA report follow the list of contents prescribed in the EIA Notification 2006 and the “Environmental Impact Assessment Guidance Manual for Mining of Minerals” published by MoEF & CC.

1.8 THE SCOPE OF THE STUDY

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the Post monsoon season (Oct – Dec 2024) for various environmental components so as to assess the anticipated impacts of the cluster Mining projects on the environment and suggest suitable mitigation measures for likely adverse impacts due to the proposed project.

TABLE 1.4: ENVIRONMENT ATTRIBUTES

Sl.No.	Attributes	Parameters	Source and Frequency
1	Ambient Air Quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂	Continuous 24-hourly samples twice a week for three months at 5 locations (1 Core & 4 Buffer)
2	Meteorology	Wind speed and direction, temperature, relative humidity and rainfall	Near project site continuous for three months with hourly recording and from secondary sources of IMD station
3	Water quality	Physical, Chemical and Bacteriological parameters	Grab samples were collected at 6 locations – 5 Ground water samples; once during study period.
4	Ecology	Existing terrestrial and aquatic flora and fauna within 10 km radius circle.	Limited primary survey and secondary data was collected from the Forest department.
5	Noise levels	Noise levels in dB(A)	5 locations – data monitored once for 24 hours during EIA study
6	Soil Characteristics	Physical and Chemical Parameters	Once at 6 locations during study period
7	Land use	Existing land use for different categories	Based on Survey of India topographical sheet and satellite imagery and primary survey.
8	Socio-Economic Aspects	Socio-economic and demographic characteristics, worker characteristics	Based on primary survey and secondary sources data like census of India 2011.

9	Hydrology	Drainage pattern of the area, nature of streams, aquifer characteristics, recharge and discharge areas	Based on data collected from secondary sources as well as hydro-geology study report prepared.
10	Risk assessment and Disaster Management Plan	Identify areas where disaster can occur by fires and explosions and release of toxic substances	Based on the findings of Risk analysis done for the risk associated with mining.

Source: Field Monitoring Data

1.8.1 Regulatory Compliance & Applicable Laws/Regulations

- Application for Mining Lease
- Granted Mining lease by the Indian Bureau of Mines.
- Review of Mining plan got approval by IBM for the respective proposals
- Environment Protection Act, 1986
- EIA Notification, 2006

2. PROJECT DESCRIPTION

2.0 GENERAL

The Garnet Mining leases requires Environmental Clearance as per the EIA Notification, 2006 and its subsequent amendments. There are 7 Garnet mining leases falls in the cluster category. The total extent of the cluster is 29.12.50 Ha.

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.

2.1 DESCRIPTION OF THE PROJECT

The Project site specific and there is no additional area required for this project. There is no effluent generation/discharge from this project. It is an existing Mines granted mining lease by the Government of India. Garnet. 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.

2.2 LOCATION OF THE PROJECT

- The lease areas are located in Kottathur & Naduvalur village, Musiri & Thuraiyur taluk, Tiruchirappalli District
- The project is located about 1.33 km west of Naduvalur and 1.36 km West of Kottathur, 8 km South East of Thuraiyur & 26.77km North East.
- The proposed area falls in the Survey of India Topo Sheet No. 58-I/12
- The Latitude between of **11°06.097'N to 11°06.197'N** The Longitude between of **78°39.506'E to 78°39.590'E** on WGS 1984 Datum. – P1
- The Latitude between of **11°05'59.41021"N to 11°06'05.56791"N** The Longitude between of **78°39'21.14409"E to 78°39'35.79532"E** on WGS 1984 Datum. – P2
- The project does not fall within 10 km radius of any Eco – sensitive zone, National Park, Tiger Reserve, Elephant Corridor and Biosphere Reserves.

TABLE 2.1: SITE CONNECTIVITY

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

Source: Survey of India Toposheet

The boundary co ordinates of the lease area is tabulated below.

TABLE 2.2: BOUNDARY CO-ORDINATES OF PROJECT – P1

P1			P2		
BOUNDARY CO-ORDINATES			BOUNDARY CO-ORDINATES		
S.N.	LATITUDE	LONGITUDE	S.N.	LATITUDE	LONGITUDE
1	11° 06' 05.99598"N	78° 39' 30.50409"E	1	11° 06' 02.88427"N	78° 39' 21.14409"E
1A	11° 06' 07.62228"N	78° 39' 30.53523"E	1A	11° 06' 04.00425"N	78° 39' 22.33845"E
1B	11° 06' 09.24858"N	78° 39' 30.56637"E	2	11° 06' 04.29351"N	78° 39' 22.65962"E
1C	11° 06' 10.87488"N	78° 39' 30.59750"E	3	11° 06' 04.58428"N	78° 39' 23.15874"E
2	11° 06' 11.23842"N	78° 39' 30.60449"E	3A	11° 06' 04.69444"N	78° 39' 24.80289"E
3	11° 06' 11.44219"N	78° 39' 31.63295"E	4	11° 06' 04.71452"N	78° 39' 25.78644"E
4	11° 06' 11.30410"N	78° 39' 31.88797"E	5	11° 06' 04.98408"N	78° 39' 25.99298"E
4A	11° 06' 11.23943"N	78° 39' 33.53311"E	6	11° 06' 05.10481"N	78° 39' 26.26207"E
5	11° 06' 11.17209"N	78° 39' 34.33889"E	6A	11° 06' 04.97552"N	78° 39' 27.90004"E
6	11° 06' 11.08377"N	78° 39' 35.50918"E	7	11° 06' 04.88981"N	78° 39' 28.19553"E
7	11° 06' 10.37990"N	78° 39' 35.51479"E	8	11° 06' 05.56791"N	78° 39' 28.31743"E
8	11° 06' 10.46318"N	78° 39' 34.33397"E	8A	11° 06' 04.91782"N	78° 39' 29.80101"E
9	11° 06' 09.74106"N	78° 39' 34.33195"E	9	11° 06' 04.69500"N	78° 39' 30.12169"E
10	11° 06' 09.73741"N	78° 39' 34.23323"E	10	11° 06' 04.21613"N	78° 39' 31.50407"E
11	11° 06' 09.10160"N	78° 39' 34.18994"E	11	11° 06' 04.04488"N	78° 39' 32.73128"E
12	11° 06' 09.04805"N	78° 39' 35.53973"E	12	11° 06' 03.41887"N	78° 39' 32.53697"E
13	11° 06' 08.39106"N	78° 39' 35.53073"E	13	11° 06' 03.60425"N	78° 39' 31.60000"E
14	11° 06' 08.38147"N	78° 39' 34.14094"E	14	11° 06' 03.21864"N	78° 39' 31.48586"E
15	11° 06' 07.70024"N	78° 39' 34.09456"E	14A	11° 06' 03.13121"N	78° 39' 33.12396"E
15A	11° 06' 06.16629"N	78° 39' 34.55387"E	15	11° 06' 02.95869"N	78° 39' 33.84003"E
16	11° 06' 05.64000"N	78° 39' 34.69901"E	16	11° 06' 02.89618"N	78° 39' 34.80575"E
16A	11° 06' 05.54260"N	78° 39' 33.05736"E	16A	11° 06' 01.50877"N	78° 39' 35.45708"E
17	11° 06' 05.43219"N	78° 39' 31.79002"E	17	11° 06' 00.82169"N	78° 39' 35.70716"E
DATUM WGS-84			18	11° 05' 59.41021"N	78° 39' 35.79532"E
			18A	11° 05' 59.50626"N	78° 39' 34.14851"E
			18B	11° 05' 59.48826"N	78° 39' 32.50169"E
			19	11° 05' 59.39799"N	78° 39' 31.89501"E
			20	11° 06' 00.54582"N	78° 39' 32.17554"E
			21	11° 06' 00.80247"N	78° 39' 32.03377"E
			22	11° 06' 01.31897"N	78° 39' 30.69465"E
			23	11° 06' 01.30632"N	78° 39' 30.54823"E
			24	11° 06' 01.98059"N	78° 39' 30.28756"E
			24A	11° 06' 02.02044"N	78° 39' 28.64095"E
			25	11° 06' 01.94934"N	78° 39' 27.51855"E
			26	11° 06' 02.33089"N	78° 39' 28.05018"E
			26A	11° 06' 04.00792"N	78° 39' 28.15677"E
			27	11° 06' 04.67530"N	78° 39' 28.20421"E
			28	11° 06' 04.88244"N	78° 39' 26.67457"E
			29	11° 06' 03.38764"N	78° 39' 26.51609"E
			30	11° 06' 03.51766"N	78° 39' 25.61399"E
			31	11° 06' 02.59265"N	78° 39' 25.48240"E
			32	11° 06' 02.99727"N	78° 39' 23.92516"E
			32A	11° 06' 02.93930"N	78° 39' 22.28021"E
			DATUM WGS-84		

Source : Approved Review of Mining plan of the Respective leases

FIGURE 2.1: PHOTOGRAPHS OF THE PROJECT SITE - P1



FIGURE 2.1A: PHOTOGRAPHS OF THE PROJECT SITE - P2



FIGURE 2.2: GOOGLE IMAGE OF THE PROJECT AREA - P1

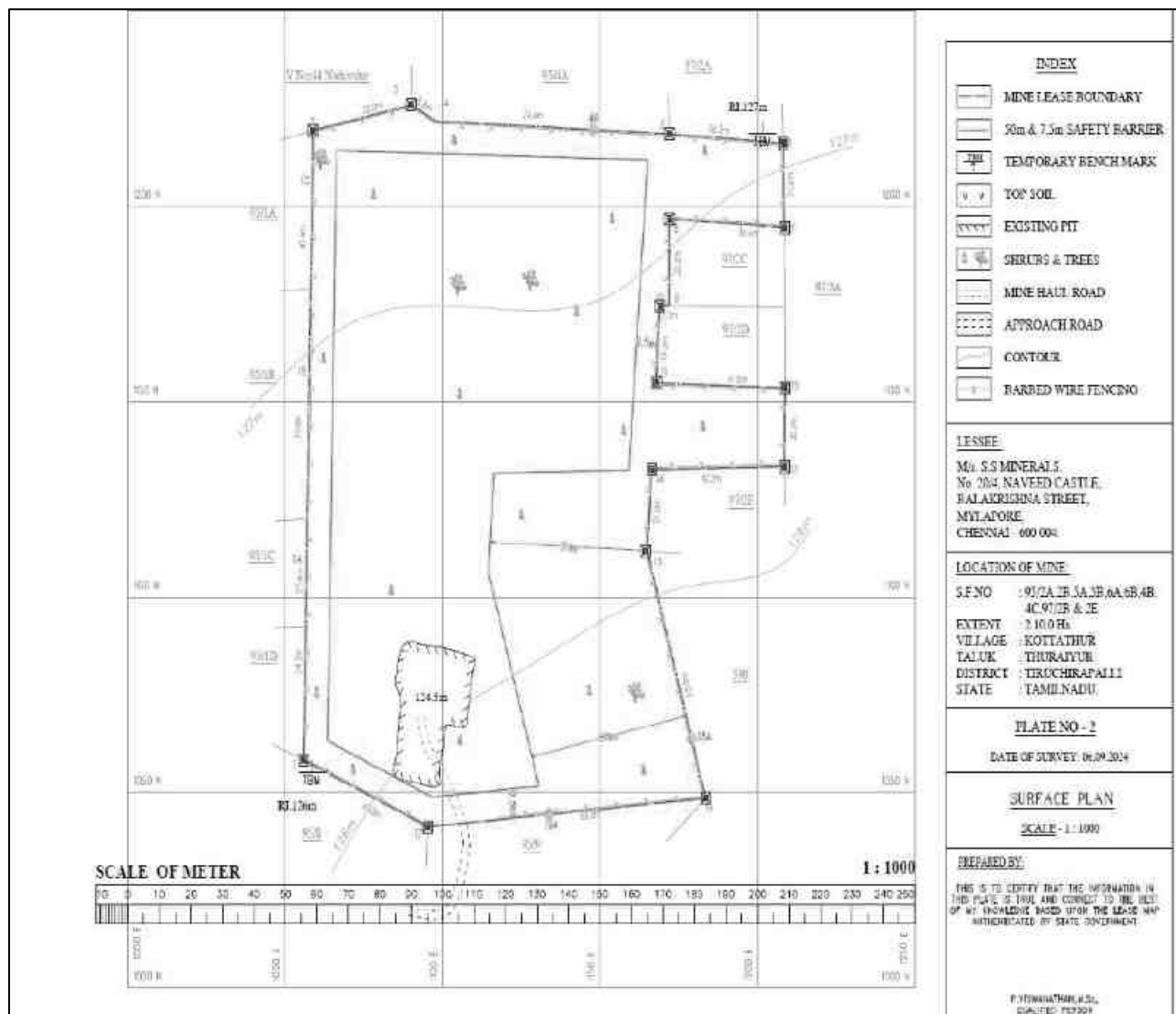


Source: Google Earth Imagery

FIGURE 2.2A: GOOGLE IMAGE OF THE PROJECT AREA - P2



FIGURE 2.3: MINE LEASE PLAN / SURFACE PLAN – P1



Source: Approved Mining Plan

FIGURE 2.4: MINE LEASE PLAN / SURFACE PLAN – P2

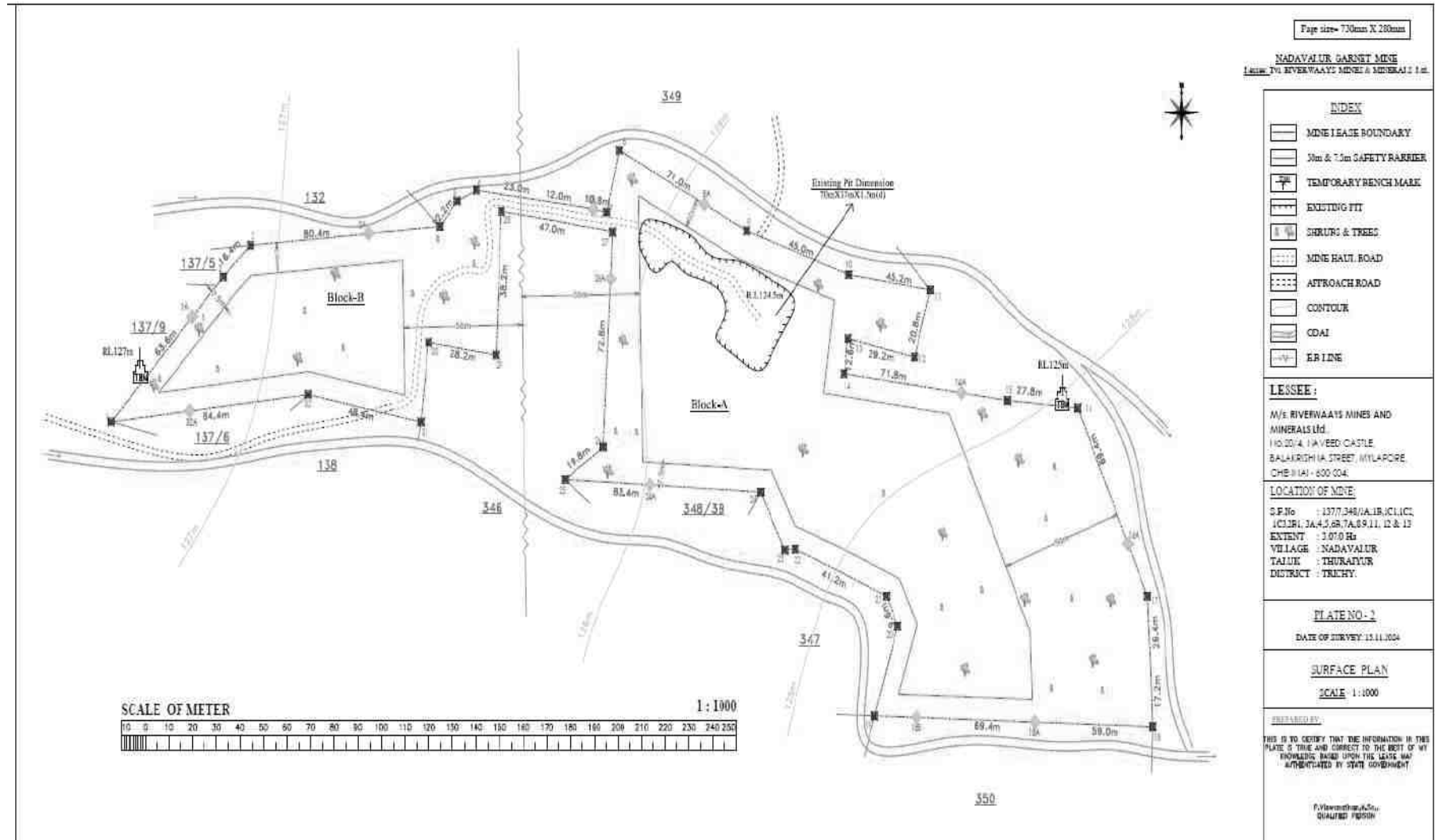


FIGURE 2.5: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

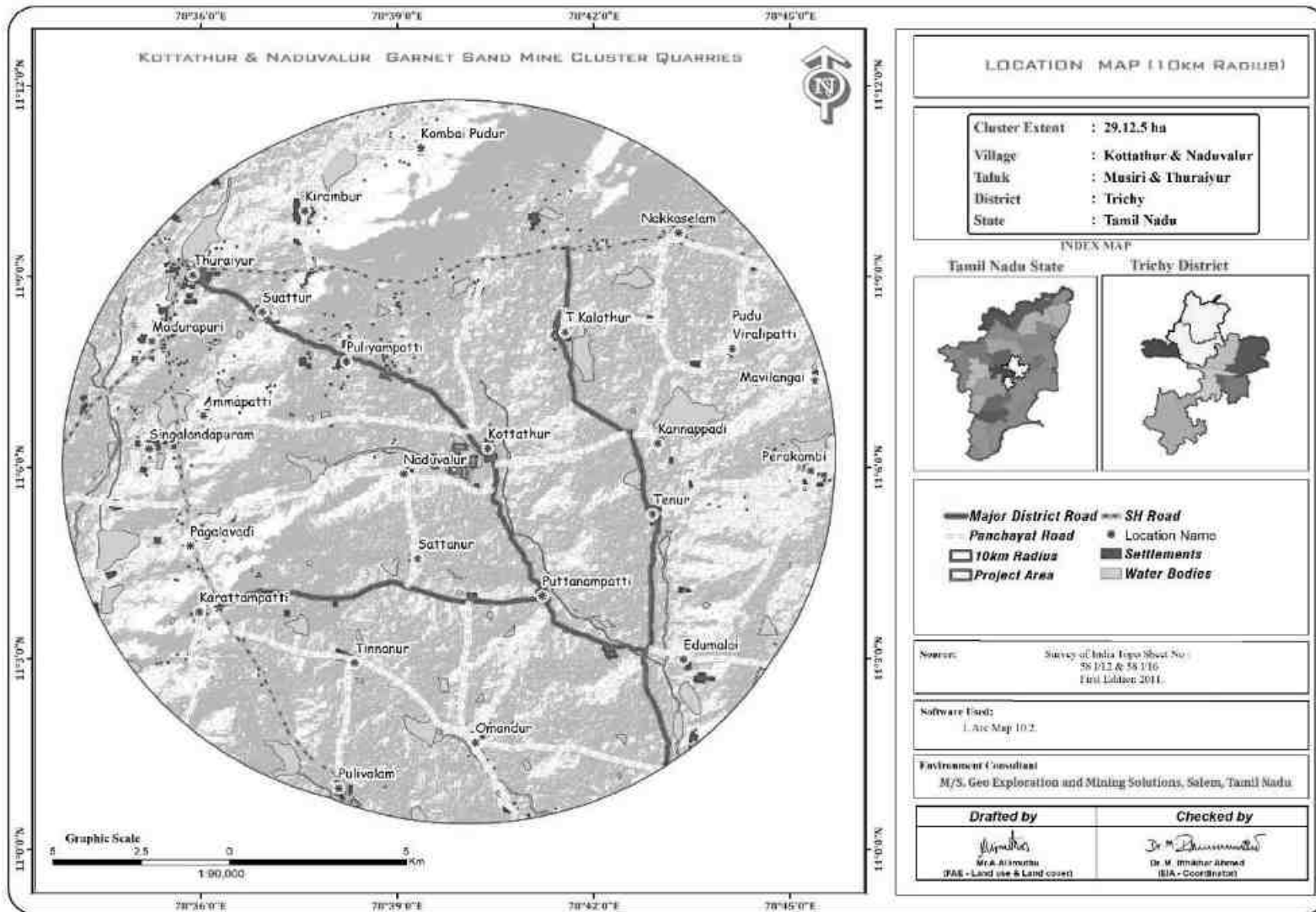


FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 5KM RADIUS

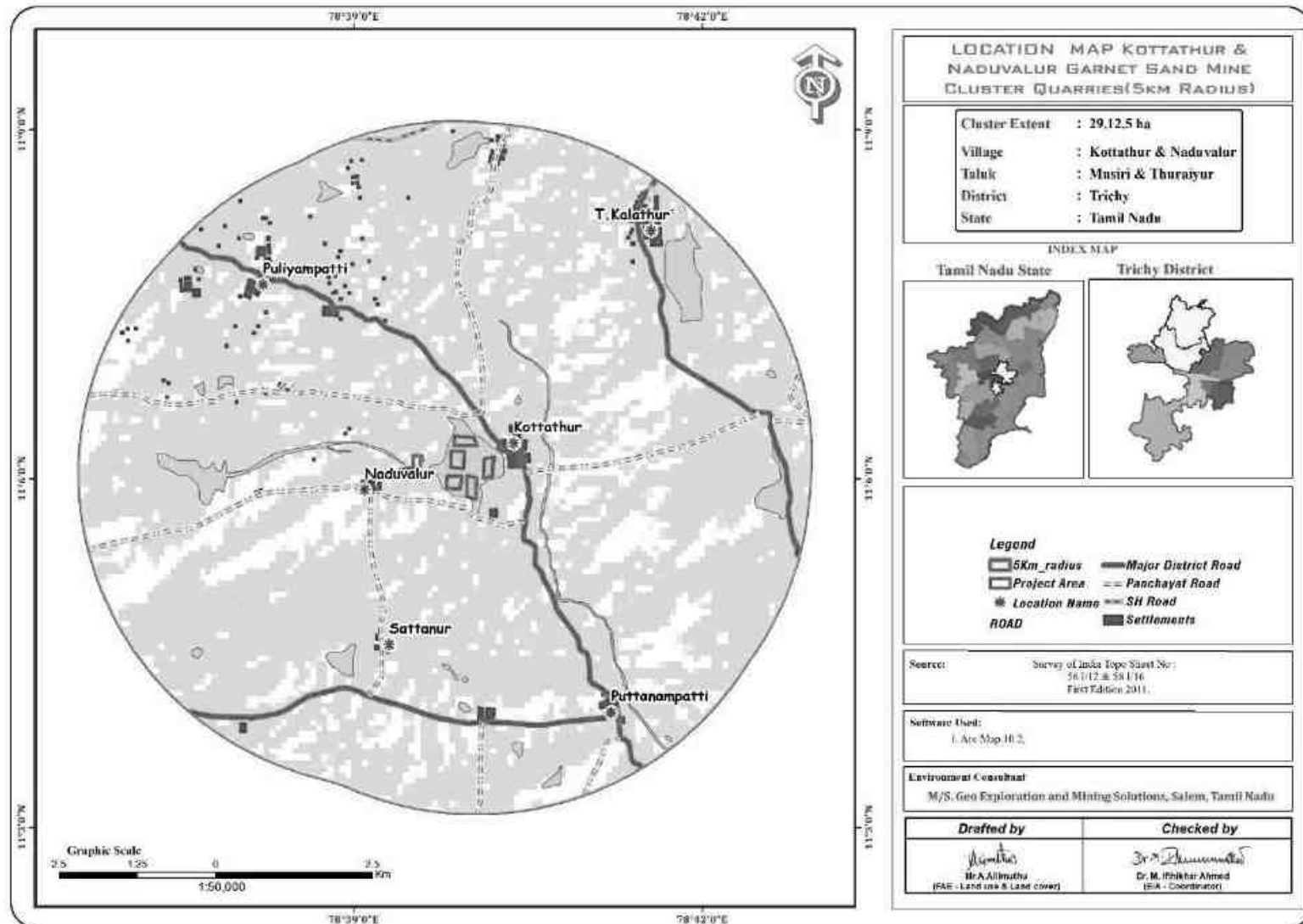
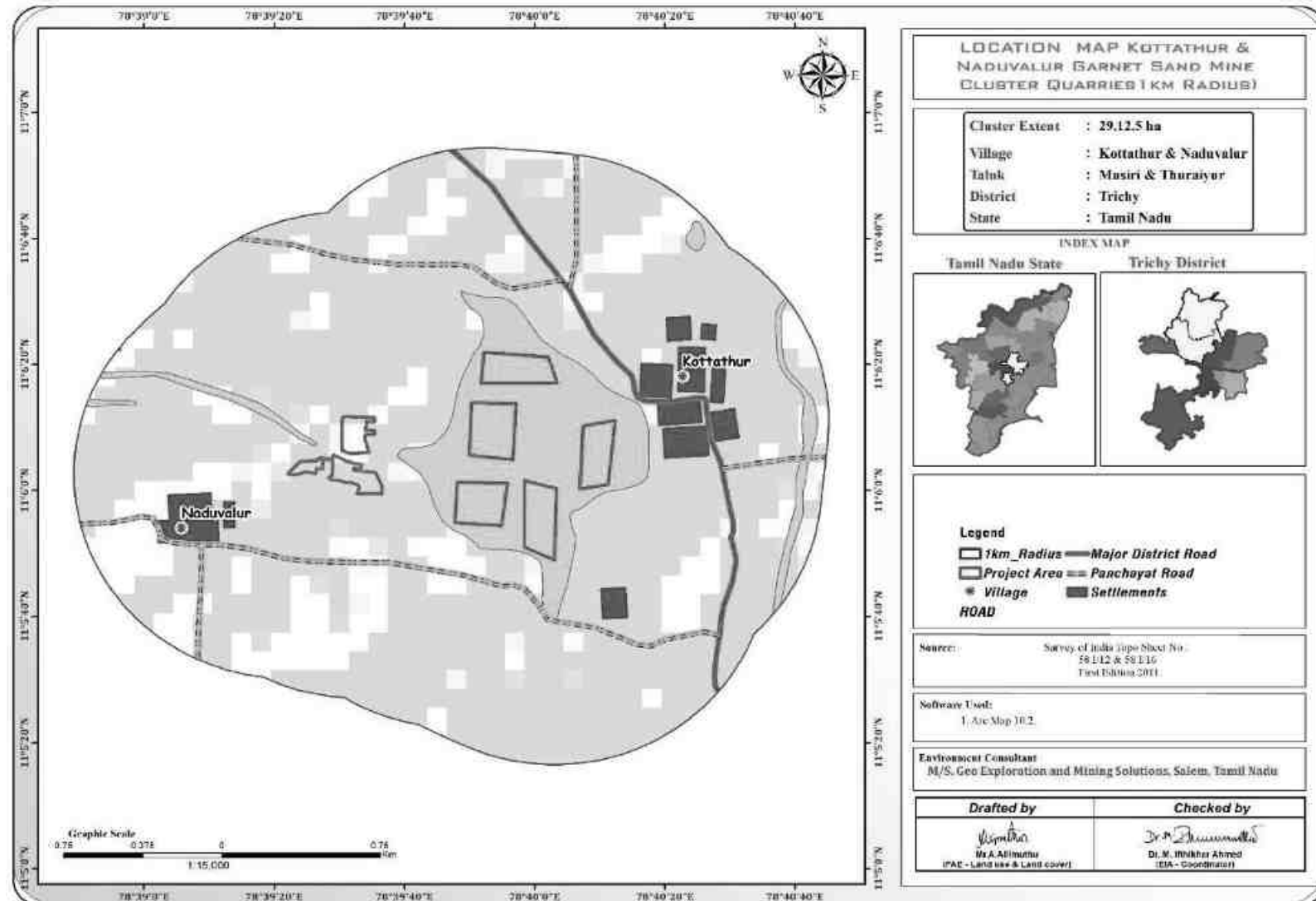


FIGURE 2.7: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS



2.2.1 Project Area

- The Garnet sand Mine is an existing lease is proposed to operate by opencast method of mining and the project is site specific
- There is no beneficiation or processing proposed inside the project area
- There is no forest land involved in the project and is devoid of major vegetation and trees.

TABLE 2.3: 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

TABLE 2.3A: 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

Source: Approved Mining Plan

2.2.2 Size or Magnitude of Operation

TABLE 2.4: OPERATIONAL DETAILS FOR PROPOSED PROJECT – 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

TABLE 2.5: OPERATIONAL DETAILS FOR PROPOSED PROJECT – 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

2.3 GEOLOGY

2.3.1 Regional Geology

Tiruchirappalli District is located centrally in Tamil Nadu and surrounded by Namakkal, Salem, Karur, Ariyalur, Pudukkottai, Thanjavur and Dindigul Districts. Being the central District of the state the district has so many advantages. Basically an agrarian district with industrial growth supported by the public sector companies like BHEL, HAPP, OFT and Railway workshop. The district is pioneer in fabrication industry and frontrunner in the fabrication of windmill towers in the country. Tiruchirappalli district is situated in the Cauvery Delta Agro climatic zone. Loamy, Clayey and sandy alluvial soil are the soil types found in the district. Major horticulture crops cultivated in this district are fruits crops like mango, banana, guava and acid lime, vegetables like tomato, onion, brinjal, and tapioca, spices like chillies, coriander, tamarind, turmeric and plantation crops like betel vine and flower crops like jasmine, marigold, crossandra and rose. Paddy, Cholan, Ragi and Cumbu are the principal crops of the district. Paddy is the

The Tiruchirappalli district exposes crystalline rocks of Archaean and Proterozoic age, Upper Gondwana Formations, sedimentary rocks of Mesozoic age, Miocene and Quaternary sediments. –

Stratigraphy of the area –

Lithology	Group	Age
Alluvium, Soil and Morrum		Recent
Ferrogenous sandstone		Tertiary
Marl and Marly Limestone		Upper Cretaceous
Clastic bedded limestone and Marl		
Massive pink coral limestone		Lower Cretaceous
Grey Shale		
Conglomerate and Sandstone		Upper Gondwana
-----Unconformity-----		
Syenite Complex	Alkali Group	Proteromic
Ultra-basic complex(s)		
Mixed gneisses, amphibolites, pyroxenites, calc-gneisses, Charnockite,	Charnockite Group	Archaean
Garnetiferous Gneiss and Crystalline rocks		

Crystalline rocks of Archaean to late Proterozoic age occupy over 80% of the area of the Tamilnadu, while the rest is covered by Phanerozoic sedimentary rocks mainly along the coastal belt and in a few inland River valleys. The hard rock terrain comprises predominantly of Charnockite and Khondalite groups and their migmatitic derivatives, supracrustal sequences of Sathyamangalam and Kolar groups and Peninsular Gneissic Complex (Bhavani Group), intruded by ultramaficmafic complexes, basic dykes, granites and syenites. The sedimentary rocks of the coastal belt include fluviatile, fluvio-marine and marine sequences, such as Gondwana Supergroup (Carboniferous to Permian and Upper Jurassic to Lower Cretaceous), marine sediments of Cauvery basin (Lower Cretaceous to Paleogene), Cuddalore /Panambarai Formation (Mio-Pliocene) and sediments of Quaternary and Recent age. Geological map

2.3.2 Local Geology: -

The study area constitutes a part of tectonic phase made of granulites terrain in the peninsular shield. The outcrop of garnetiferous gneiss overlain by peninsular gneiss, which is approximately aligned in Northeast – South west direction, The garnetiferous gneiss is hard and compact embedded with large phenocrysts of almandine luster garnet which is in advance stage of weathering.

The garnet sands in Tiruchirappalli region are restricted to the Musiri, Thuraiyur and Thottiyam Taluks. It forms a part of the meta-sedimentary rocks of Archean age correlated to Bhavani Super Group of Dharwar Group, comprising mostly of high concentrated garnetiferous gneiss, overlain by peninsular gneiss. The garnetiferous gneiss is hard and compact embedded with large phenocrysts of almandine garnet. The process of weathering results in the disintegration of rocks which in turn enables the release of their mineral grains. When the grains like garnet, clinozoisite, amphibole, magnetite, etc., are released from the parent rocks, during the rainfall they get liberated and transported along the stream course. They get deposited in the streambed as detrital grains as and when they meet with

(interface) sudden change in the velocity of runoff. Deposition of garnet sands by the stream has been a regular process taking place every rainy season adding to the thickness of deposits along the streambed year after year.

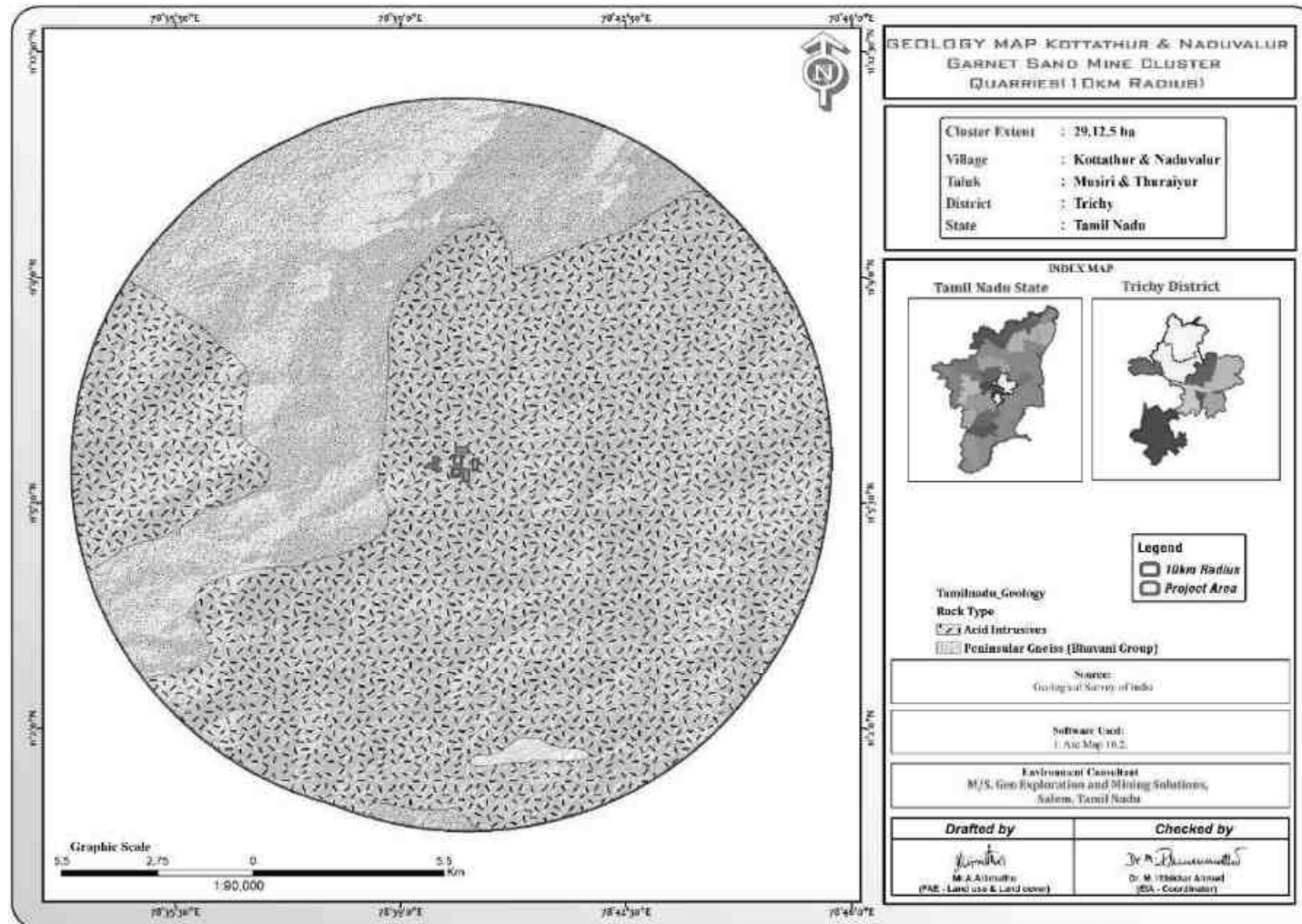
2.3.3 Hydrogeology

Tiruchirappalli district is one of the inland districts in the State and lies in the Central Part of the State. The district is bounded by Perambalur District in the North and Ariyalur District in the Northeast and Karur District in the West and Thanjavur District in the East.

The District lies between 10° 17' to 11° 25'N Latitude, 78° 09'to 79° 03'E Longitude and has an areal extent of 4511 sq.km.

- Most of the District is a pediplain with a general slope towards the central part where River Cauvery and Coleroon flow.
- The entire district falls in Cauvery Basin and drained by River Cauvery and its tributaries like Ayyar, Uppar, and partly by Maruthaiyar, Ponnana AR, Koraiyar and partly by Vellar River System.
- There are small residual hills scattered in western and southern part of the district, prominent among them, is Rock Fort hill, located in the heart of Tiruchirappalli town.

FIGURE 2.8: REGIONAL GEOLOGY MAP



From the above map it is inferred that the cluster quarries fall in the hard rock terrain (Peninsular Gneiss)Source:

FIGURE 2.9: GEOMORPHOLOGY MAP

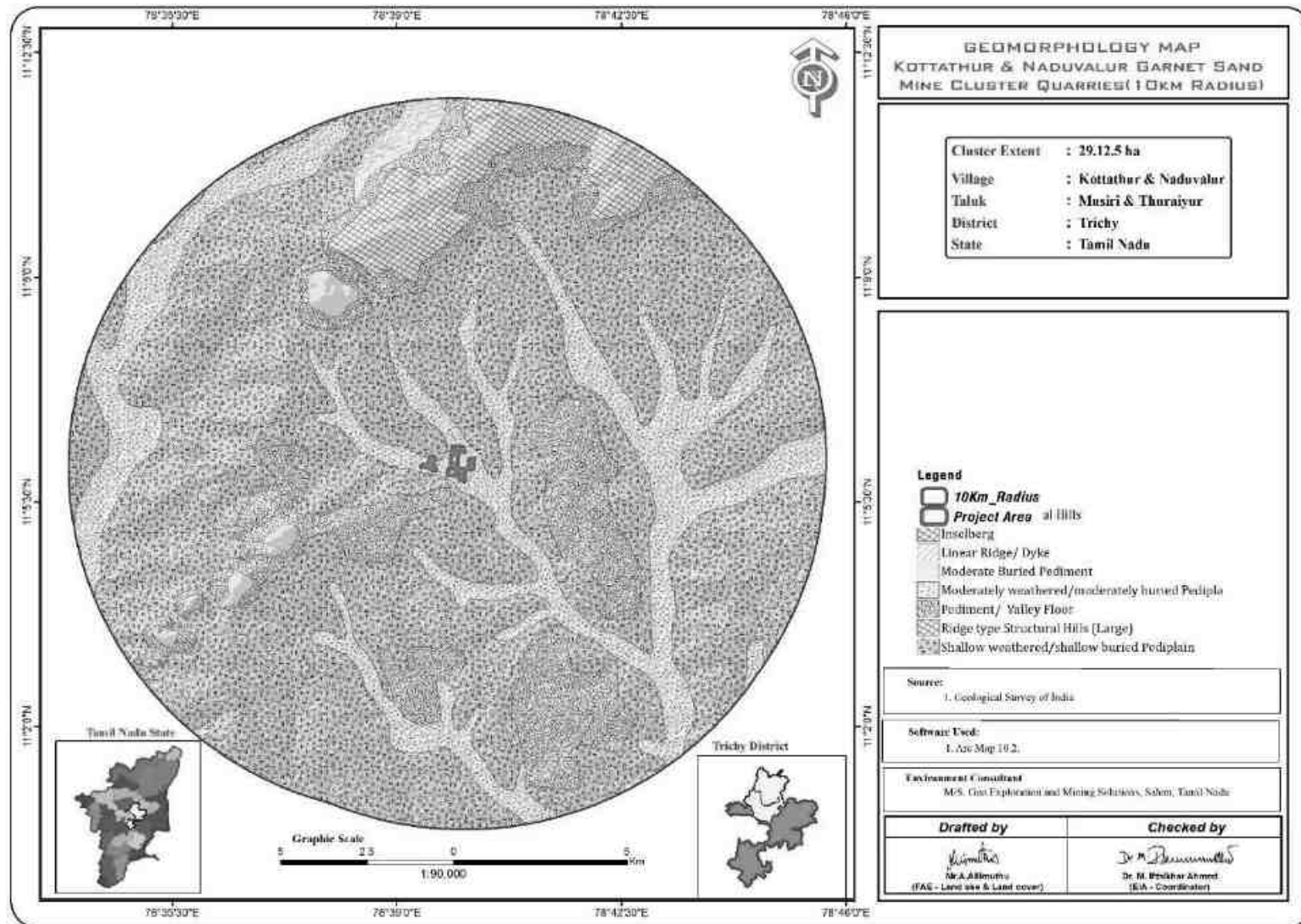
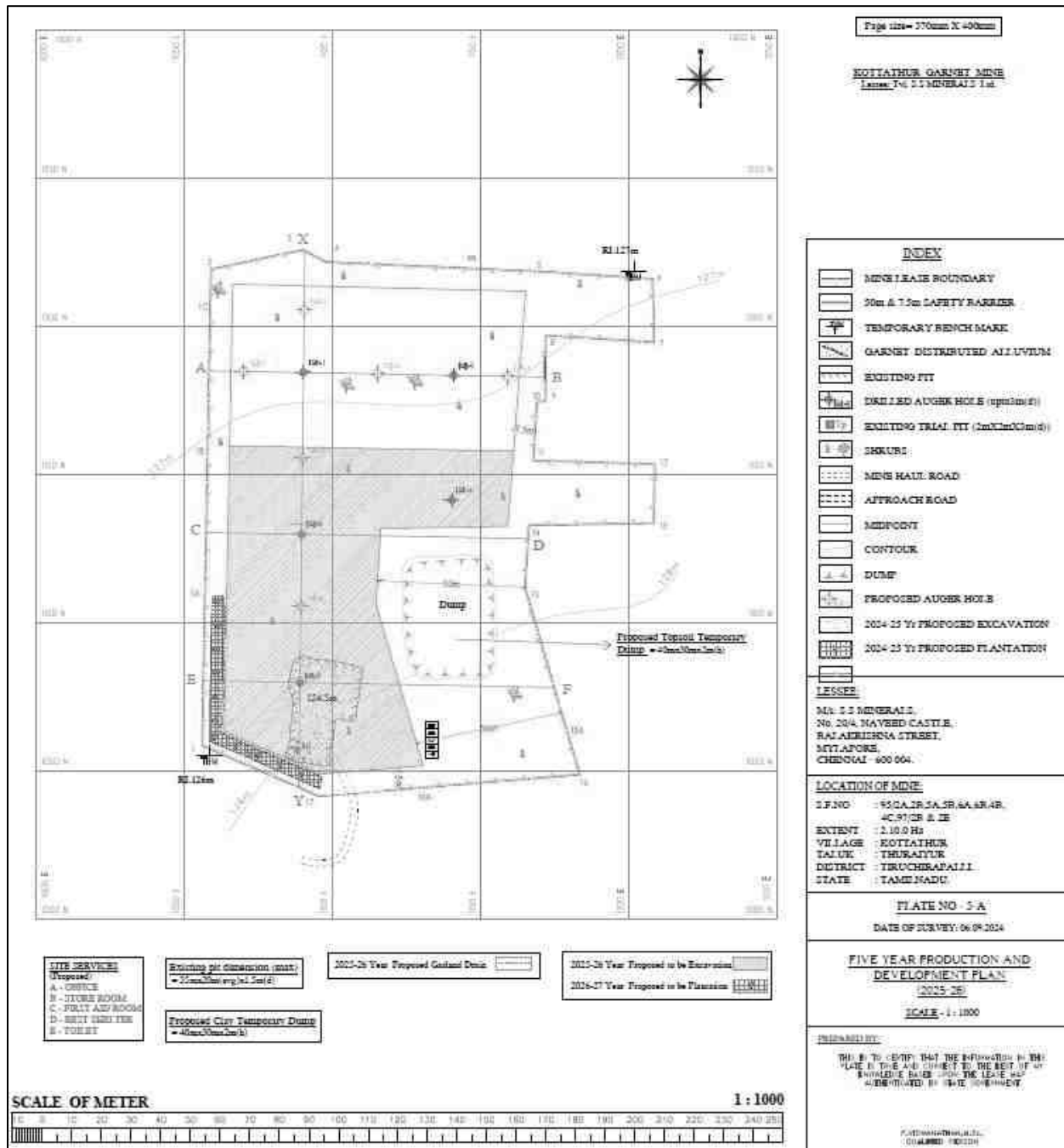


FIGURE 2.10: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2025-26) - P1



Source: Approved Mining Plan

FIGURE 2.10A: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2026-27) - P1

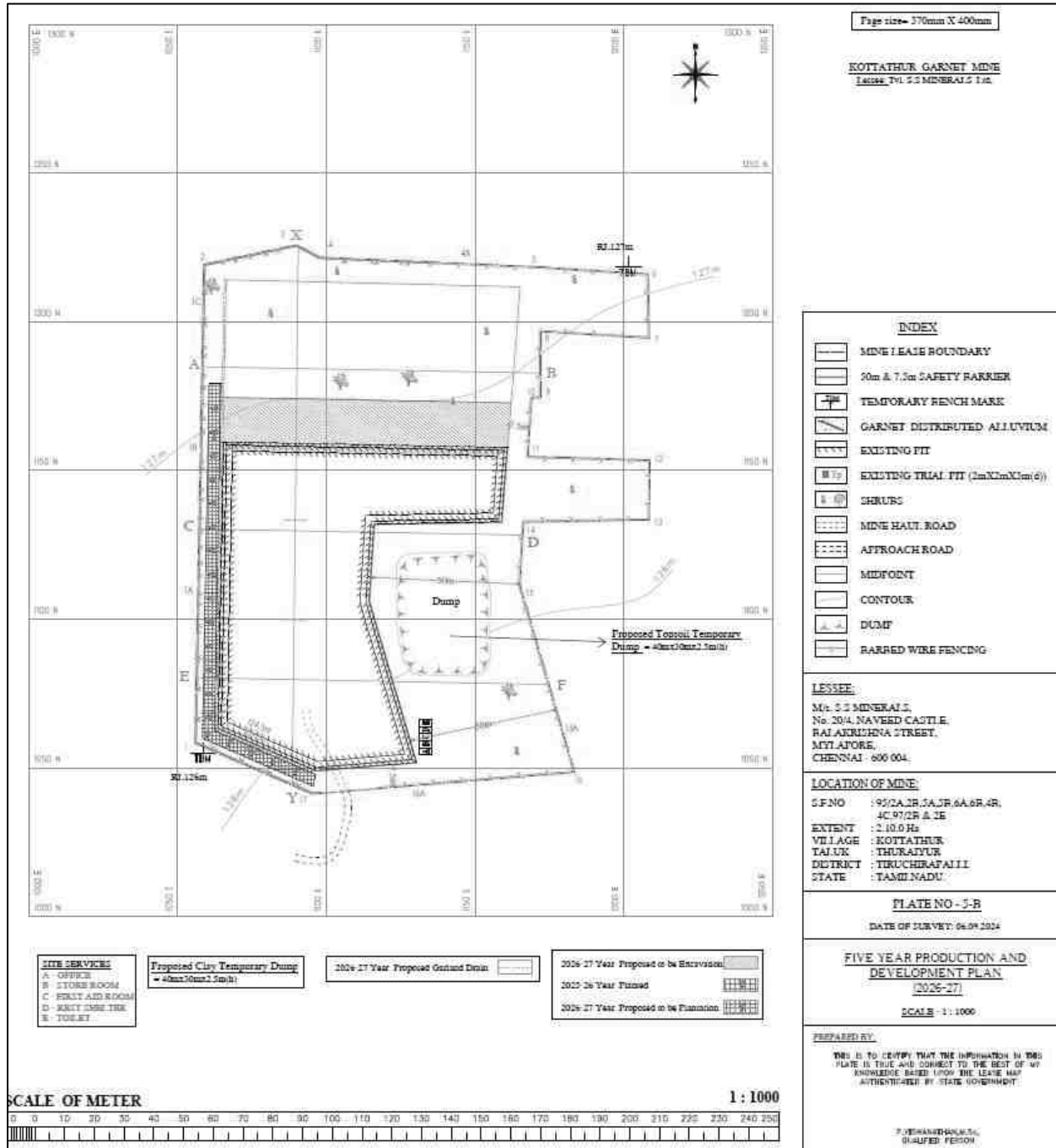


FIGURE 2.10B: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2027-28) - P1

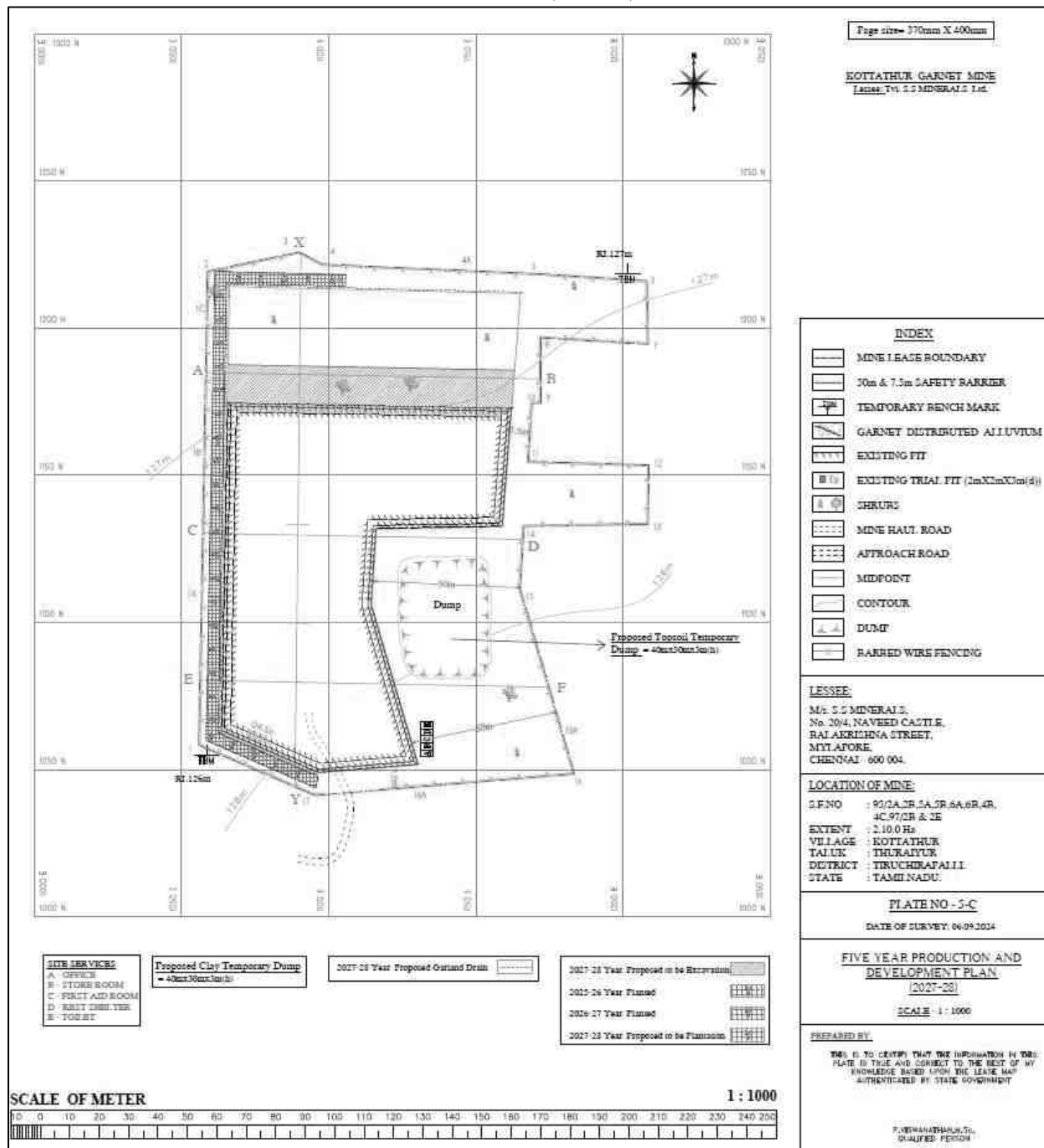


FIGURE 2.10C: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2028-29) - P1

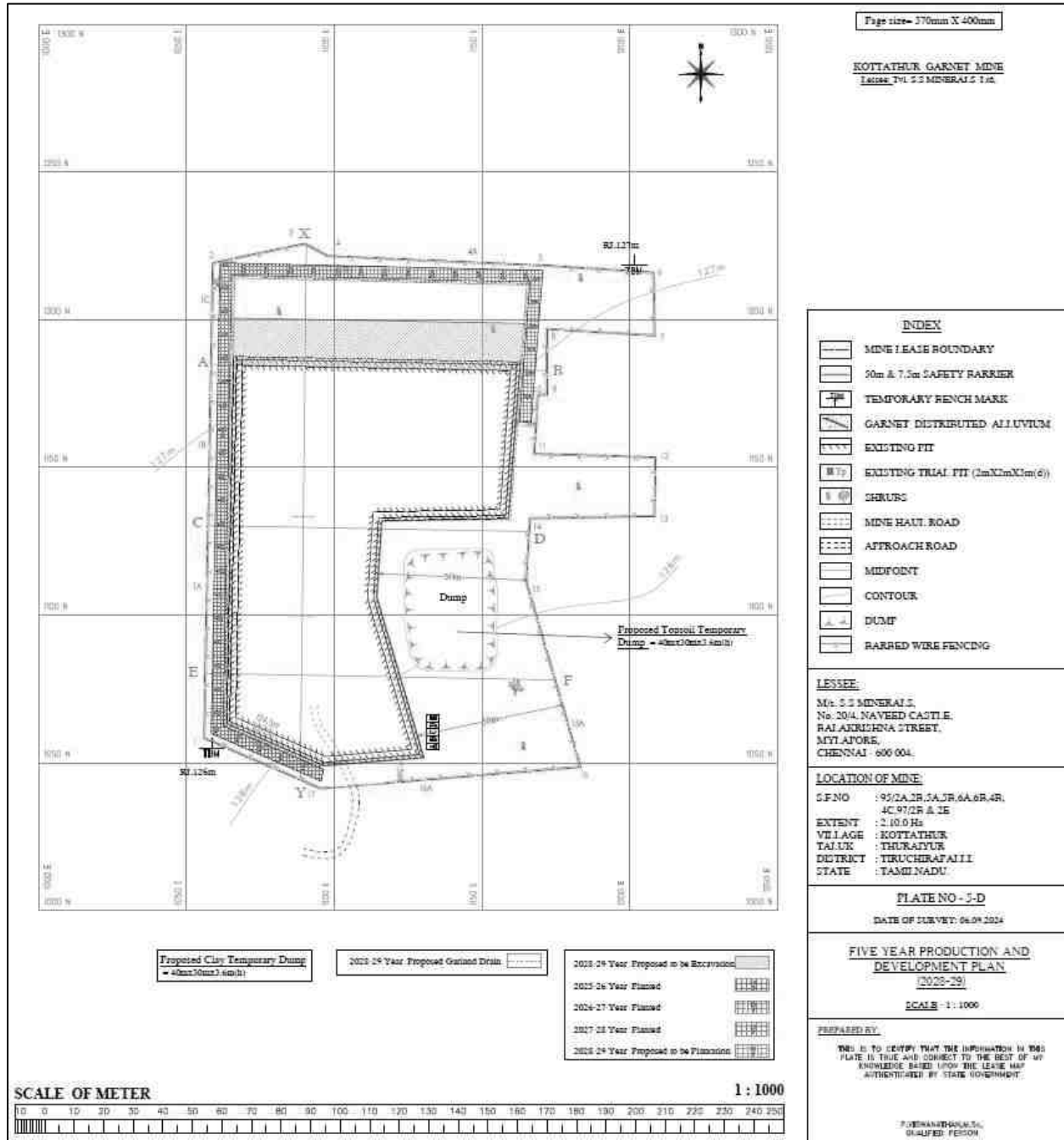
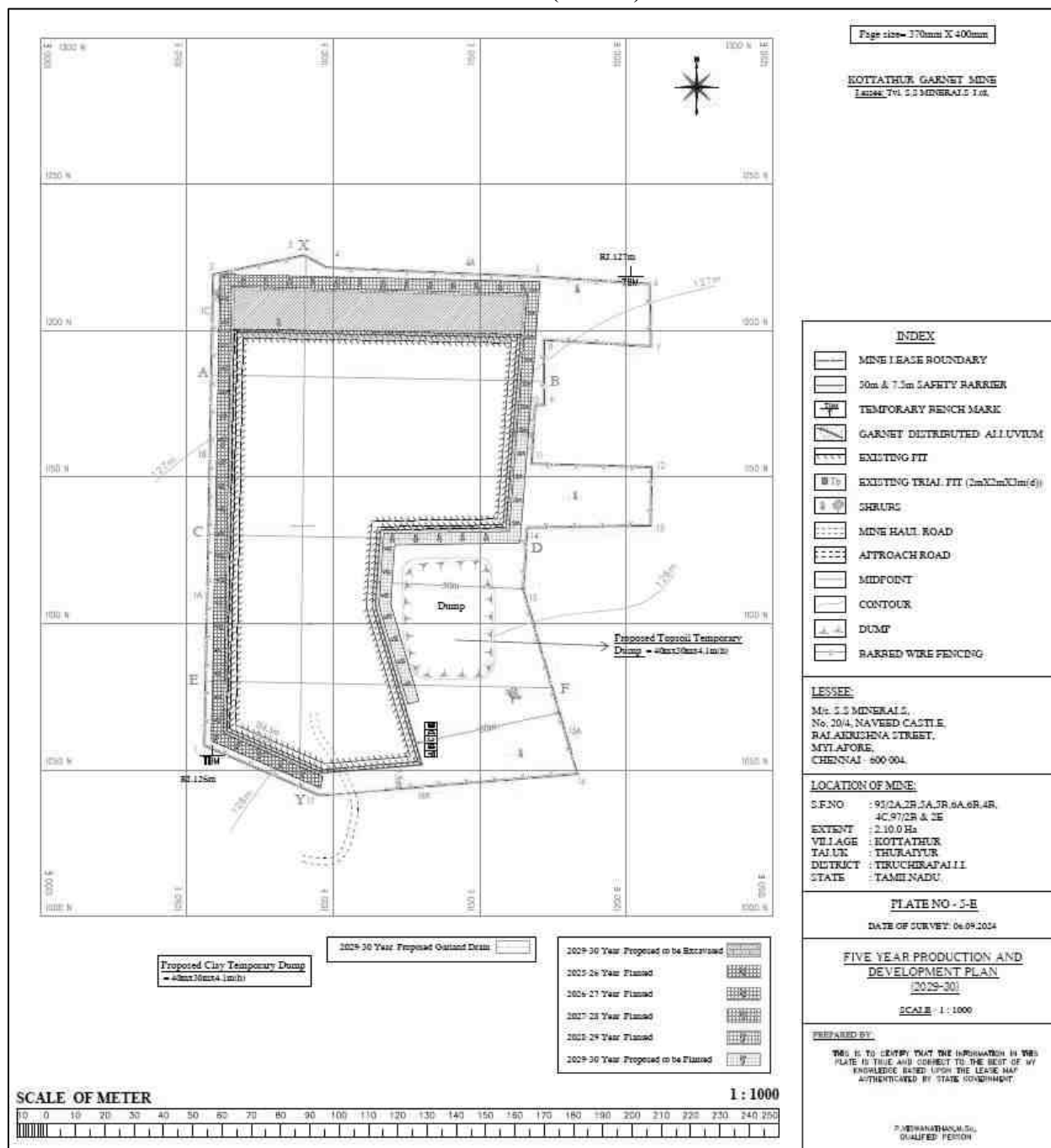


FIGURE 2.10D: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2029-30) - P1



Page Size - 400mm X 270mm

200+25 Year Proposed to be Saturated

FIGURE 2.10F: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2025-26) - P2

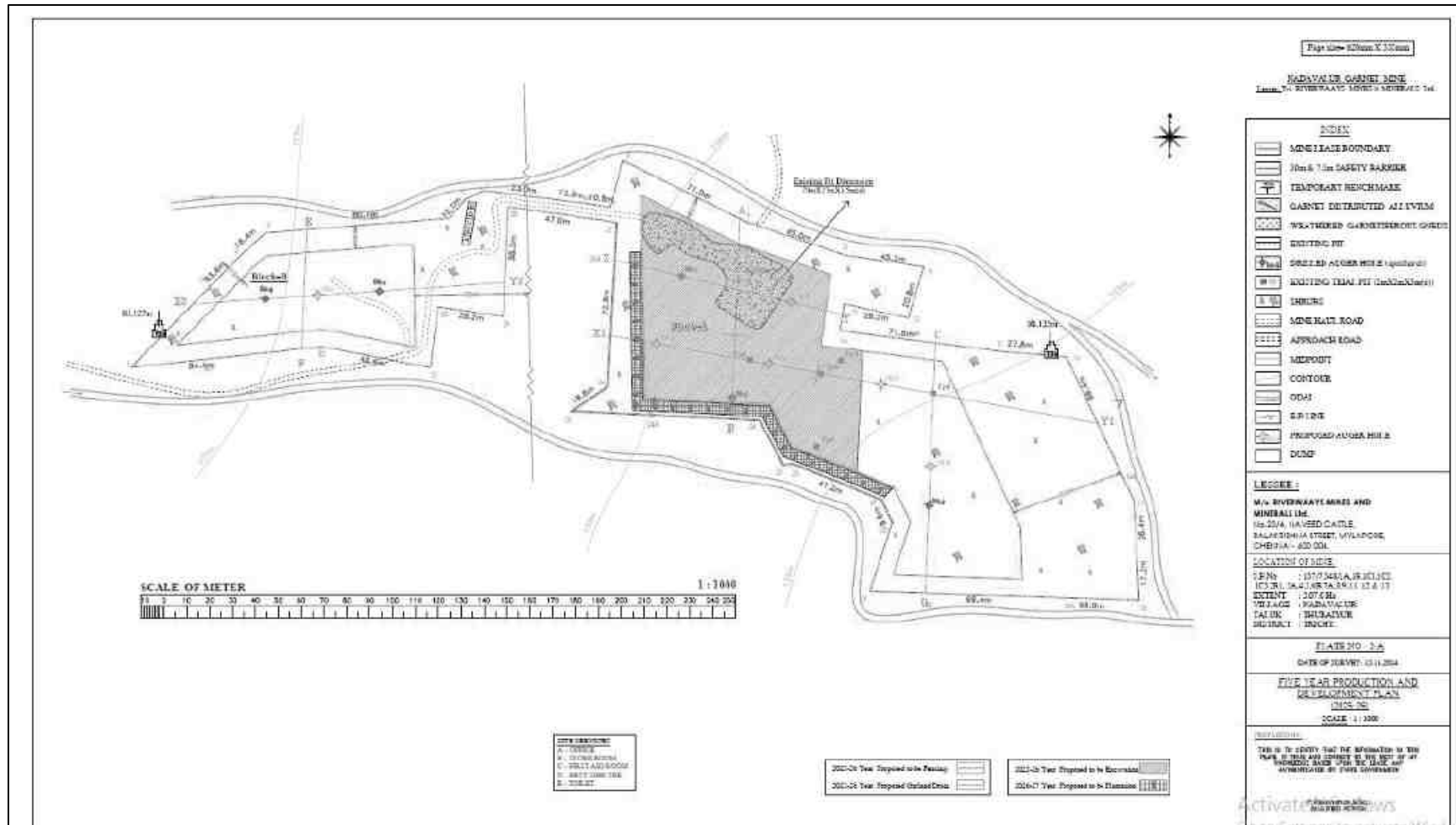


FIGURE 2.10G: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2026-27) - P2

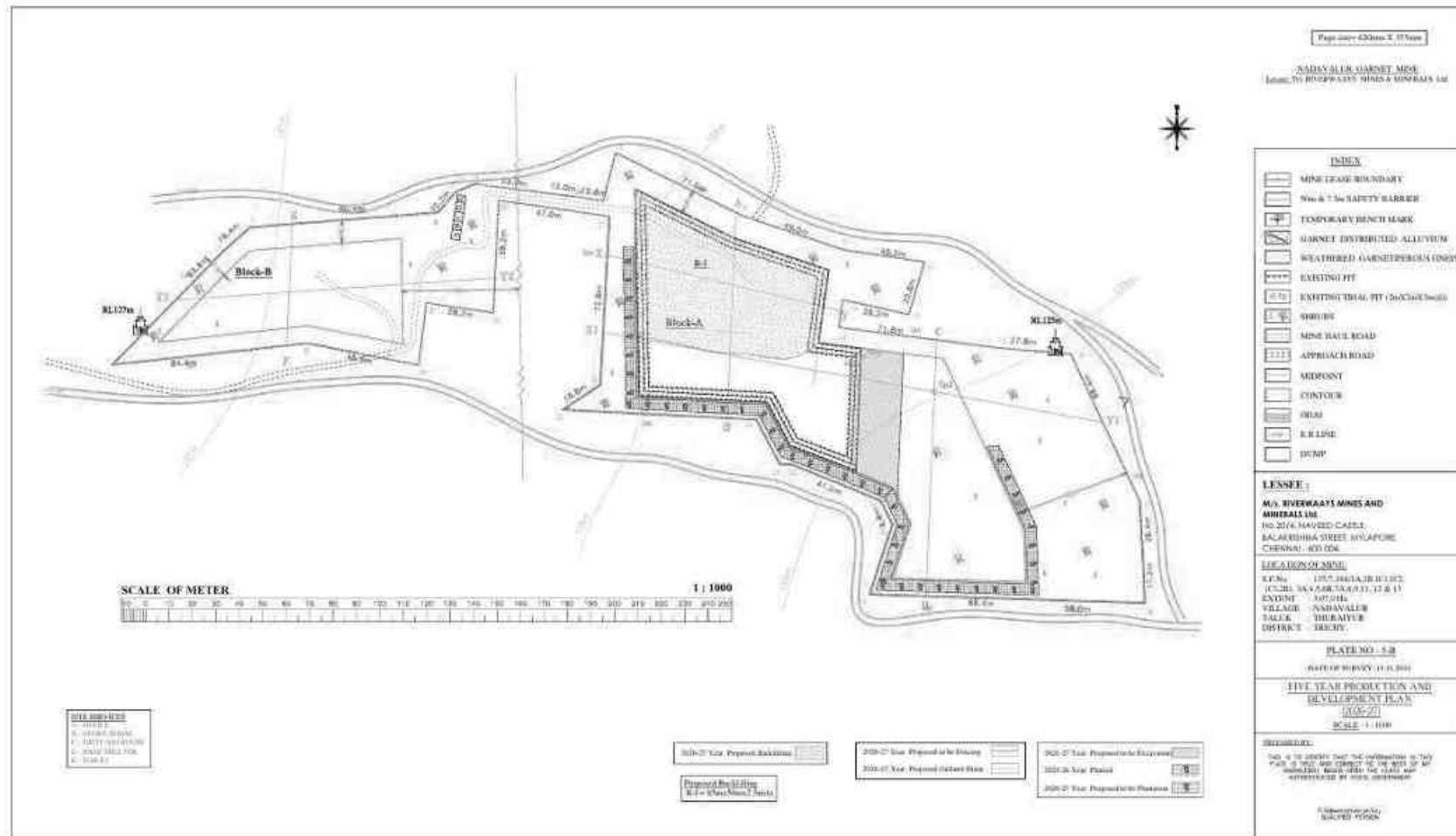


FIGURE 2.10H: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2027-28) - P2

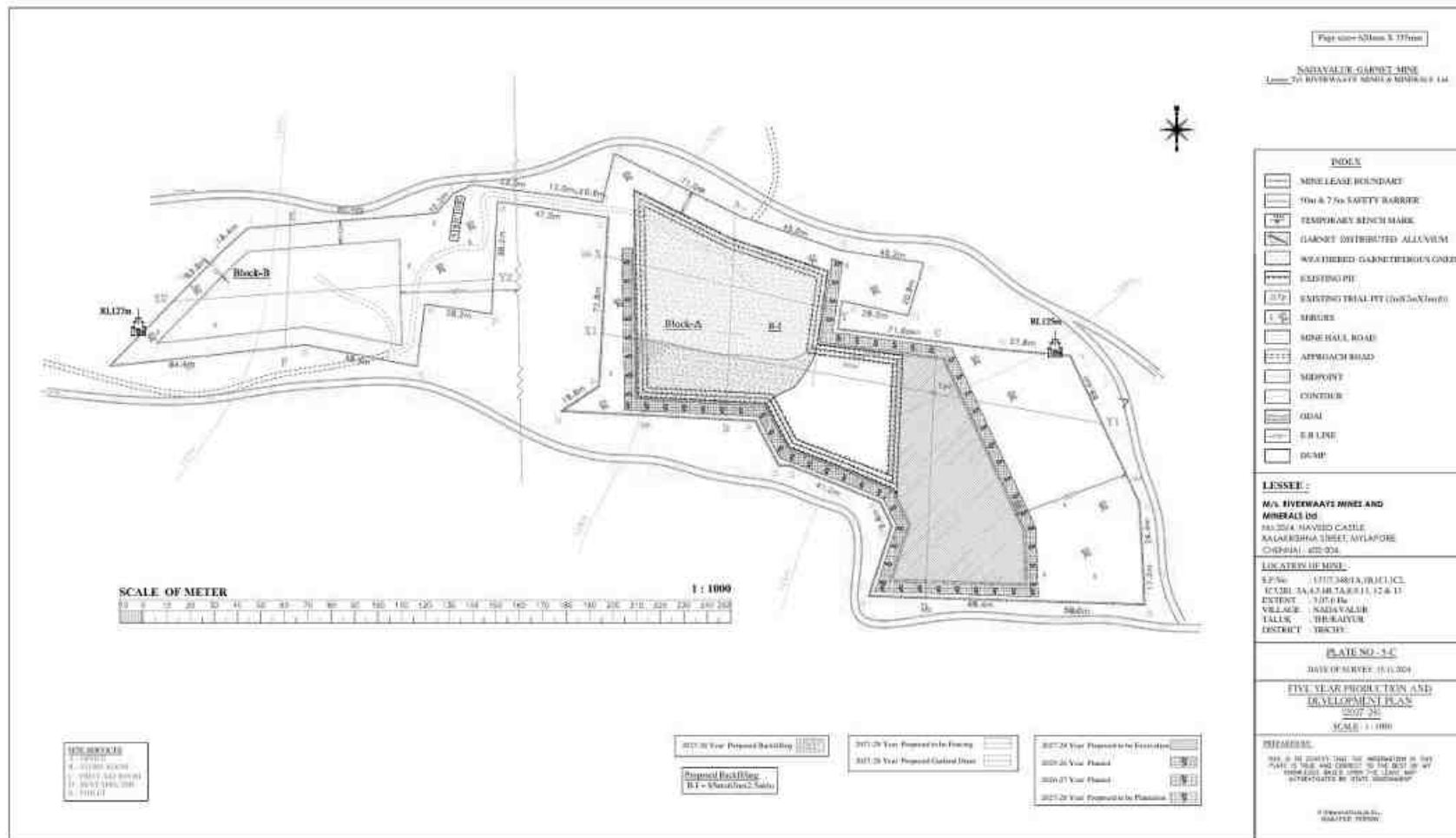


FIGURE 2.10 I: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2028-29) - P2

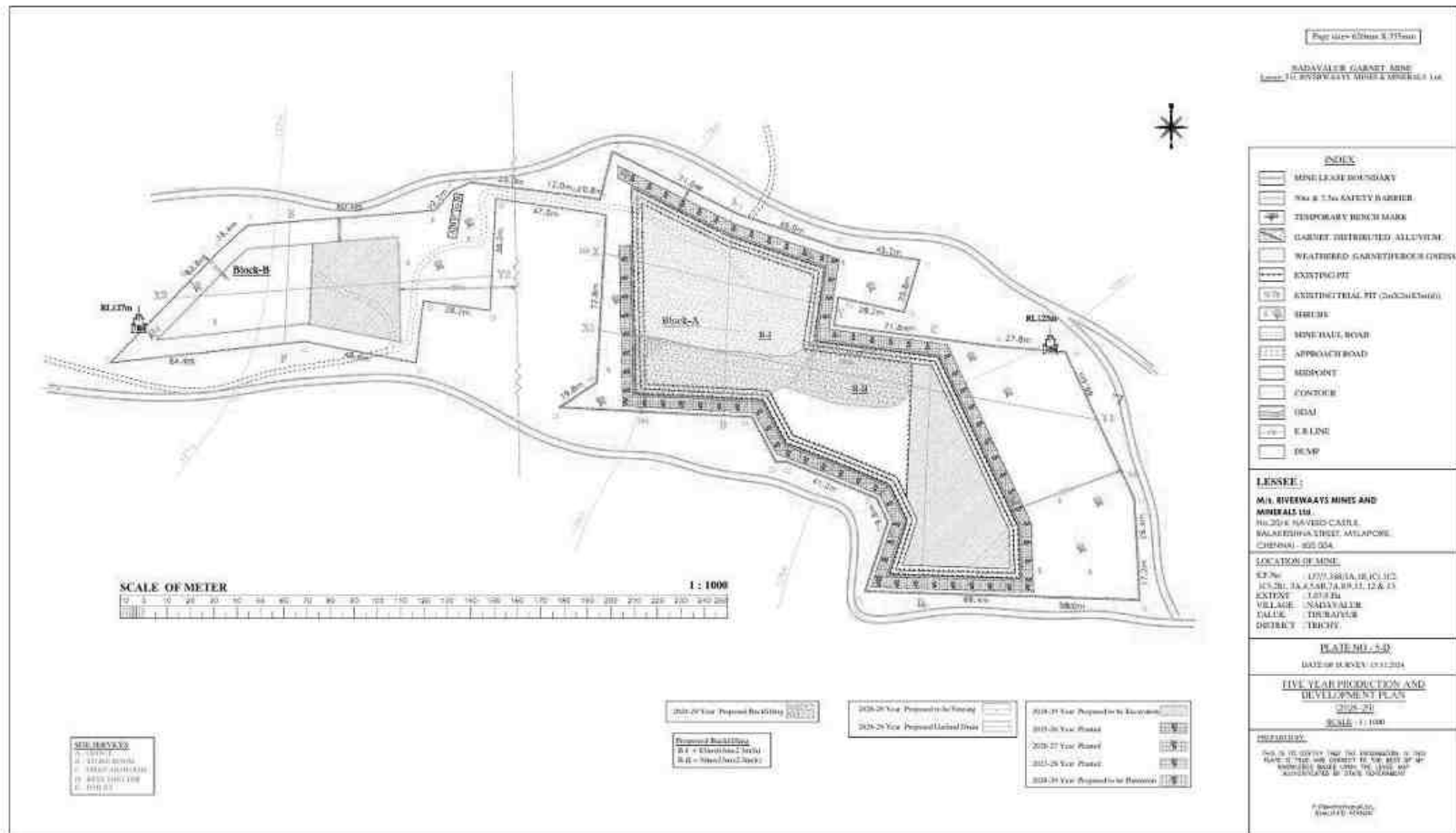


FIGURE 2.10 J: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS (2029-30) - P2

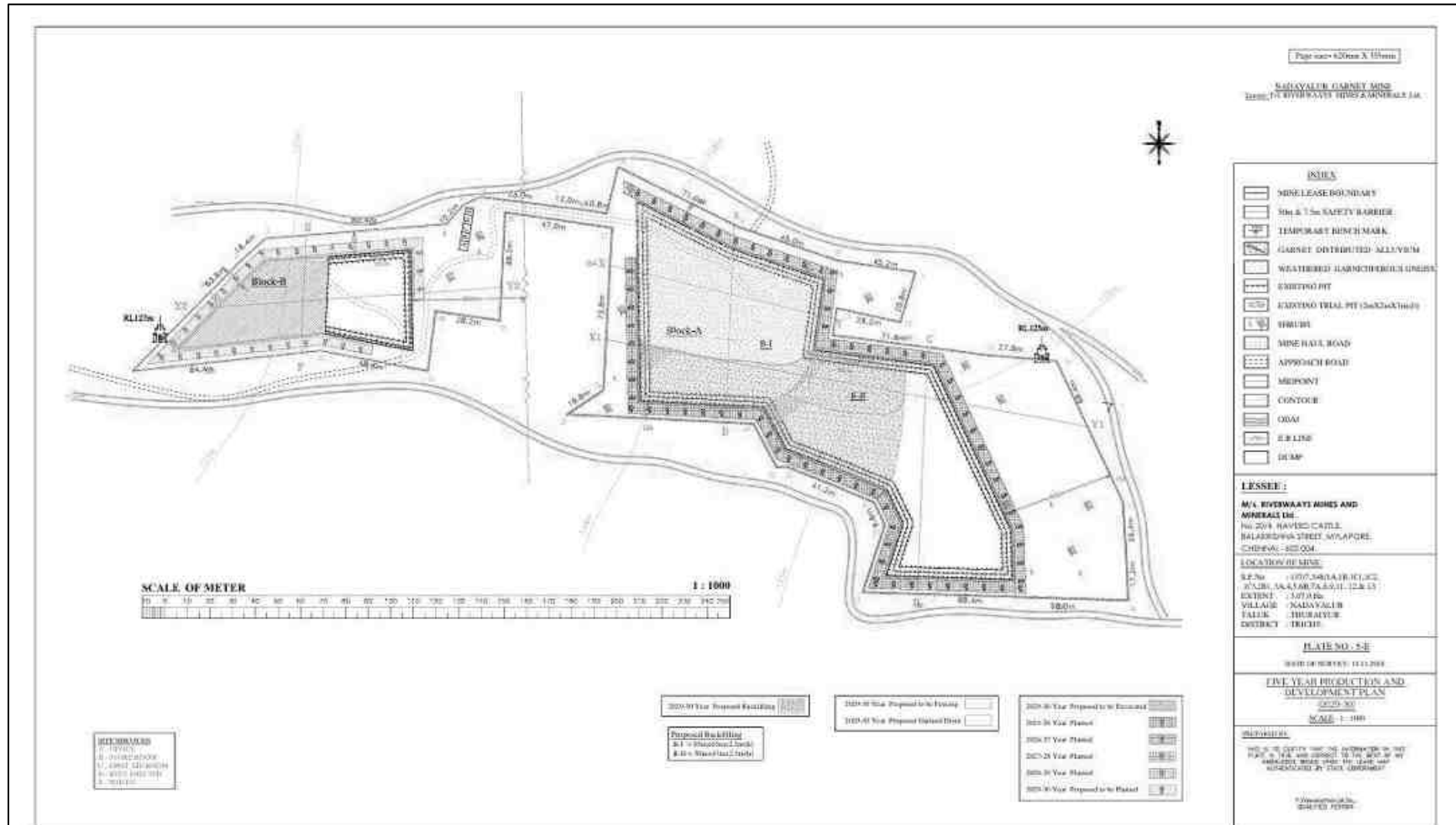
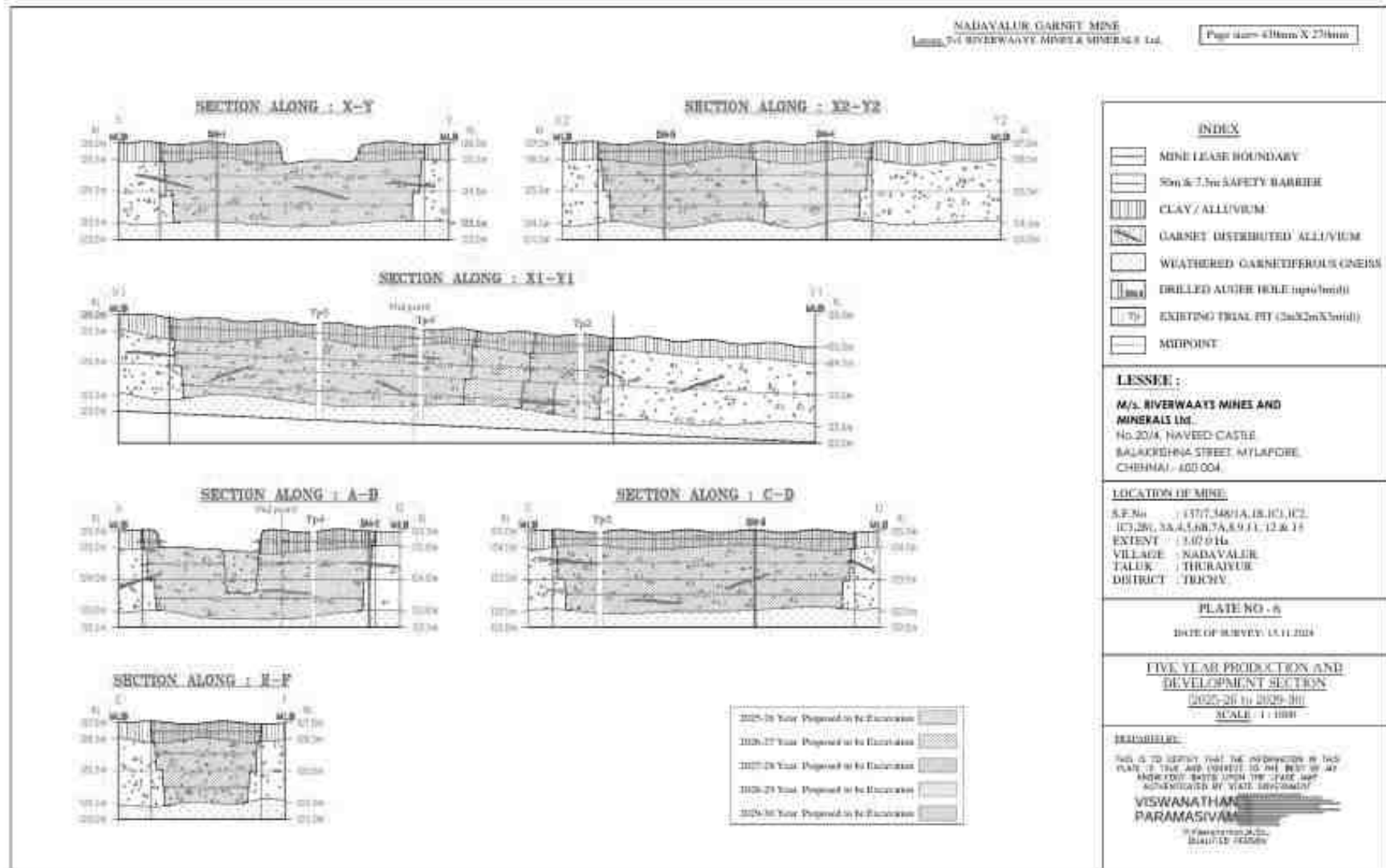


FIGURE 2.10 K: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS - P2



Page size: 270mm X 400mm

KOTATHUR GARNET MINE
(MINE No. 12 MINERAL S. 118)

LEGEND

- MINE LIMIT BOUNDARY
- Pit & 7.5m DEPTH BARRIER
- TEMPORARY BOUNDARY
- GARNET DISTRIBUTED ALLUVIUM
- EXISTING PIT
- EXISTING TRIAL PIT (2000mm X 1000mm)
- CONTOUR
- MINE RAIL ROAD
- APPROACH ROAD
- MIDPOINT
- CONTOUR
- DUMP
- RANGED WIRE FENCING

LOCATION OF MINE:
MINE NO. 12 MINERAL S. 118
10th NAVEDU CATTLE
RAJADURINA STREET
MYSORE
COORDINATE: 500 000

LOCATION OF MINE:
MINE NO. 12 MINERAL S. 118
10th NAVEDU CATTLE
RAJADURINA STREET
MYSORE
COORDINATE: 500 000

LEGEND

- MINE LIMIT BOUNDARY
- Pit & 7.5m DEPTH BARRIER
- TEMPORARY BOUNDARY
- GARNET DISTRIBUTED ALLUVIUM
- EXISTING PIT
- EXISTING TRIAL PIT (2000mm X 1000mm)
- CONTOUR
- MINE RAIL ROAD
- APPROACH ROAD
- MIDPOINT
- CONTOUR
- DUMP
- RANGED WIRE FENCING

LEGEND

- MINE LIMIT BOUNDARY
- Pit & 7.5m DEPTH BARRIER
- TEMPORARY BOUNDARY
- GARNET DISTRIBUTED ALLUVIUM
- EXISTING PIT
- EXISTING TRIAL PIT (2000mm X 1000mm)
- CONTOUR
- MINE RAIL ROAD
- APPROACH ROAD
- MIDPOINT
- CONTOUR
- DUMP
- RANGED WIRE FENCING

LEGEND

- MINE LIMIT BOUNDARY
- Pit & 7.5m DEPTH BARRIER
- TEMPORARY BOUNDARY
- GARNET DISTRIBUTED ALLUVIUM
- EXISTING PIT
- EXISTING TRIAL PIT (2000mm X 1000mm)
- CONTOUR
- MINE RAIL ROAD
- APPROACH ROAD
- MIDPOINT
- CONTOUR
- DUMP
- RANGED WIRE FENCING

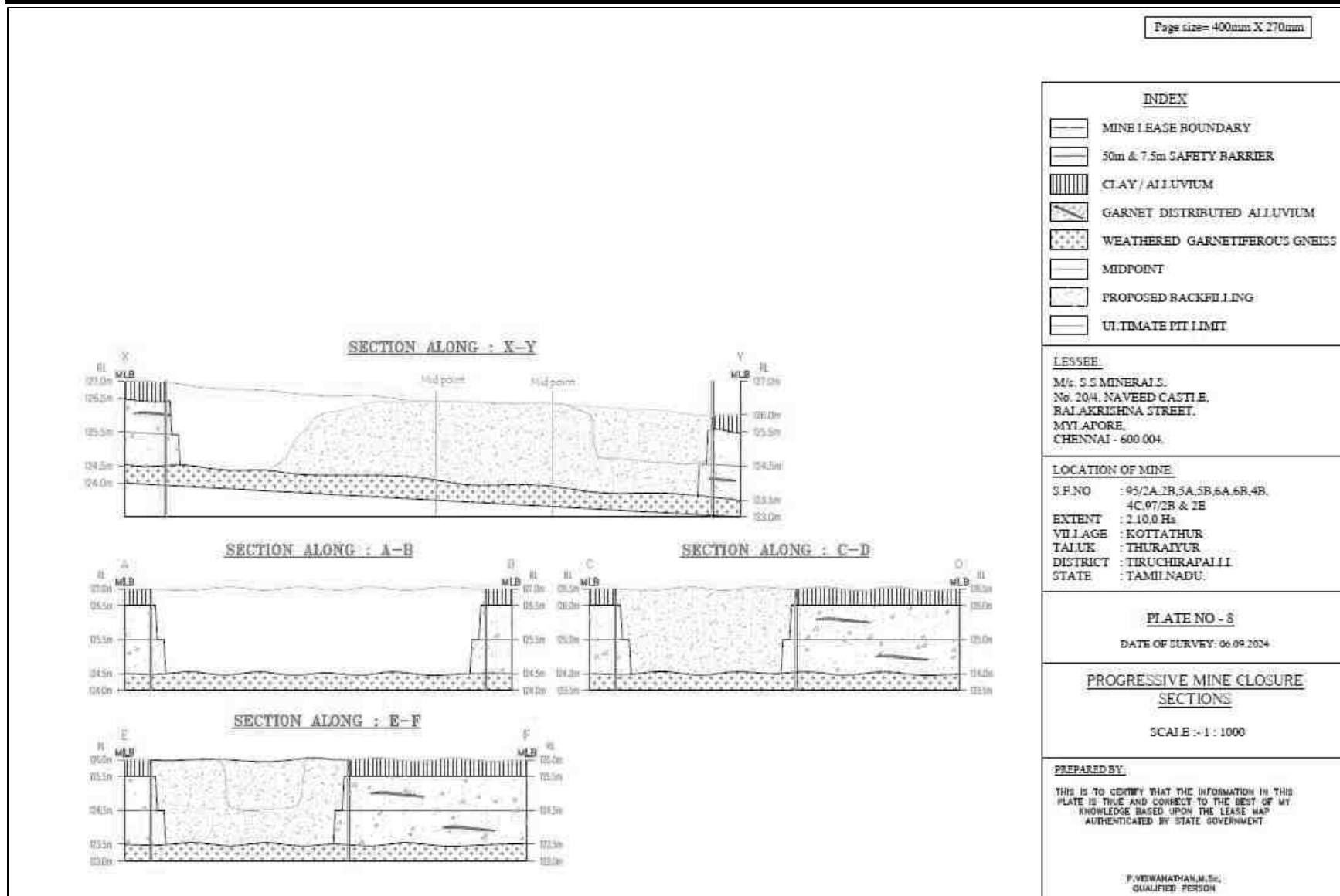
LEGEND

- MINE LIMIT BOUNDARY
- Pit & 7.5m DEPTH BARRIER
- TEMPORARY BOUNDARY
- GARNET DISTRIBUTED ALLUVIUM
- EXISTING PIT
- EXISTING TRIAL PIT (2000mm X 1000mm)
- CONTOUR
- MINE RAIL ROAD
- APPROACH ROAD
- MIDPOINT
- CONTOUR
- DUMP
- RANGED WIRE FENCING

LEGEND

- MINE LIMIT BOUNDARY
- Pit & 7.5m DEPTH BARRIER
-

40



Page: 1001 to 1002 of 1002



FIGURE 2.11B: CLOSURE PLAN AND SECTIONS – P2



2.4 RESOURCES AND RESERVES

The Resources and Reserves of Garnet Sand were calculated based on Cross-Section Method by plotting sections to cover the maximum lease area for the proposed project. It is an exiting lease and now the proposals are in the preparation of Review of Mining plan for the period of 2025-26 to 2029-30.

Based on the availability of Geological Resources the Mineable Reserves are calculated by considering excavation system of bench formation and leaving essential safety distance of 7.5 m (Safety Barrier all around the lease area) and safety distance as per precise area communication letter and deducting the locked up reserves during bench formation (Also called as Bench Loss) and the Mineable Reserves is calculated considering there is no waste / overburden for all the proposed projects.

TABLE 2.6: MINERAL RESERVES AS PER THE APPROVED RoMP – P1

Description	ROM in Tonnes	Garnet Recovery in Tonnes	Mineral Rejects in Tonnes
Geological Resource	78,242	27,384	78,242
Mineable Resource	39,544	13,840	25,703
Year wise production	39,544	13,840	25,703
Peak production Capacity	19,780	6,923	12,857

Source: Approved Review of Mining Plan

TABLE 2.7: YEAR-WISE PRODUCTION PLAN – P1

Year	ROM Ts	Garnet Recovery @ 35% in Tonnes	Mineral Rejects in Tonnes	Topsoil in m ³
I	19,780	6,923	12,857	2,357.50
II	5,490	1,921	3,568.50	727.50
III	4,758	1,665	3,092.70	630.50
IV	4,758	1,665	3,092.70	630.50
V	4,758	1,665	3,092.70	630.50
Total	39,544	13,840	25,703.60	4976.50

TABLE 2.8: MINERAL RESERVES AS PER THE APPROVED RoMP – P2

Description	ROM in Tonnes	Garnet Recovery in Tonnes	Mineral Rejects in Tonnes
Geological Resource	1,19,474	41,816	77,658
Mineable Resource	49,366	17,278	32,088
Year wise production	49,366	17,278	32,088
Peak production Capacity	24,948	8,731	16,216

TABLE 2.9: YEAR-WISE PRODUCTION PLAN – P2

Year	ROM	Garnet Recovery @ 35% in Tonnes	Mineral Rejects in Tonnes	Topsoil in m ³
I	24,948	8731.80	16,216.20	2,361
II	6,372	2230.20	4,141.80	846
III	6,270	2194.50	4,075.50	1,128
IV	6,208	2172.80	4,035.20	629
V	5,568	1948.80	3,619.20	816
Total	49366	17,278	32,088	5,780

Source: Approved Mining Plan

Disposal of Waste

Since the recovery of ROM is expected to be 35%, the balance 65% reject from the processing plant will be transported back and backfilled in the mined out area. Top soil will be spread over the backfilled area and the mined out pit will be restored back to primining condition.

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.,

TABLE 2.10: 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

Source: Approved Mining Plan

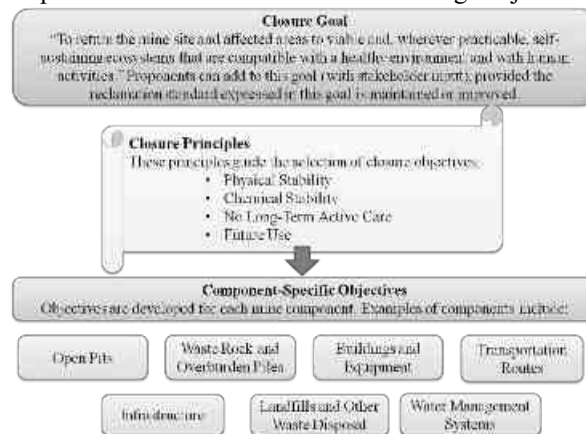
- At the end of life of mine, the excavated mine pit / void will facilitate to collect the rainwater and the pit will act as temporary reservoir.
- After mine closure the greenbelt developed along the safety barrier and top benches and temporary water reservoir will enhance the ecosystem

- Mine Closure is a process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.
- The principal closure objectives are for rehabilitated mines to be physically safe to humans and animals, geotechnically stable, geo-chemically non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.

Post-Closure Monitoring –

The purpose of post-closure monitoring with respect to open pit mine workings is to ensure the attainment of closure objectives.

- Monitor physical and geotechnical stability of remnant pit walls.
- Monitor the ground regime in pit walls to confirm achievement of design objectives.

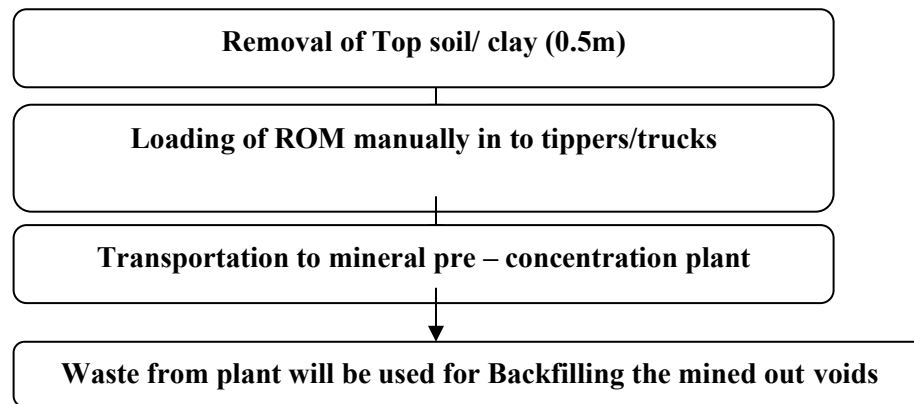


- Monitor water level in pit to confirm closure objectives regarding fish, fish habitat, and wildlife safety are being achieved
- Sample water quality and quantity at controlled pit discharge points
- Identify and test unanticipated areas where water management is an issue
- Inspect integrity of barriers such as berms & fences
- Monitor wildlife interactions with barriers to determine effectiveness
- Inspect aquatic habitat in flooded pits where applicable
- Monitor dust levels

2.5 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.



2.5.1 Drilling , Blasting Parameters & Machinery

No Drilling and Blasting Activities has been proposed. No Excavators, Poclains will be involved in this project.

2.6 GENERAL FEATURES

2.6.1 Existing Infrastructures

Infrastructures like Mine office, Temporary Rest shelters for workers, Latrine and Urinal Facilities will be constructed as per the Mine Rule after the grant of mine lease.

2.6.2 Drainage Pattern

Drainage pattern is the pattern formed by the streams, rivers, and lakes in a particular drainage basin over time that reveals characteristics of the kind of rocks and geological structures in a landscape. They are governed by the topography of the land, whether a particular region is dominated by hard or soft rocks, and the gradient of the land.

Dendritic drainage pattern is one of the most common type that develop in areas where the rock (or unconsolidated material) beneath the stream has no particular fabric or structure and can be easily eroded equally in all directions.

There are no streams, canals or water bodies crossing within the project area. The drainage pattern of the area is dendritic – sub dendritic.

2.6.3 Traffic Density

The traffic survey conducted based on the transportation route of material, the Garnet is proposed to be transported mainly through Naduvalur Panchayat Road that connects to on South Eastern Side.

Traffic density measurements were performed at two locations

1. Naduvalur Panchayat Road
2. Thuraiyur to Kottathur District Road.

Traffic density measurement were made continuously for 24 hours by visual observation and counting of vehicles under three categories, viz., Heavy motor vehicles, light motor vehicles and two/three wheelers. As traffic densities on the roads are high, two skilled persons were deployed simultaneously at each station during each shift- one person on either direction for counting the traffic. At the end of each hour, fresh counting and recording was undertaken.

TABLE.2.11: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Naduvalur Panchayat Road	1.5 km-SE	Major District Road (Two Lane)
TS2	Thuraiyur to Kottathur District Road	1.8 km-SE	Village road (Single Lane)

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.12: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	122	366	28	28	118	59	453
TS2	296	888	115	115	370	185	1188

Source: On-site monitoring by GEMS FAE & TM

* PCU conversion factor: HMV (Trucks and Bus) = 3, LMV (Car, Jeep and Auto) = 1 and 2/3 Wheelers = 0.5

TABLE 2.13: GARNET HOURLY TRANSPORTATION REQUIREMENT

Transportation of Garnet per day		
Capacity of trucks	No. of Trips per day Cumulatively	Volume in PCU
10 tonnes	10	30

Source: Data analysed from Approved Mining Plan

FIGURE.2.12: MINERAL TRANSPORTATION ROUTE MAP

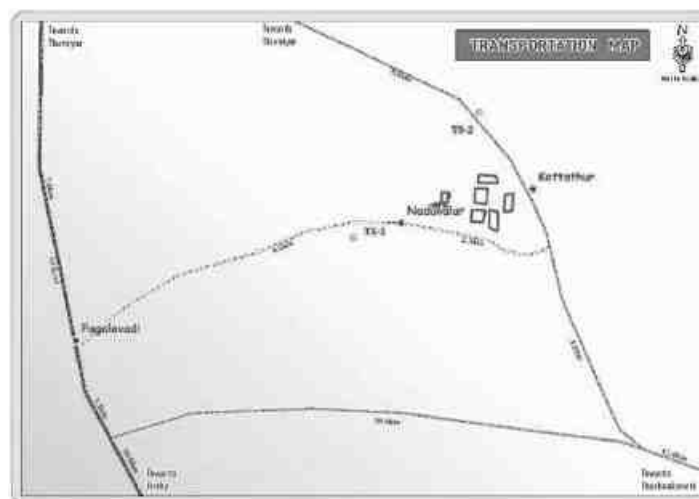


TABLE 2.14: SUMMARY OF TRAFFIC VOLUME

Route	Existing Traffic volume in PCU	Incremental traffic due to the project	Total traffic volume	Hourly Capacity in PCU as per IRC – 1960 guidelines
Naduvalur Panchayat Road	453	30	483	1200
Thuraiyur to Kottathur District Road	1188	30	1218	1500

Source: On-site monitoring analysis summary by GEMS FAE & TM

- Due to these projects the existing traffic volume will not exceed
- As per the IRC 1960 this existing village road can handle 1,200 PCU in hour and Major district road can handle 1500 PCU in hour hence there will not be any conjunction due to this proposed transportation.

2.6.4 Mineral Beneficiation and Processing

There is no proposal for the mineral processing or ore beneficiation in any of the proposed project.

2.7 PROJECT REQUIREMENT

2.7.1 Water Source & Requirement

Detail of water requirements in KLD as given below:

TABLE 2.15: WATER REQUIREMENT FOR THE PROJECT

P1		
*Purpose	Quantity	Source
Dust Suppression	0.4 KLD	From Existing bore wells from nearby area
Green Belt development	0.4 KLD	From Existing bore wells from nearby area
Sanitation & Drinking	0.2 KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	1.0 KLD	
P2		
*Purpose	Quantity	Source
Dust Suppression	0.4 KLD	From Existing bore wells from nearby area
Green Belt development	0.4 KLD	From Existing bore wells from nearby area
Sanitation & Drinking	0.2 KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	1.0 KLD	

Source: Prefeasibility report

* Drinking water will be sourced from Approved Water Vendors

2.7.2 Power and Other Infrastructure Requirement

The project is not required power supply for the mining operations. Machineries will be operated by the source of Diesel. The Mining activity is proposed during day time only (General Shift 8 AM – 5 PM, Lunch Break 1 PM – 2 PM). Electricity for use in office and other internal infrastructure will be obtained from TNEB.

No workshops are proposed inside the project area hence there will not be any process effluent generation from the project area. Domestic effluent from the mine office will be discharged to septic tank and soak pit. There is no toxic effluent expected to generate in the form of solid, liquid or gaseous form hence there is no requirement of waste treatment plant.

2.7.3 Fuel Requirement

High speed Diesel (HSD) will be used for mining machineries. Diesel will be brought from nearby Fuel Stations.

Garnet – P1:

Per hour Excavator will consume = 10 liters / hour
 Per hour Excavator will excavate = 60m³ of Garnet
 Garnet quantity = 38,914/60 = 648 hours
 Diesel consume = 648 hours' x 10 liters
 Total diesel consumption = 6480 Liters of HSD will be utilized for Garnet

Garnet – P2:

Per hour Excavator will consume = 10 liters / hour
 Per hour Excavator will excavate = 60m³ of Garnet
 Garnet quantity = 49,366/60 = 822 hours
 Diesel consume = 820 hours' x 10 liters
 Total diesel consumption = 8200 Liters of HSD will be utilized for Garnet

2.7.4 Project Cost – P1

Proposed Project Cost is Rs.13,50,000/-

Corporate Environmental Responsibility Cost is Rs 2,00,000/-

Project Cost – P2

Proposed Project Cost is Rs.13,50,000/-

Corporate Environmental Responsibility Cost is Rs 2,00,000/-

2.8 EMPLOYMENT REQUIREMENT:

The following manpower's are proposed in the mining plan to carry out the day-to-day Mining activities, the same employment is maintaining aimed at the proposed production target and also to comply with the statutory provisions of The Metalliferous mine's regulations, 1961.

TABLE 2.16: PROPOSED MANPOWER DEPLOYMENT – P1

Particulars	Workers	Numbers
A) Skilled Labour	Mine Engineer	1
	Mine Mate	2
	Clerk	1
B) Semi-Skilled Labour	Drivers	2
C) Unskilled	Labour	6
	Total	12

TABLE 2.16A: PROPOSED MANPOWER DEPLOYMENT – P2

Particulars	Workers	Numbers
A) Skilled Labour	Mine Engineer	1
	Mine Mate	2
	Clerk	1
B) Semi-Skilled Labour	Drivers	2
C) Unskilled	Labour	10
	Total	16

Source: Approved Mining Plan

2.9 PROJECT IMPLEMENTATION SCHEDULE

The commercial operation will commence after the grant of Environmental Clearance. CTO will be obtained from the Tamil Nadu State Pollution Control Board. The conditions imposed during the Environmental Clearance will be compiled before the start of mining operation.

TABLE 2.17: EXPECTED TIME SCHEDULE

Sl.No.	Particulars	Time Schedule (In Month)					Remarks if any
		1 st	2 nd	3 rd	4 th	5 th	
1	Environmental Clearance						
2	Consent to Operate						Production Start Period
Time line may vary; subjected to rules and regulations /& other unforeseen circumstances							

Source: Anticipated based on Timelines framed in EIA Notification & CPCB Guidelines.

3. DESCRIPTION OF ENVIRONMENT

3.0 GENERAL

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 for the below attributes –

- Land
- Water
- Air
- Noise
- Biological
- Socio-economic status

Study Area

An area of 10 km radius (aerial distance) from the periphery of the cluster is considered for EIA study. The data collection has been used to understand the existing environment scenario around the cluster against which the potential impacts of the project can be assessed. The study area has been divided into two zones viz **core zone** and **buffer zone** where core zone is considered as cluster and buffer zone taken as 10km radius from the periphery of the Cluster. Both Core zone and Buffer zone is taken as the study area.

Study Period

The baseline study was conducted during the Post Monsoon season i.e., October 2024 – December 2024

Study Methodology

- The project area was surveyed in detail with the help of Total Station and the boundary pillars were picked up with the help of GPS. The boundary coordinates were superimposed on the satellite imagery to understand the relief of the area, besides Land use pattern of the area was studied through the Bhuvan (ISRO).
- Soil samples were collected and analysed for relevant physio-chemical characteristics, exchangeable Cations, nutrients & micro nutrients etc., in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development.
- Ground water samples were collected during the study period from the existing bore wells, while surface water was collected from ponds in the buffer zone. The samples were analysed for parameters necessary to determine water quality (based on IS: 10500:2012 criteria) and those which are relevant from the point of view of environmental impact of the proposed mines.
- An onsite meteorological station was setup, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.
- In order to assess the Ambient Air Quality (AAQ), samples of ambient air were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM₁₀ and SO₂, NO_x with gaseous attachments & Fine Dust Samplers (FDS) for PM_{2.5} and other parameters as per NAAQ norms and analysed for primary air pollutants to work out the existing status of air quality.
- The Noise level measurements were also made at various locations in different intervals of time with the help of sound level meter to establish the baseline noise levels in the impact zone.
- Baseline biological studies were carried out to assess the ecology of the study area to study the existing flora and fauna pattern of the area.

- Socio-Economic survey was conducted at village and household level in the study area to understand the present socio-economic conditions and assess the extent of impact due to the proposed mining project. The sampling methodologies for the various environmental parameters required for the study, frequency of sampling, method of samples analysis, etc., are given below Table 3.1.

TABLE 3.1: MONITORING ATTRIBUTES AND FREQUENCY OF MONITORING

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/Auto matic 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.

Source: On-site monitoring/sampling by Creative Engineers & Consultants in association with GEMS

* All monitoring and testing have been carried out as per the Guidelines of CPCB and MoEF & CC.

3.1 LAND ENVIRONMENT

The main objective of this section is to provide a baseline status of the study area covering 10km radius around the proposed mine site so that temporal changes due to the mining activities on the surroundings can be assessed in future.

3.1.1 Land Use/ Land Cover

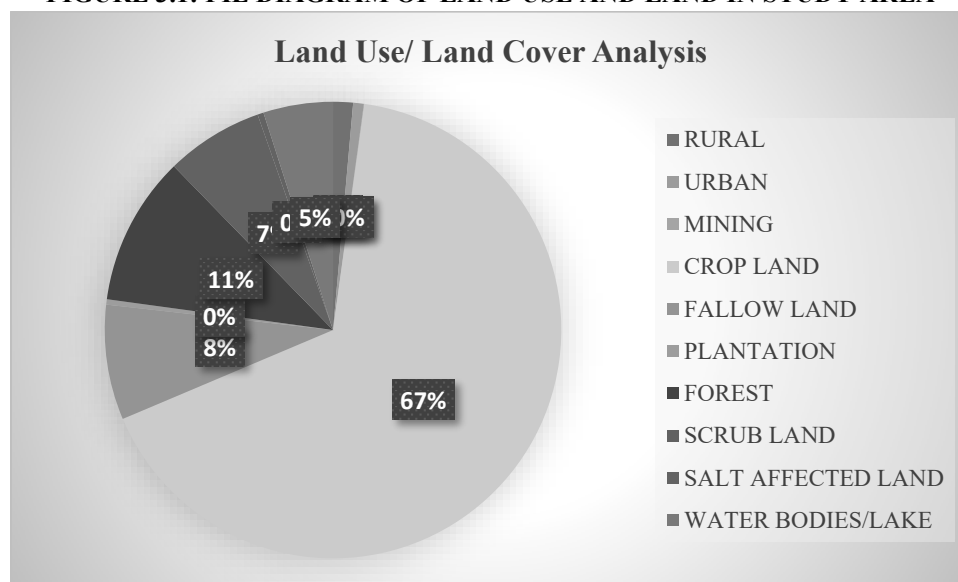
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through LISS III imagery of Bhuvan (ISRO). The 10 km radius map of study area was taken for analysis of Land use cover.

TABLE 3.2: 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

Source: Survey of India Toposheet and Landsat Satellite Imagery

FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND IN STUDY AREA



Source: Table 3.2

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%.

3.1.2 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.

3.1.3 Drainage Pattern of the Area

Drainage pattern are created by stream erosion over time that reveals characteristics of the kind of rocks and geological structures in a landscape region drained by streams.

Drainage pattern is the pattern formed by the streams, rivers, and lakes in a particular drainage basin. They are governed by the topography of the land, whether a particular region is dominated by hard or soft rocks, and the gradient of the land.

Dendritic patterns, which are by far the most common, develop in areas where the rock (or unconsolidated material) beneath the stream has no particular fabric or structure and can be eroded equally easily in all directions.

There are no streams, canals or water bodies crossing within the project area. The drainage pattern of the area is dendritic – sub dendritic.

3.1.4 Seismic Sensitivity

The proposed project site falls in the seismic Zone II, low damage risk zone as per BMTPC, Vulnerability Atlas of Seismic zone of India IS: 1893 – 2002. The project area falls in the hard rock terrain on the peninsular shield of south India which is highly stable.

(Source: https://moes.gov.in/writereaddata/files/LS_EN_20032020_385.pdf)

3.1.5 Environmental Features in the Study Area

There is no Wildlife Sanctuaries, National Park and Archaeological monuments within project area. No Protected and Reserved Forest area is involved in the project area. Therefore, there will be no need to acquisition/diversion of forest land. The details related to the environment sensitivity around the proposed mine lease area i.e. 10 km radius, are given in the below Table 3.3.

FIGURE 3.2: PHYSIOGRAPHIC MAP OF LISSIII IMAGE AROUNDS 10KM RADIUS

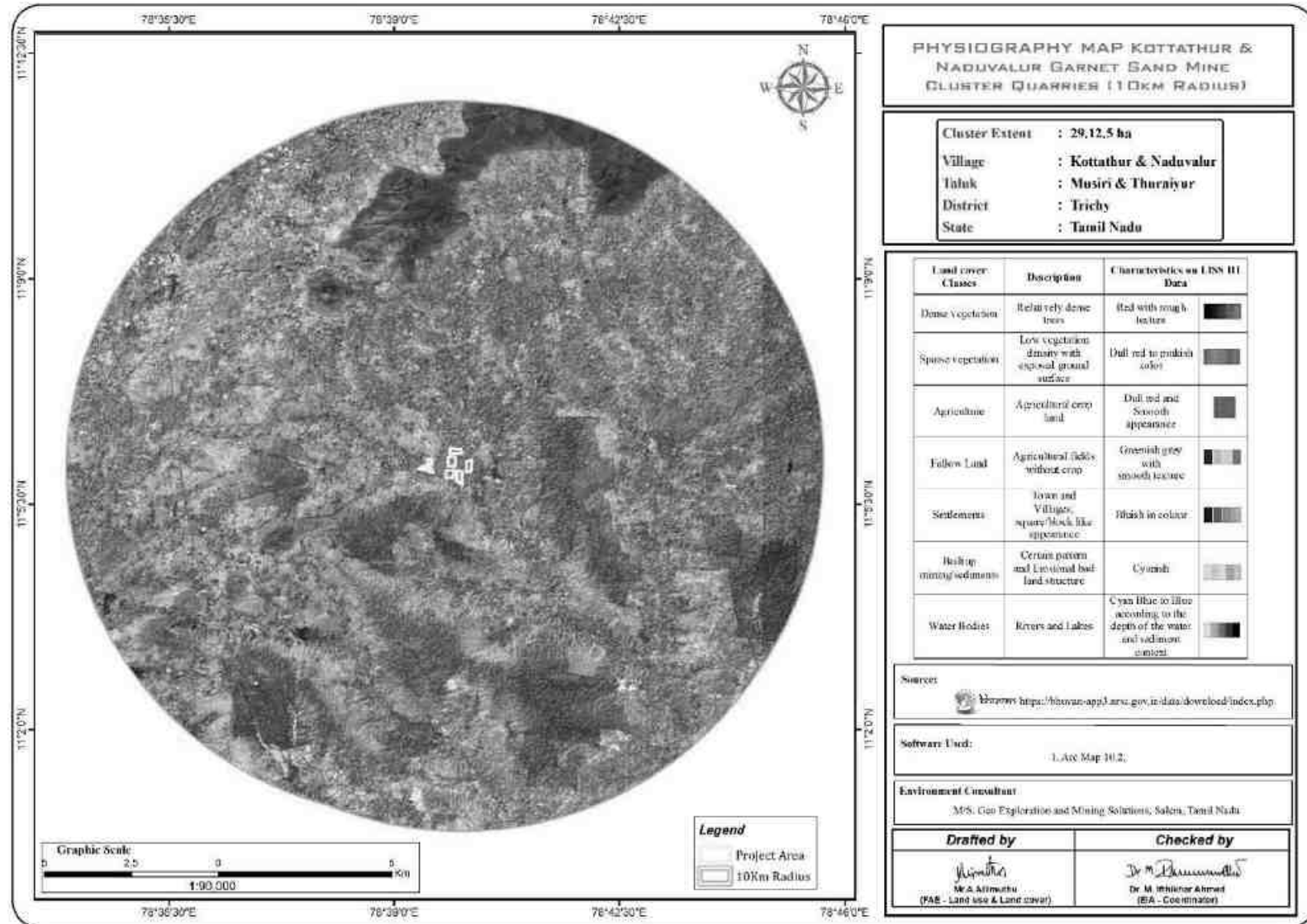


FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS

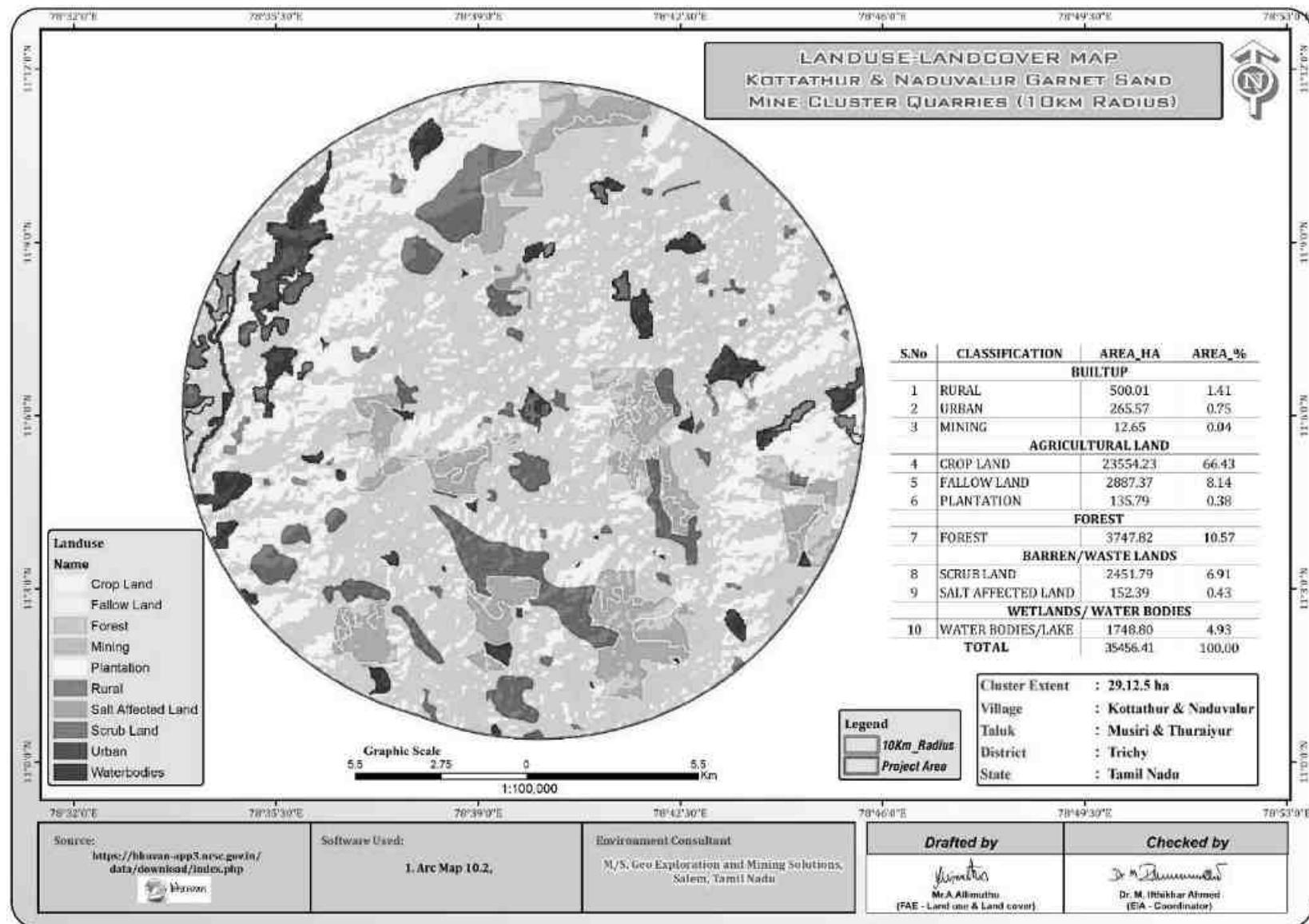


TABLE 3.3: DETAILS OF ENVIRONMENT SENSITIVITY AROUND THE CLUSTER

Sl.No	Sensitive Ecological Features	Name	Arial Distance in km from Cluster
1	National Park / Wild life Sanctuaries	Karaivetti bird Sanctuary	42km-SE
2	Reserve Forest	Sattanur R.F	600m - South
3	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10Km Radius
4	Critically Polluted Areas	None	Nil within 10km Radius
5	Mangroves	None	Nil within 10km Radius
6	Mountains/Hills	None	Nil within 10km Radius
7	Notified Archaeological Sites	None	Nil within 10km Radius
8	Industries/ Thermal Power Plants	None	Nil within 10km Radius
9	Defence Installation	None	Nil within 10km Radius

Source: Survey of India Toposheet

TABLE 3.4: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

PROPOSAL – P1		
Sl.No	NAME	DISTANCE & DIRECTION
1	Vari	30m South
2	Eri	100m SE
3	Tank	2.9km West
4	Tank	6.0km NE
PROPOSAL – P2		
Sl.No	NAME	DISTANCE & DIRECTION
1	Vari	10m Safety -North
2	Eri	50m Safety-East
3	Tank	2.5km West
4	Tank	6km NE

Source: Village Cadastral Map and Field Survey

3.1.6 Soil Environment

Soil quality of the study area is one of the important components of the land environment. The composite soil samples were collected from the study area and analysed for different parameters. The locations of the monitoring sites are detailed in Table 3.5 and Figure 3.3.

The objective of the soil sampling is -

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

TABLE 3.5: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	Project Area	11° 6'7.42"N 78°39'30.47"E
2	S-2	Kilkunnupatti	2.8km NW	11° 7'32.43"N 78°38'46.98"E
3	S-3	Kottathur	1.5km NE	11° 6'25.51"N 78°40'28.23"E

Source: On-site monitoring/sampling by Creative Engineers & Consultants in association with GEMS

Methodology –

For studying soil quality, sampling locations were selected to assess the existing soil conditions in and around the project site representing various land use conditions. The samples were collected by auger boring into the soil up to 90-cm depth. Three (3) locations were selected for soil sampling on the basis of soil types, vegetative cover, industrial & residential activities including infrastructure facilities, which would accord an overall idea of the soil characteristics. The samples were analysed for physical and chemical characteristics. The samples were sent to laboratory for analysis. The samples were filled in Polythene bags, coded and sent to laboratory for analysis and the details of methodology in respect are given in below Table 3.6.

TABLE 3.6: METHODOLOGY OF SAMPLING COLLECTION

Particulars	Details
Frequency	One grab sample from each station-once during the study period
Methodology	Composite grab samples of the topsoil were collected from 3 depths, and mixed to provide a representative sample for analysis. They were stored in airtight Polythene bags and analysed at the laboratory.

Source: On-site monitoring/sampling by Creative Engineers & Consultants in association with GEMS

Soil Testing Result –

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. The standard classifications of soil is presented below in Figure 3.4 and the physico-chemical characteristics of the soil & Test Results in Table 3.7.

FIGURE 3.4: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

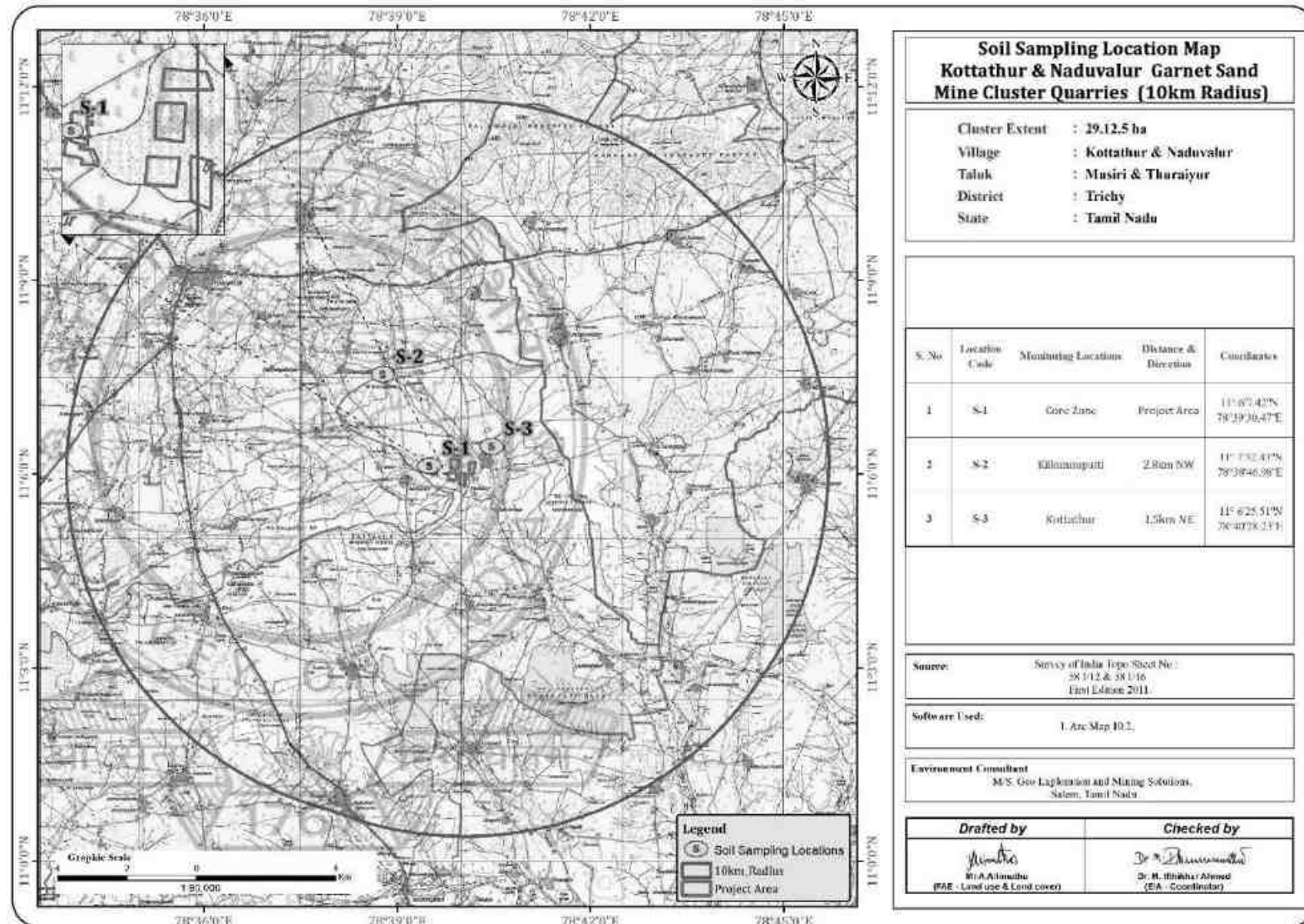


FIGURE 3.5: SOIL MAP

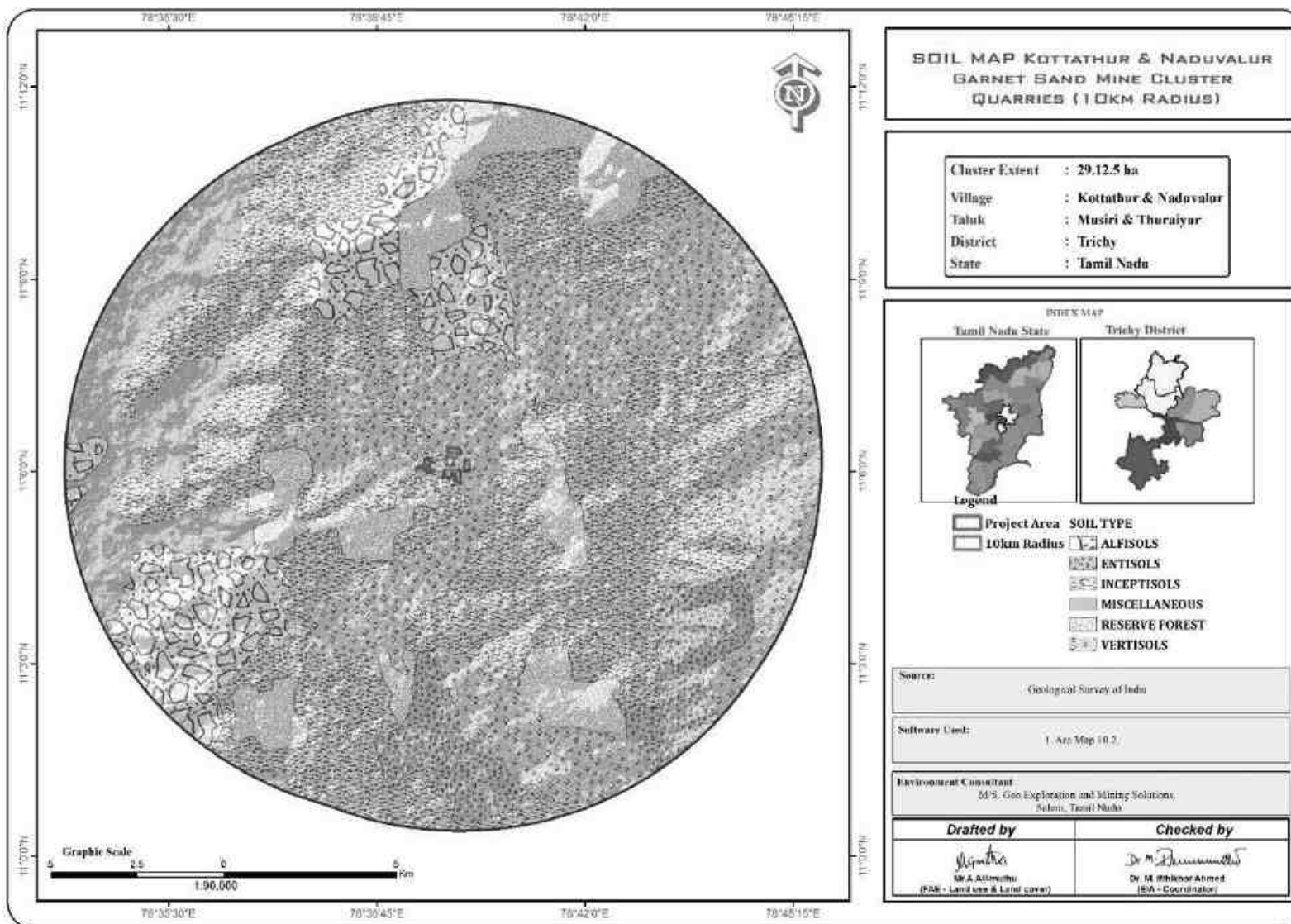


TABLE 3.7: SOIL QUALITY OF THE STUDY AREA

S. No	Parameters	Unit	S1	S2	S3
1	pH at 25 °C	-	7.19	6.65	6.92
2	Electrical Conductivity	(µmhos/cm)	35.97	110.2	70.43
3	Dry matter content	%	97.65	98.65	98.32
4	Water Content	%	2.35	1.35	1.68
5	Organic Matter	%	0.56	1.25	0.64
6	Soil texture	-	CLAY	LOAM	SILT LOAM
7	Grain Size Distribution i. Sand	%	13.03	44.05	26.31
8	ii. Silt	%	37.33	44.53	54.58
9	iii. Clay	%	49.64	11.42	19.11
10	Phosphorous	µg/g	1.12	0.86	0.98
11	Sodium	mg/kg	872	860	1032
12	Potassium	mg/kg	760	1172	715
13	Total Nitrogen	mg/kg	136	522	176
14	Total Sulphur	%	BDL(D.L - 0.02)	BDL(D.L - 0.02)	BDL(D.L - 0.02)

Source: Sampling Results by Creative Engineers & Consultants

Interpretation & Conclusion

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

3.2 WATER ENVIRONMENT

The water resources, both surface and groundwater play a significant role in the development of the area. The purpose of this study is to assess the water quality characteristics for critical parameters and evaluate the impacts on agricultural productivity, domestic community usage, recreational resources and aesthetics in the vicinity. The water samples were collected and transported as per the norms in pre-treated sampling cans to laboratory for analysis.

3.2.1 Surface Water Resources:

Cauvery River is the major surface water body in the study area and the rainfall over the area is moderate, the rainwater storage in open wells and trenches are in practice over the area and the stored water acts as source of drinking water for few months after rainy season.

3.2.2 Ground Water Resources:

Groundwater occurs in all the crystalline formations of oldest Achaeans and Recent Alluvium. The occurrence and behaviour of groundwater are controlled by rainfall, topography, geomorphology, geology, structures etc.

Ground water occurring in phreatic conditions in weathered and fractured gneiss rock formation. The weathering is controlled by the intensity of weathering and fracturing. Dug wells as well as bore wells are more common ground water abstraction structures in the area. The diameter of the dug well is in the range of 7 to 10 m and depth of dug wells range from 7.2 to 13 m bgl. The dug wells yield up to 1 lps in summer months and few wells remain dry. The yield is adequate for irrigation for one or two crops in monsoon period.

3.2.3 Methodology

Reconnaissance survey was undertaken and monitoring locations were finalized based on;

- Drainage pattern;
- Location of Residential areas representing different activities/likely impact areas; and
- Likely areas, which can represent baseline conditions

Five (5) ground water samples were collected from the study area and were analysed for physio-chemical, heavy metals and bacteriological parameters in order to assess the effect of mining and other activities on surface and ground water. The samples were analysed as per the procedures specified by CPCB, IS-10500:2012 and 'Standard methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). The water sampling locations are given in Table 3.8 and shown as Figure 3.5.

TABLE 3.8: WATER SAMPLING LOCATIONS

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	COORDINATES
GROUND WATER				
1	BW-1	Near Project Area (Naduvalur)	120m NW	11° 6'14.74"N 78°39'28.30"E
2	BW-2	Kilkunnupatti	2.5km NW	11° 7'23.84"N 78°38'46.69"E
3	BW-3	Nagalapuram	5km NE	11° 8'47.74"N 78°40'17.57"E
4	BW-4	Sathanur	2.5km South	11° 4'37.24"N 78°39'15.79"E
5	BW-5	Kottathur	1.5km NE	11° 6'22.71"N 78°40'21.64"E

Source: On-site monitoring/sampling by Creative Engineers & Consultants in association with GEMS

FIGURE 3.6: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

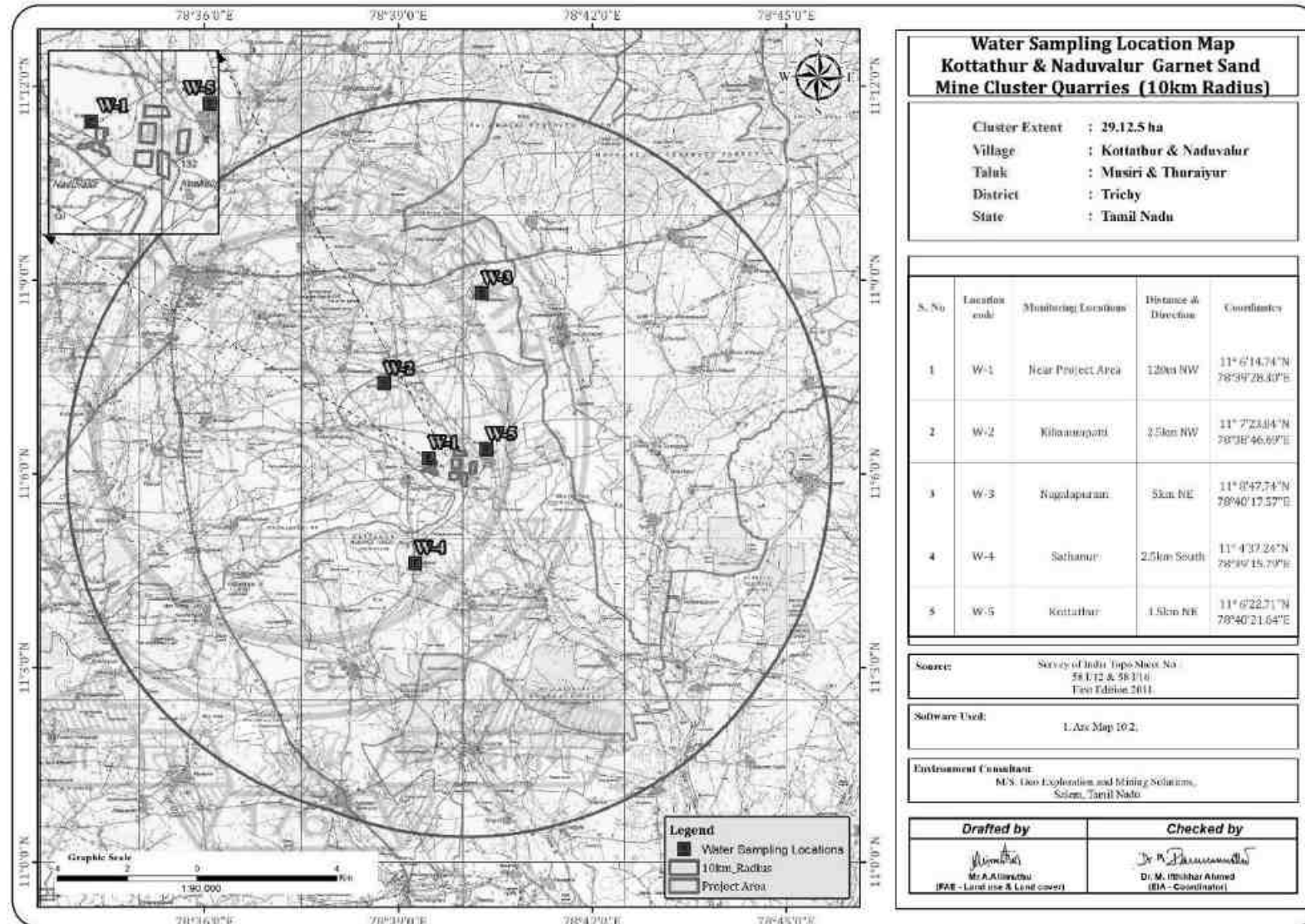


TABLE 3.9: GROUND WATER SAMPLING RESULTS

S. NO	PARAMETERS	Unit	W1 Naduvalur (Near Mine Lease)	W2 Kilkunnuppatt i Village	W3 Nagalapuram Village	W4 Sathanur Village	W5 Kottathur Village	Limits* Permissible
A.	Physical Parameters							
1	Odour	-	AGREEABLE	AGREEABLE	AGREEABLE	AGREEABLE	AGREEABLE	AGREEABLE
2	Turbidity	NTU	< 1	< 1	< 1	< 1	< 1	5
3	pH at 25 °C	-	7.58	7.12	7.19	7.15	6.97	6.5-8.5
4	Electrical Conductivity	(µmho s/cm)	754	1552	730	1442	1135	-
B.	Chemical Parameters							
5	Total Dissolved Solids	mg/L	452	930	440	865	680	2000
6	Total hardness as CaCO ₃	mg/L	278	582	431	370	332	600
7	Calcium as Ca	mg/L	51.6	146	104	77.6	82.0	200
8	Magnesium as Mg	mg/L	35.8	51.8	41.3	42.2	30.5	100
9	Calcium as CaCO ₃	mg/L	129	366	259	194	205	-
10	Magnesium as CaCO ₃	mg/L	149	216	172	176	127	-
12	Total alkalinity as CaCO ₃	mg/L	252	509	115	169	198	600
13	Chloride as Cl ⁻	mg/L	94.5	190	211	415	222	1000
14	Free Residual chlorine as Cl ⁻	mg/L	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	BDL (D.L - 0.2)	1.0
15	Sulphates as SO ₄ ²⁻	mg/L	60.4	114	12.6	110	98.6	400

S. NO	PARAMETERS	Unit	W1 Naduvalur (Near Mine Lease)	W2 Kilkunnuppatt i Village	W3 Nagalapuram Village	W4 Sathanur Village	W5 Kottathur Village	Limits* Permissible
16	Iron as Fe	mg/L	0.06	0.09	0.05	BDL (D.L - 0.01)	0.04	0.3
17	Nitrate as NO ₃	mg/L	1.68	2.25	1.89	3.05	2.66	45
18	Fluoride as F	mg/L	0.44	0.46	0.32	0.42	0.56	1.5
19	Manganese as Mn	mg/L	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	BDL (D.L - 0.05)	0.3

* IS: 10500:2012-Drinking Water Standards; # within the permissible limit as per the WHO Standard. The water can be used for drinking purpose in the absence of alternate sources. Note: SW- Surface water, GW – Ground water

3.2.4 Interpretation & Conclusion

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.

3.2.5 Hydrology and Hydrogeological studies

The district is underlain by hard rock formation fissured and fractured crystalline rocks constitute the important aquifer systems in the district. Geophysical prospecting was carried out in that area by SSRMP-80 Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 33-35m. The maximum depth proposed out of proposed projects is 2.5m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area. There is no necessity of stream, channel diversion due to these proposed projects.

During the rainy season there is a possibility of collection of seepage water from the subsurface levels which will be collected and stored in the mine sump pits and will be used for dust suppression and greenbelt development and during the end of the life of the mine this collected water will act as a temporary reservoir.

TABLE 3.10: POST MONSOON WATER LEVEL OF OPEN WELLS 1 KM RADIUS

Station Code	Water Level in Meters bgl			Latitude	Longitude
	Oct 2024	Nov 2024	Dec 2024		
OW1	10.9	11.3	11.9	11° 06' 14.8022" N	78° 39' 26.8704" E
OW2	10.6	11	11.6	11° 06' 17.3965" N	78° 39' 01.0905" E
OW3	10.4	10.8	11.4	11° 06' 41.2692" N	78° 39' 55.7614" E
OW5	11.2	11.6	12.2	11° 06' 55.2328" N	78° 39' 40.6608" E
OW4	11.1	11.5	12.1	11° 06' 30.2408" N	78° 40' 18.9897" E
OW6	11.4	11.8	12.4	11° 06' 44.6122" N	78° 40' 27.7512" E
OW7	11.6	12	12.6	11° 06' 08.6452" N	78° 40' 33.7970" E
OW8	11.5	11.9	12.5	11° 05' 55.4792" N	78° 40' 44.2492" E
OW9	11.9	12.3	12.9	11° 05' 41.0270" N	78° 39' 53.8866" E
OW10	11.3	11.7	12.3	11° 05' 20.8232" N	78° 39' 52.7276" E
OW11	11.7	12.1	12.7	11° 05' 57.2746" N	78° 38' 54.3593" E

Source: Onsite monitoring data

TABLE 3.11: POST MONSOON WATER LEVEL OF BOREWELLS 1 KM RADIUS

Station Code	Water Level in Meters bgl			Latitude	Longitude
	Oct 2024	Nov 2024	Dec 2024		
BW1	54.6	55.2	55.8	11° 05' 58.5704" N	78° 39' 11.7677" E
BW2	55	55.6	56.2	11° 06' 23.9186" N	78° 38' 59.2547" E
BW3	54.2	54.8	55.4	11° 06' 27.5819" N	78° 40' 00.9694" E
BW4	55.1	55.7	56.3	11° 06' 52.8309" N	78° 39' 52.4884" E
BW5	55.9	56.5	57.1	11° 06' 23.4087" N	78° 40' 10.2845" E
BW6	55.8	56.4	57	11° 05' 49.0566" N	78° 40' 43.7006" E
BW7	54.7	55.3	55.9	11° 05' 42.9289" N	78° 40' 11.4488" E
BW8	54.2	54.8	55.4	11° 05' 19.5394" N	78° 39' 50.1259" E
BW9	55.5	56.1	56.7	11° 06' 03.7186" N	78° 38' 47.2867" E

Source: Onsite monitoring data

FIGURE 3.7: OPEN WELL CONTOUR MAP – OCTOBER 2024

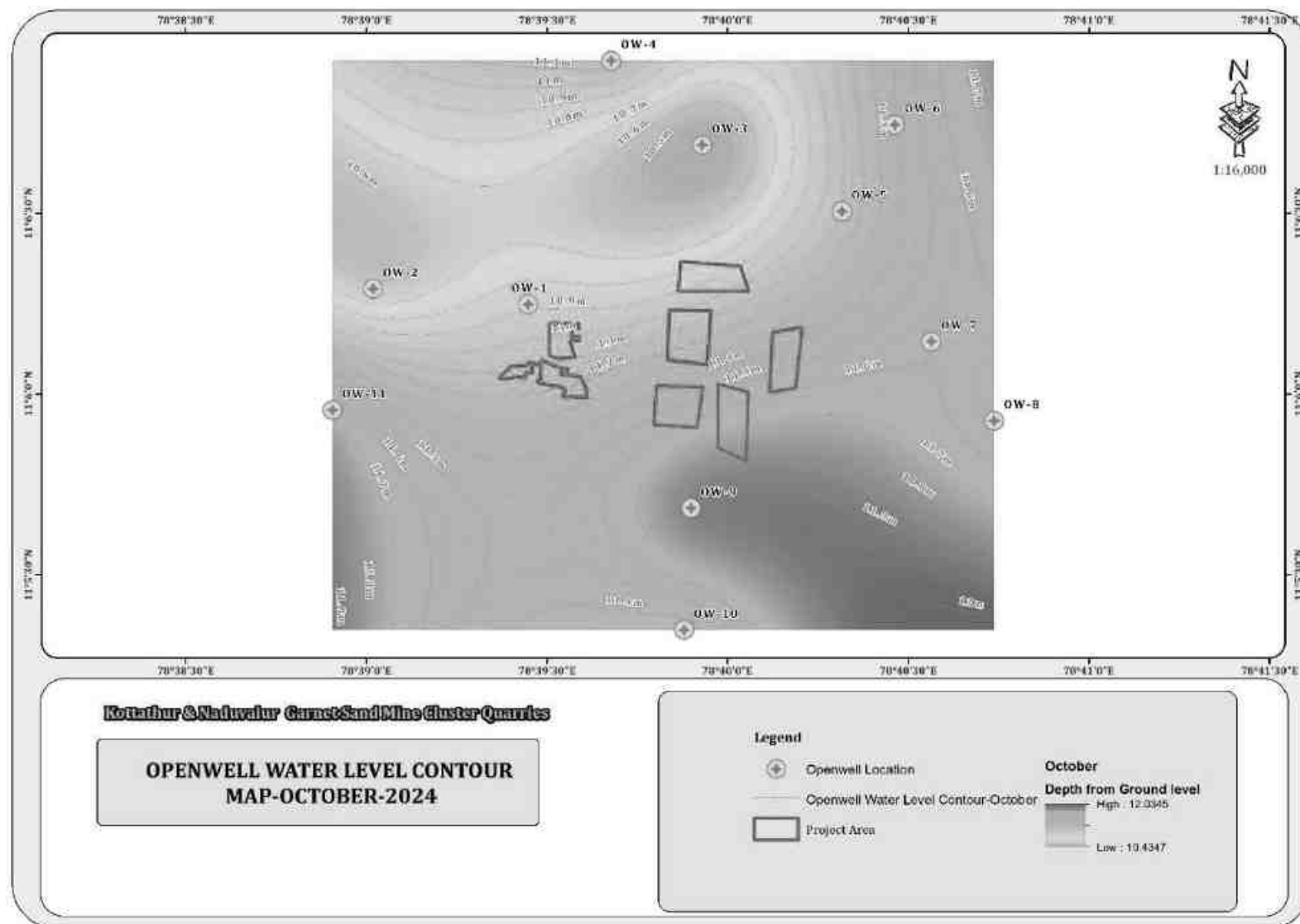


FIGURE 3.8: OPEN WELL CONTOUR MAP – NOVEMBER 2024

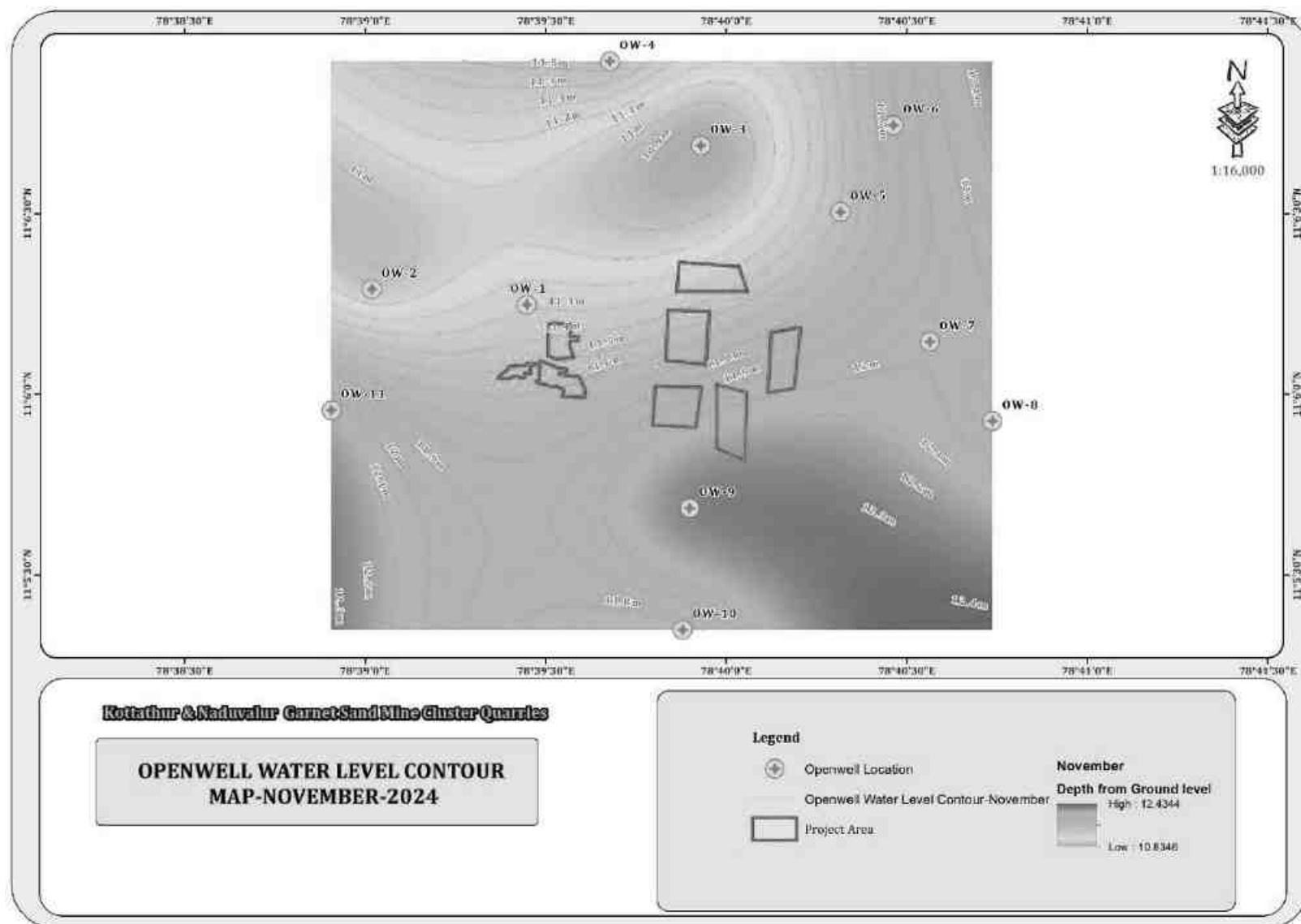


FIGURE 3.9: OPEN WELL CONTOUR MAP – DECEMBER 2024

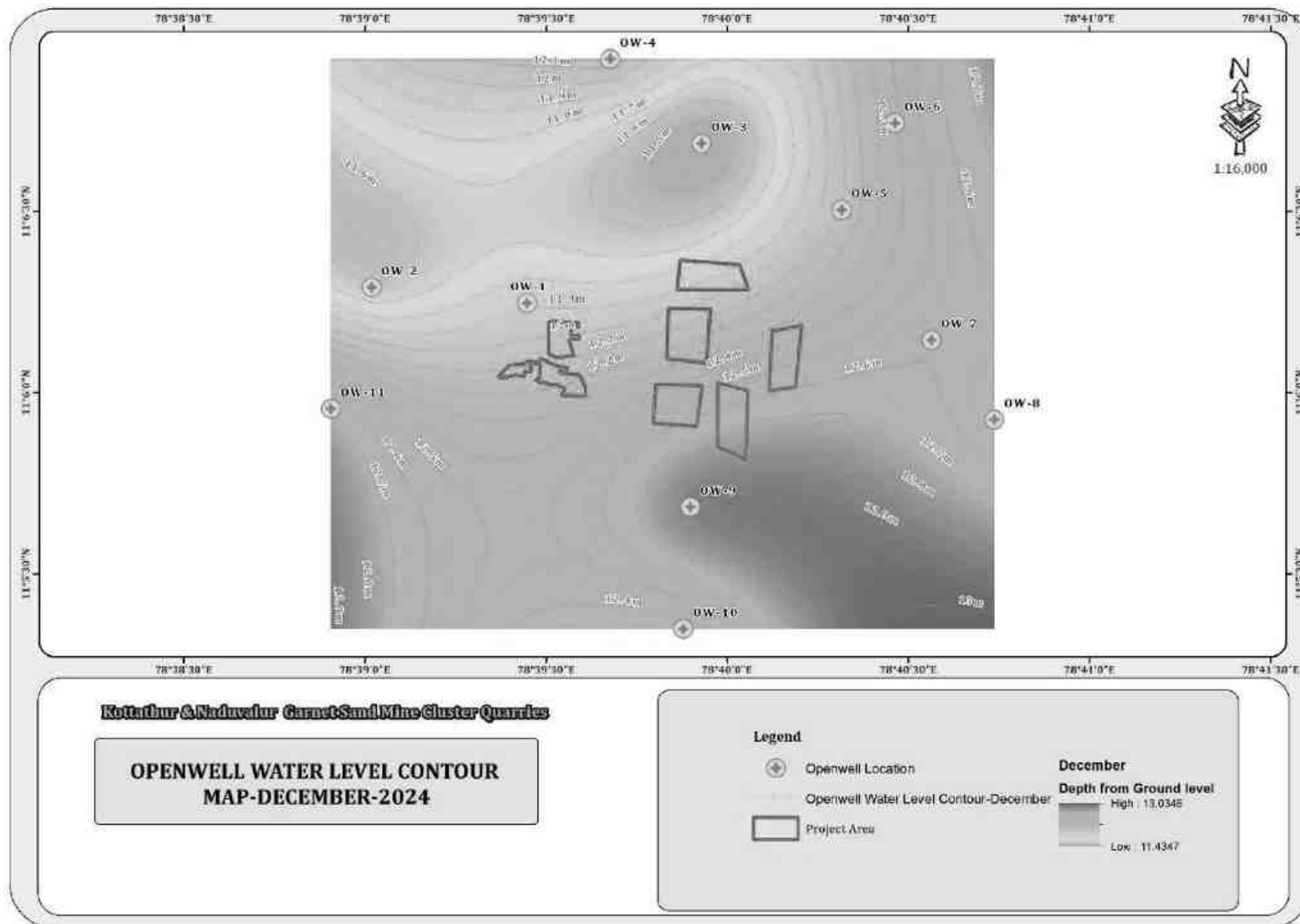


FIGURE 3.10: BOREWELL CONTOUR MAP – OCTOBER 2024

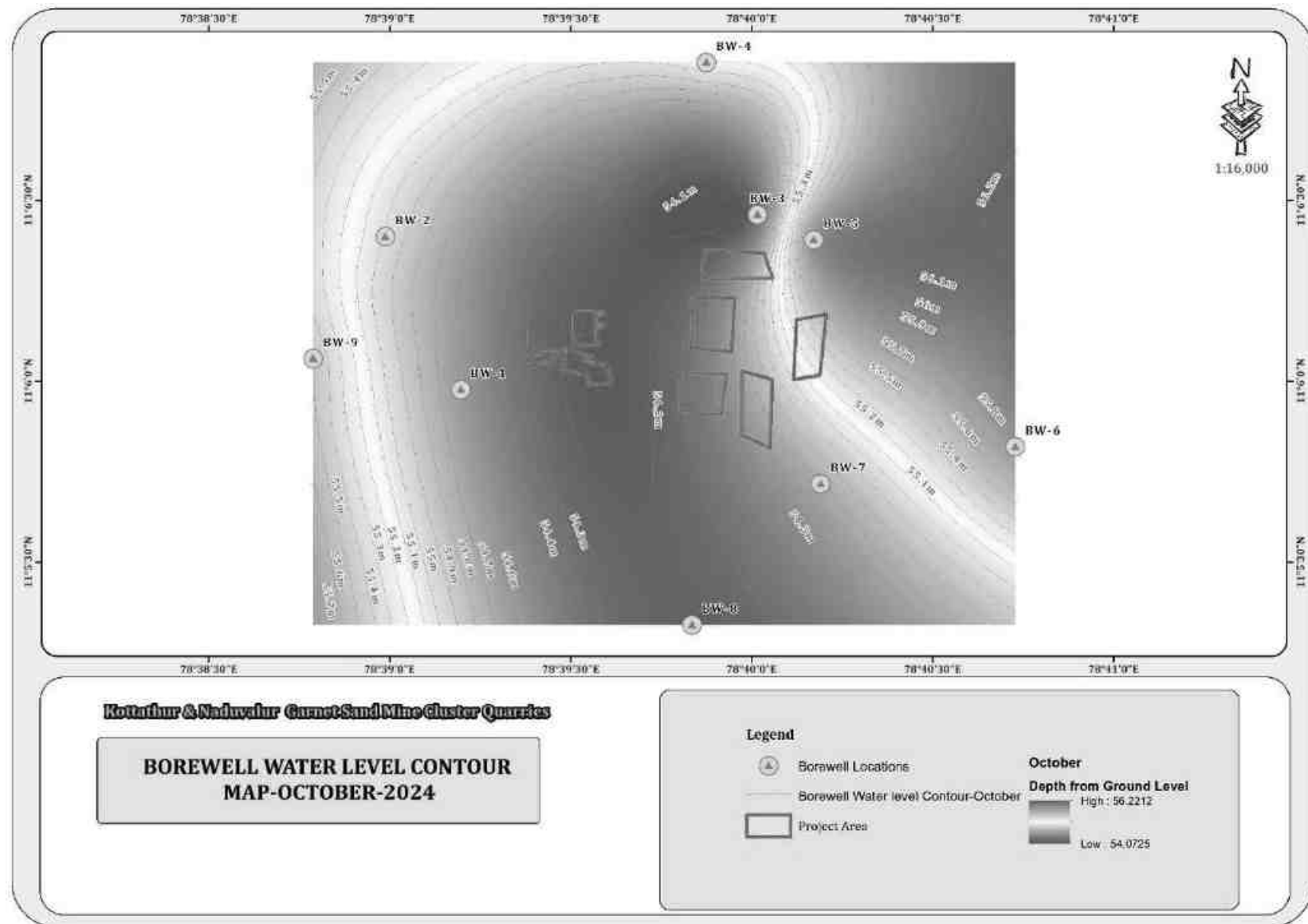


FIGURE 3.11: BOREWELL CONTOUR MAP – NOVEMBER 2024

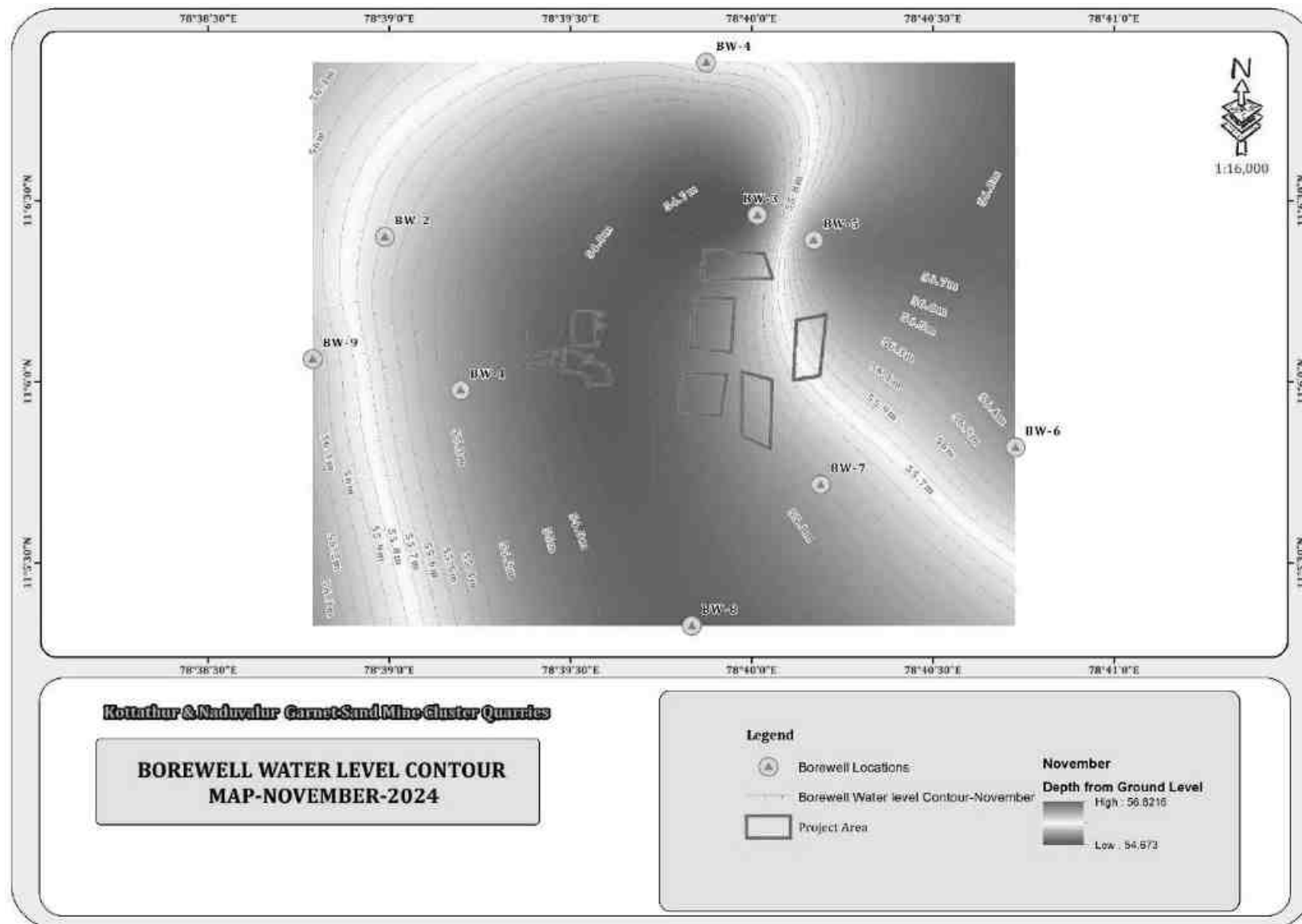


FIGURE 3.12: BOREWELL CONTOUR MAP – DECEMBER 2024

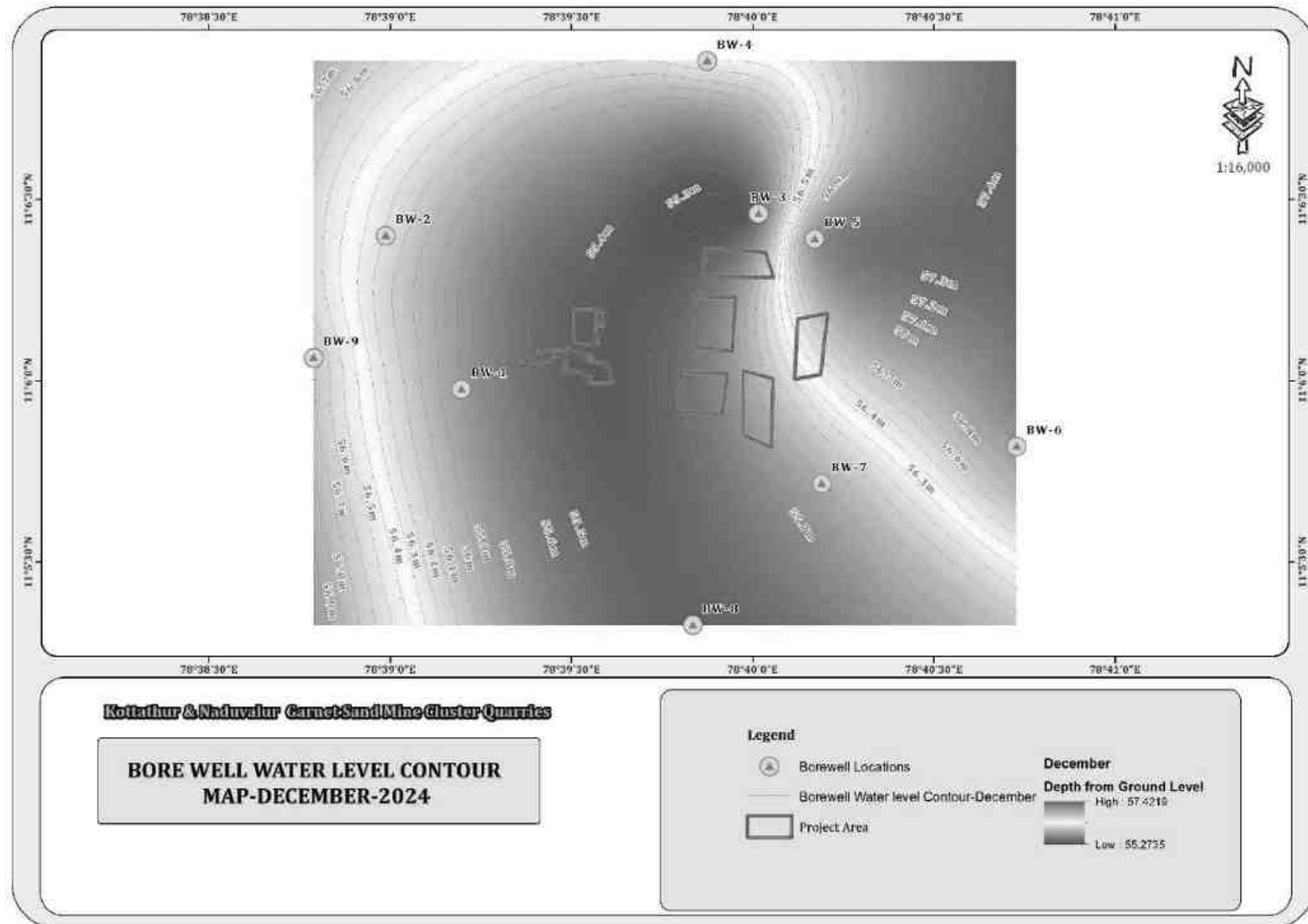
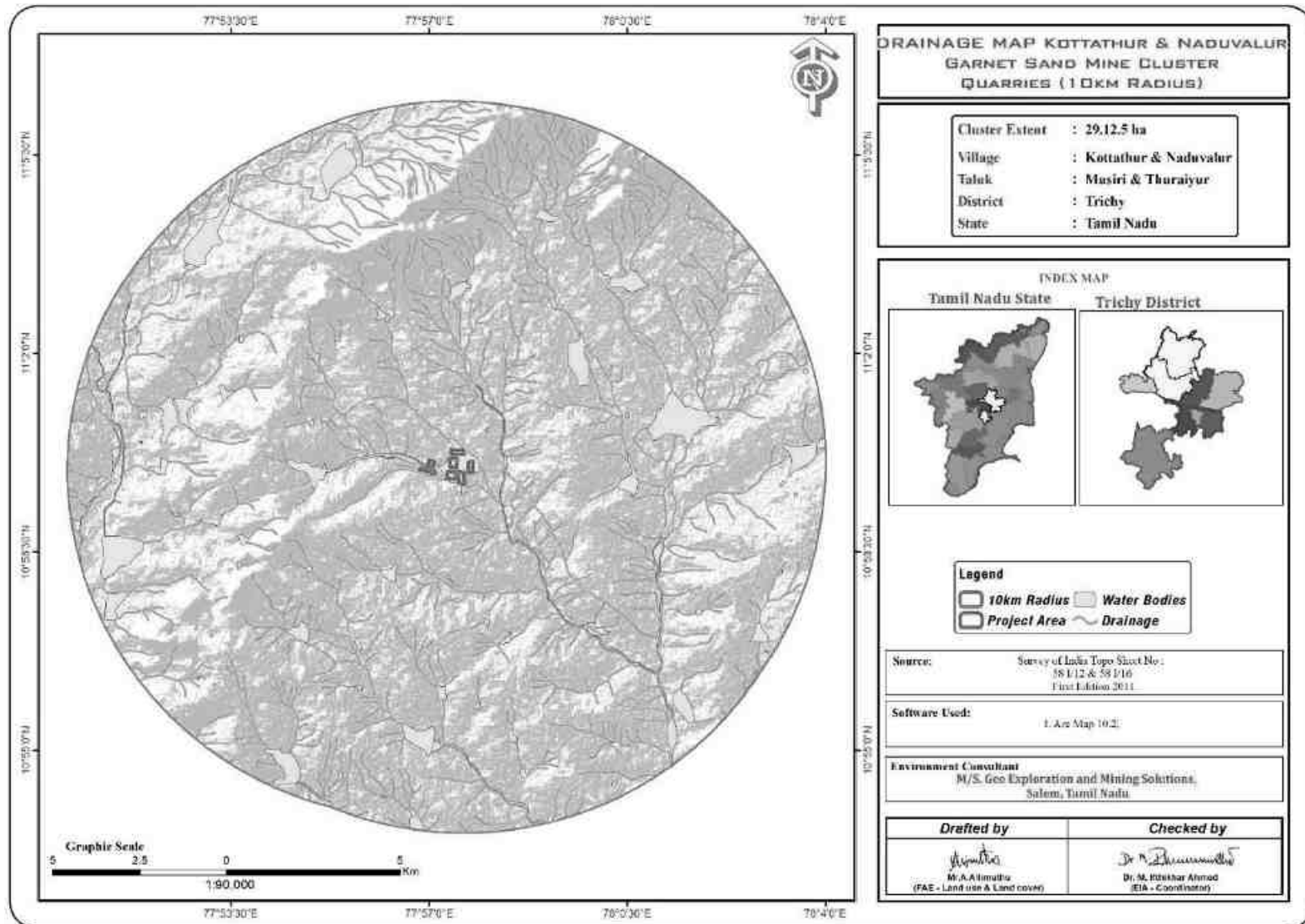


FIGURE 3.13: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE



KOTTATHUR & NADUVALUR GARNET SAND MINE CLUSTER QUARRIES

GROUND WATER PROSPECTS MAP
(10KM RADIUS)

Cluster Extent : 29.12.5 ha
 Village : Kottathur & Naduvalur
 Taluk : Musiri & Thuraiyur
 District : Trichy
 State : Tamil Nadu

Legend

Project Area
 10KM Radius

Source: <https://bhuvan-app1.nrsc.gov.in/state/TN>

Environment Consultant:
 M/S. Geo Exploration and Mining Solutions,
 Salem, Tamil Nadu

Drafted by:
 M.A. Alimuraha
 (PAB - Land use & Land cover)

Checked by:
 Dr. M. Bhaskar Ahamed
 (BIA - Coordinator)

Tamil Nadu State

Trichy District

Graphic Scale:
 0 5.5 Km
 1:100,000

3.2.5.1 Methodology and Data Acquisition

Electric Resistivity Method is well established for delineating lateral as well vertical discontinuities in the resistive structure of the Earth's subsurface. The present study makes use of vertical electric sounding (VES) to delineate the Vertical Resistivity structure at depth. Schlumberger electrode set up was employed for making sounding measurements. Since it is least influenced by lateral in homogeneities and is capable of providing higher depth of investigation. This is four electrodes collinear set up where in the outer electrodes send current into the ground and the inner electrodes measure the potential difference.

The present study utilizes maximum current electrode separation AB/2. The data from this survey are commonly arranged and contoured in the form of Pseudo-section that gives an approximate of the subsurface resistivity. This technique is used for the inversion of Schlumberger VES data to predict the layer parameter namely layer resistivity and Geo electric layer thickness. The main goal of the present study is to search the vertical in homogeneities that is consistent with the measured data.

For a Schlumberger among the Apparent resistivity can be calculated as follows.

$$\rho_a = \frac{G\Delta V}{I}$$

ΔV = potential difference between receiving electrodes

G = Geometric Factor.

Rocks show wide variation in resistivity ranging from 10-8 more than 10+14 ohmmeter. On a broad classification, one can group the rocks falling in the range of 10-8 to 1 ohmmeter as good conductors. 1 to 106 ohmmeter as intermediate conductors and 106 to 1012 ohmmeter as more as poor conductor. The resistivity of rocks and subsurface lithology, which is mostly dependent on its porosity and the pore fluid resistivity is defined by Archie's Law,

$$\rho_r = F\rho_w = a \phi^m \rho_w$$

ρ_r = Resistivity of Rocks

ρ_w = Resistivity of water in pores of rock

F = Formation Factor

ϕ = Fractional pore volume

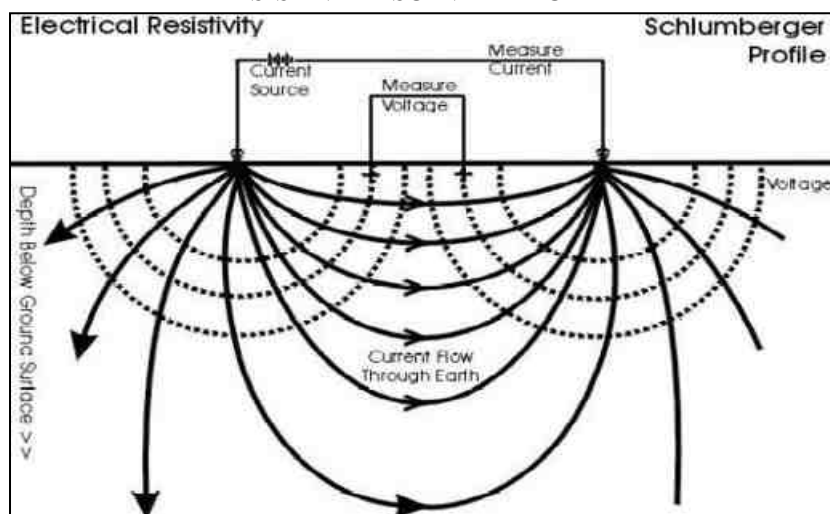
A = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

The layout for a resistivity survey depends on the choice of the current and potential electrode arrangement, which is called electrode array. Here the present study is considered with Schlumberger array. In which the distance may be used for current electrode separation while potential electrode separation is kept on third to one fifth of the same. One interesting aspect in VES is the principle of reciprocity, which permits interchange of the potential and current electrode without any effect on the measured apparent resistivity.

The field equipment deployed for the study is in a deep resistivity meter with a model of SSR – MP – AT. This Signal stacking Resistivity meter is a high-quality data acquisition system incorporating several innovation features for Earth resistivity. In the presence of random earth Noises the signal to noise ration can be enhanced by $\sqrt{N}$ where N is the number of stacked readings. This SSR meter in which running averages of measurements [1, (1+2)/2, (1+2+3)/3 ... (1+2...+16/16)] up to the chosen stacks are displayed and the final average is stored automatically, in memory utilizing the principles of stacking to achieve the benefit of high signals to noise ratio. Based on these above significations the signal stacking resistivity meter was used for (VES) Vertical Electric Resistivity Sounding.

RESISTIVITY SURVEY PROFILE



Measurements of ground Resistivity is essentially done by sending a current through two electrodes called current electrodes (C₁ & C₂) and measuring the resulting potential by two other electrodes called potential electrode (P₁ & P₂). The amount of current required to be sent into the ground depends on the contact resistance at the current electrode, the ground resistivity and the depth of interest.

3.2.5.3 Data Presentation

It was inferred that the low resistance encountered at the depth between 70-65m. The maximum depth proposed out of proposed projects is 42m BGL. Hence there is no possibilities of water table intersection during the entire mine life period besides it is also inferred topographically that there are no major water bodies intersecting the project area.

3.2.5.4 Geophysical Data Interpretation

The geophysical data was obtained to study the lateral variations, vertical in homogeneities in the sub – surface with respect to the availability of groundwater. From the interpreted data, it has inferred that the area has moderate groundwater potential in the investigated area. This small Mining operation will not have any significant impact on the natural water bodies.

3.3 AIR ENVIRONMENT

The existing ambient air quality of the area is important for evaluating the impact of mining activities on the ambient air quality.

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 cluster forms the baseline information. The sources of air pollution in the region are mostly due to vehicular traffic, dust arising from unpaved village road and domestic & agricultural activities. The prime objective of the baseline air quality study was to establish the existing ambient air quality of the study area. These will also be useful for assessing the conformity to standards of the ambient air quality during the operation of proposed projects in cluster.

This section describes the identification of sampling locations, methodology adopted during the monitoring period and sampling frequency.

3.3.1 Meteorology & Climate

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

A temporary meteorological station was installed at project site by covering the project site. The station was installed at a height of 3 m above the ground level in such a way that there are no obstructions facilitating flow of wind, wind speed, wind direction, humidity and temperature are recorded on hourly basis.

Climate –

The mean daily maximum temperature drops to 30.2°C, while the mean daily minimum drops to 19.2°C and 19.6°C in January. The weather is pleasant during the period from November to January. Mornings in general are more humid than the afternoons, with the humidity exceeding 78% on an average. In the period June to November the afternoon humidity exceeds 66% on an average. In the rest of the year the afternoons are drier, the summer afternoons being the driest. The district receives the rain under the influence of both southwest and northeast monsoons. The northeast monsoon chiefly contributes to the rainfall in the district. The southwest monsoon rainfall is highly erratic and summer rains are negligible.

Rainfall –

TABLE 3.12: RAINFALL DATA

Actual Rainfall In mm						Normal Rainfall In Mm
2019	2020	2021	2022	2023	2024(as on 30.09.24)	
635.0	748.8	1222.7	854.1	645.4	378.0	818

Source: <https://www.twadboard.tn.gov.in/content/Trichy>

TABLE 3.13: METEOROLOGICAL DATA RECORDED AT SITE

POST MONSOON SEASON (October 2024 to December 2024)

SL:NO	PARAMETERS	MIN	MAX
1	Temperature In °c	21.7	38.0
2	Humidity in %	42.3	99.0
3	Wind speed in km/hr	<1.8	27.7
4	Predominant wind direction from	NE	

Source: On-site monitoring/sampling by Creative Engineers & Consultants in association with GEMS

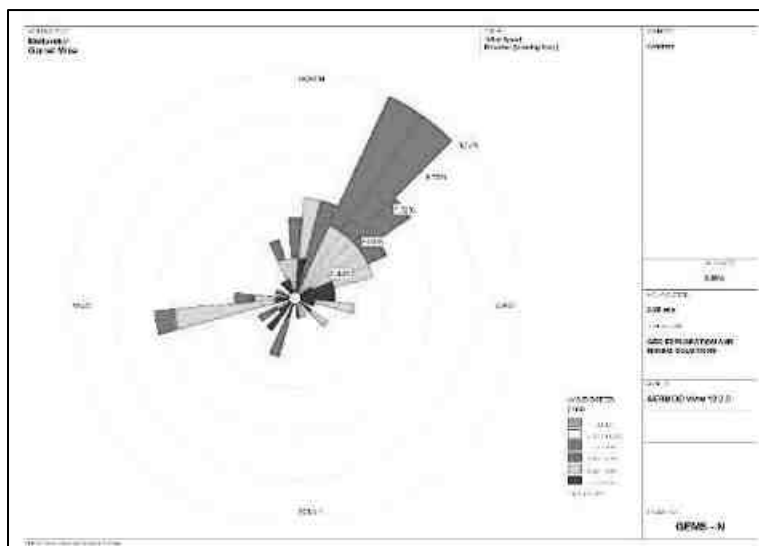
Correlation between Secondary and Primary Data

The meteorological data collected at the site is almost similar to that of secondary data collected from IMD Coimbatore_Agro. A comparison of site data generated during the three months with that of IMD, Coimbatore_Agro reveals the following:

- The average maximum and minimum temperatures of IMD, Coimbatore_Agro showed a higher in respect of on-site data i.e., in Kottathur & Naduvalur villages.
- The relative humidity levels were lesser at site as compared to IMD, Coimbatore_Agro.
- The wind speed and direction at site shows similar trend that of IMD, Coimbatore_Agro.

Wind rose diagram of the study site is depicted in Figure. 3.14. Predominant downwind direction of the area during study season is North-East to South West.

FIGURE 3.15: WINDROSE DIAGRAM



3.3.2 Methodology and Objective

The prime objective of the ambient air quality study is to assess the existing air quality of study area and its conformity to NAAQS. The observed sources of air pollution in the study area are industrial, traffic and domestic activities. The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network considering the followings:

- Meteorological condition on synoptic scale;
- Topography of the study area;
- Representatives of regional background air quality for obtaining baseline status;
- Location of residential areas representing different activities;
- Accessibility and power availability; etc

TABLE 3.15: NATIONAL AMBIENT AIR QUALITY STANDARDS

Sl.No.	Pollutant	Time Weighted Average	Concentration in ambient air	
			Industrial, Residential, Rural & other areas	Ecologically Sensitive area (Notified by Central Govt.)
1	Sulphur Dioxide ($\mu\text{g}/\text{m}^3$)	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)	Annual Avg. 24 hours	40.0 80.0	30.0 80.0

3	Particulate matter (size less than 10µm) PM10 (µg/m3)	Annual Avg. 24 hours	60.0 100.0	60.0 100.0
4	Particulate matter (size less than 2.5 µm PM2.5 (µg/m3)	Annual Avg. 24 hours	40.0 60.0	40.0 60.0

Source: NAAQS CPCB Notification No. B-29016/20/90/PCI-I Dated: 18th Nov 2009

*Annual Arithmetic mean of minimum 104 measurements in a year taken twice a Week 24 hourly at uniform interval,

** 24 hourly / 8 hourly or 1 hourly monitored value as applicable shall be complied with 98 % of the time in a year.

However, 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

3.3.4 Frequency & Parameters for Sampling

Ambient air quality monitoring has been carried out with a frequency of two samples per week at Five (5) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period October 2024 to December 2024. The baseline data of ambient air has been generated for PM₁₀, PM_{2.5}, Sulphur Dioxide (SO₂) & Nitrogen Dioxide (NO₂). Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

It was ensured that the equipment was placed preferably at a height of at least 3 ± 0.5m above the ground level at each monitoring station, for negating the effects of wind-blown ground dust. The equipment was placed at open space free from trees and vegetation which otherwise act as a sink of pollutants resulting in lower levels in monitoring results.

3.3.5 Ambient Air Quality Monitoring Stations

Five (5) monitoring stations were set up in the study area as depicted in Figure 3.15 for assessment of the existing ambient air quality. Details of the sampling locations are as per given below.

TABLE 3.16: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ1	Core Zone	Project Area	11° 5'59.60"N 78°39'32.82"E
2	AAQ2	Kilkunnupatti	2.8km NW	11° 7'32.68"N 78°38'51.14"E
3	AAQ3	Nagalapuram	5km NE	11° 8'52.61"N 78°40'11.73"E
4	AAQ4	Sathanur	2.5km South	11° 4'35.77"N 78°39'15.44"E
5	AAQ5	Kottathur	1.5km NE	11° 6'23.48"N 78°40'28.13"E

Source: On-site monitoring/sampling by Creative Engineers & Consultants in association with GEMS.

Ambient Air Quality Monitoring Station Map
Kottathur & Naduvalur Garnet Sand Mine Cluster Quarries 10km Radius

Cluster Extent : 29.12.5 ha
Village : Kottathur & Naduvalur
Taluk : Musiri & Thuraiyur
District : Trichy
State : Tamil Nadu

s.No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	AAQ-1	Core Zone	Project Area	11° 5' 09.60" N 78° 39' 32.82" E
2	AAQ-2	Kilumampath	2.8km NW	11° 7' 32.68" N 78° 38' 51.14" E
3	AAQ-3	Nagapuram	5km NE	11° 6' 52.61" N 78° 40' 11.73" E
4	AAQ-4	Sathanur	2.5km South	11° 4' 35.77" N 78° 39' 15.64" E
5	AAQ-5	Kottathur	1.5km NE	11° 6' 23.40" N 78° 40' 28.14" E

Legend
 AAQ Monitoring Locations
 10km Radius
 Project Area

Source: Survey of India Topo Sheet No : 59 L12 & 58 L16
 First Edition 2011.

Software Used: Arc Map 10.2.

Environment Consultant:
 M/S. Geo Exploration and Mining Solutions,
 Salem, Tamil Nadu.

Drafted by: M.A. Alimuddin
 (P.E. - Land Use & Land cover)

Checked by: Dr. M. Bhikshu Ahmed
 (B.A. - Geobotany)

TABLE 3.17: AMBIENT AIR QUALITY DATA

S. NO	LOCATION CODE	PARAMETERS	Cat.*	PM ₁₀			PM _{2.5}			SO ₂			NO ₂		
		LOCATIONS		MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX
1	A1	Naduvalur (Near Mine Lease)	R	42.4	47.1	52.1	19.5	21.7	24.0	4.6	5.8	6.9	7.5	8.7	9.8
2	A2	Kilkunnuppatti Village	R	44.6	48.4	53.1	20.7	22.5	24.6	4.7	5.9	7.2	7.3	8.6	10.1
3	A3	Nagalapuram Village	R	45.1	49.8	55.5	20.6	22.7	25.3	5.0	6.2	7.5	7.6	8.9	10.5
4	A4	Sathanur Village	R	41.1	46.0	51.4	18.6	20.8	23.2	4.4	5.6	6.7	7.2	8.4	9.6
5	A5	Kottathur Village	R	46.3	53.2	60.1	21.3	24.5	27.6	5.2	6.4	7.8	7.9	9.3	11.2
NAAQ standards as per CPCB Notification, 2009				PM₁₀			PM_{2.5}			SO₂			NO₂		
			*	100			60			80			80		
			**	100			60			80			80		

FIGURE 3.17: BAR DIAGRAM OF PARTICULATE MATTER PM_{2.5}

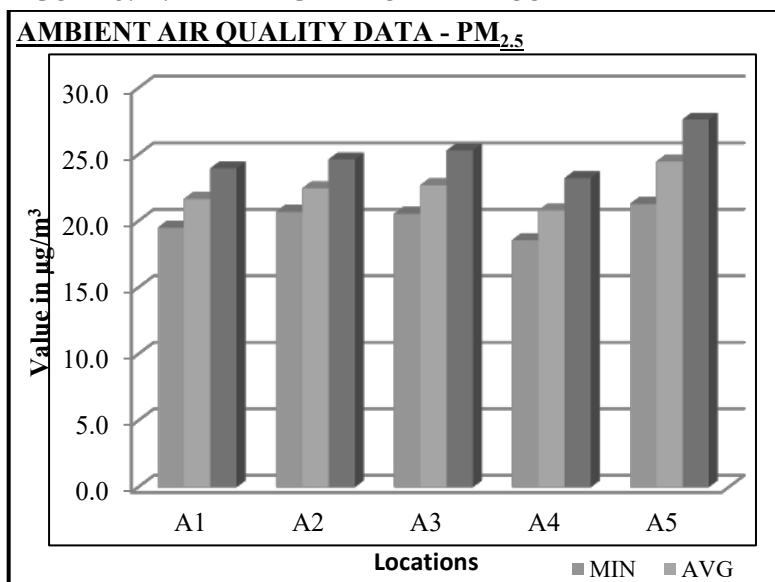


FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER PM₁₀

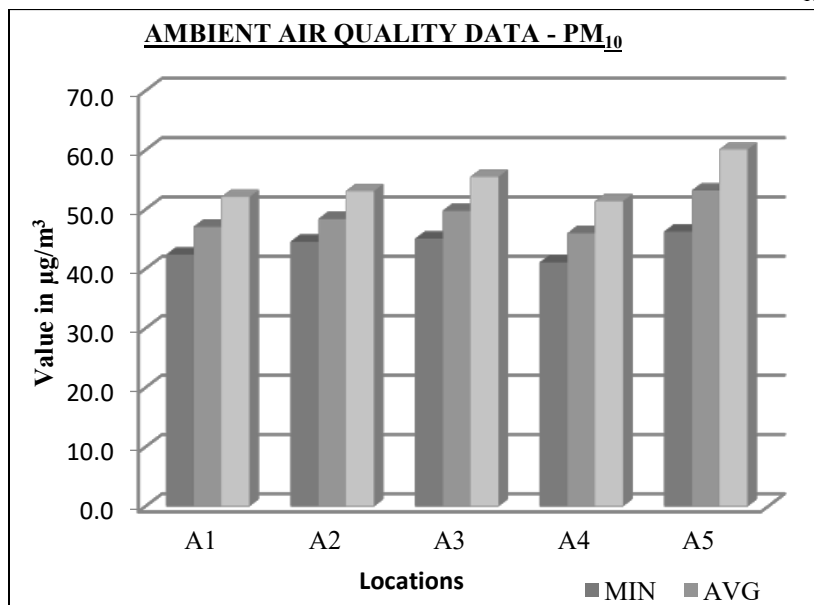


FIGURE 3.19: BAR DIAGRAM OF PARTICULATE MATTER SO₂

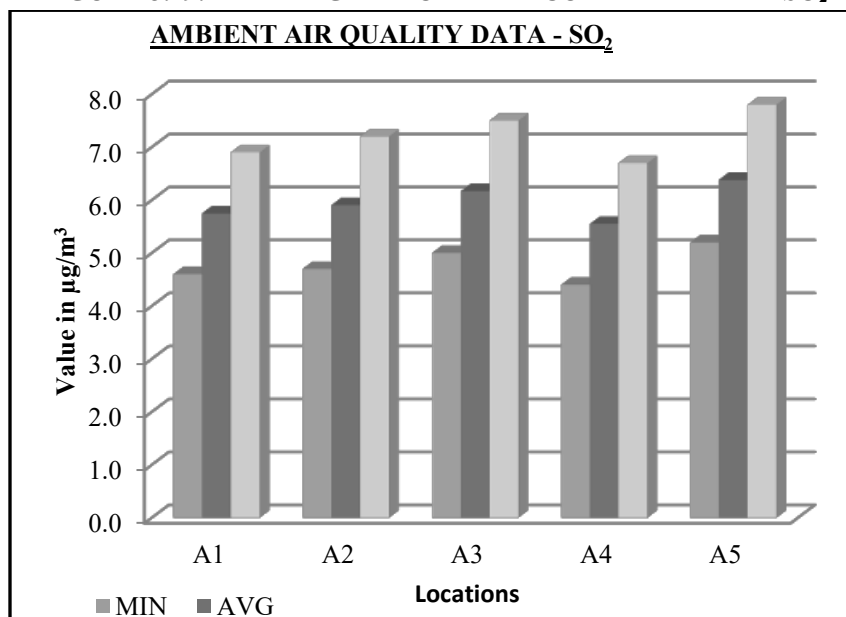
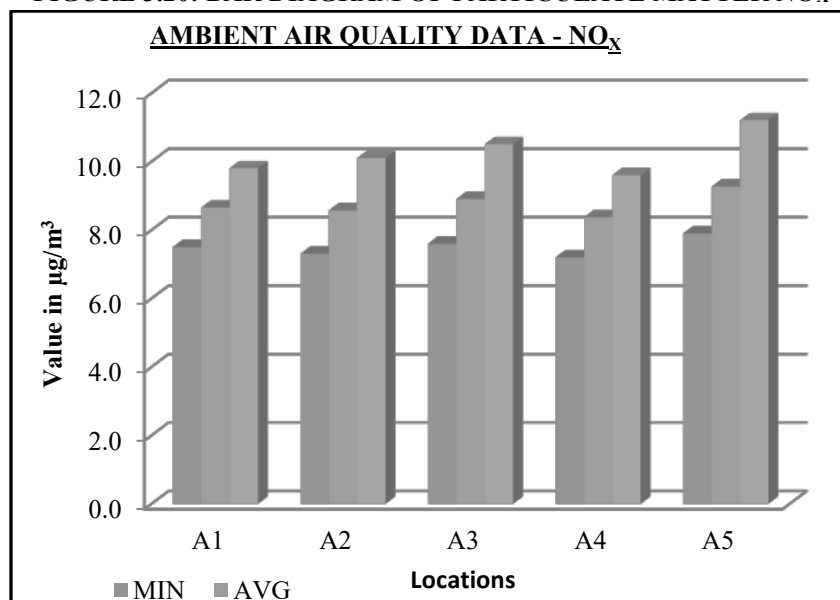


FIGURE 3.20: BAR DIAGRAM OF PARTICULATE MATTER NO_x



3.3.6 Interpretations & Conclusion

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. PM_{2.5} 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 PM₁₀ values were in the range of 41.1 – 60.1 µg/m³. PM_{2.5} values were in the range of 18.6 – 27.6 µg/m³. SO₂ levels were ranging from 4.4 – 7.8 µg/m³. NO₂ levels were ranging from 7.2 – 11.2 µg/m³.

While comparing with the NAAQ Norms, all monitored values of PM₁₀, PM_{2.5}, SO₂, and NO₂ 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/m³). Silica values in the study area are found to be below detectable limit (DL – 0.05 mg/m³) which is well within the prescribed limit of 5 mg/m³.

3.4 NOISE ENVIRONMENT

The vehicular movement on road and mining activities is the major sources of noise in study area, the environmental assessment of noise from the mining activity and vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, and annoyance and general community responses.

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

3.4.1 Identification of Sampling Locations

In order to assess the ambient noise levels within the study area, noise monitoring was carried out at Seven (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.

TABLE 3.18: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	Project Area	11° 6'11.20"N 78°39'30.61"E
2	N2	Kilkunnupatti	2.8km NW	11° 7'28.46"N 78°38'58.35"E
3	N3	Nagalapuram	5km NE	11° 8'50.80"N 78°40'20.05"E
4	N4	Sathanur	2.5km South	11° 4'38.45"N 78°39'15.97"E
5	N5	Kottathur	1.5km NE	11° 6'21.59"N 78°40'27.95"E

Source: On-site monitoring/sampling by Creative Engineers & Consultants in association with GEMS

3.4.2 Method of Monitoring

Digital Sound Level Meter was used for the study. All reading was taken on the 'A-Weighting' frequency network, at a height of 1.5 meters from ground level. The sound level meter does not give a steady and consistent reading and it is quite difficult to assess the actual sound level over the entire monitoring period. To mitigate this shortcoming, the Continuous Equivalent Sound level, indicated by Leq, is used. Equivalent sound level, 'Leq', can be obtained from variable sound pressure level, 'L', over a time period by using following equation. The equivalent noise level is defined mathematically as,

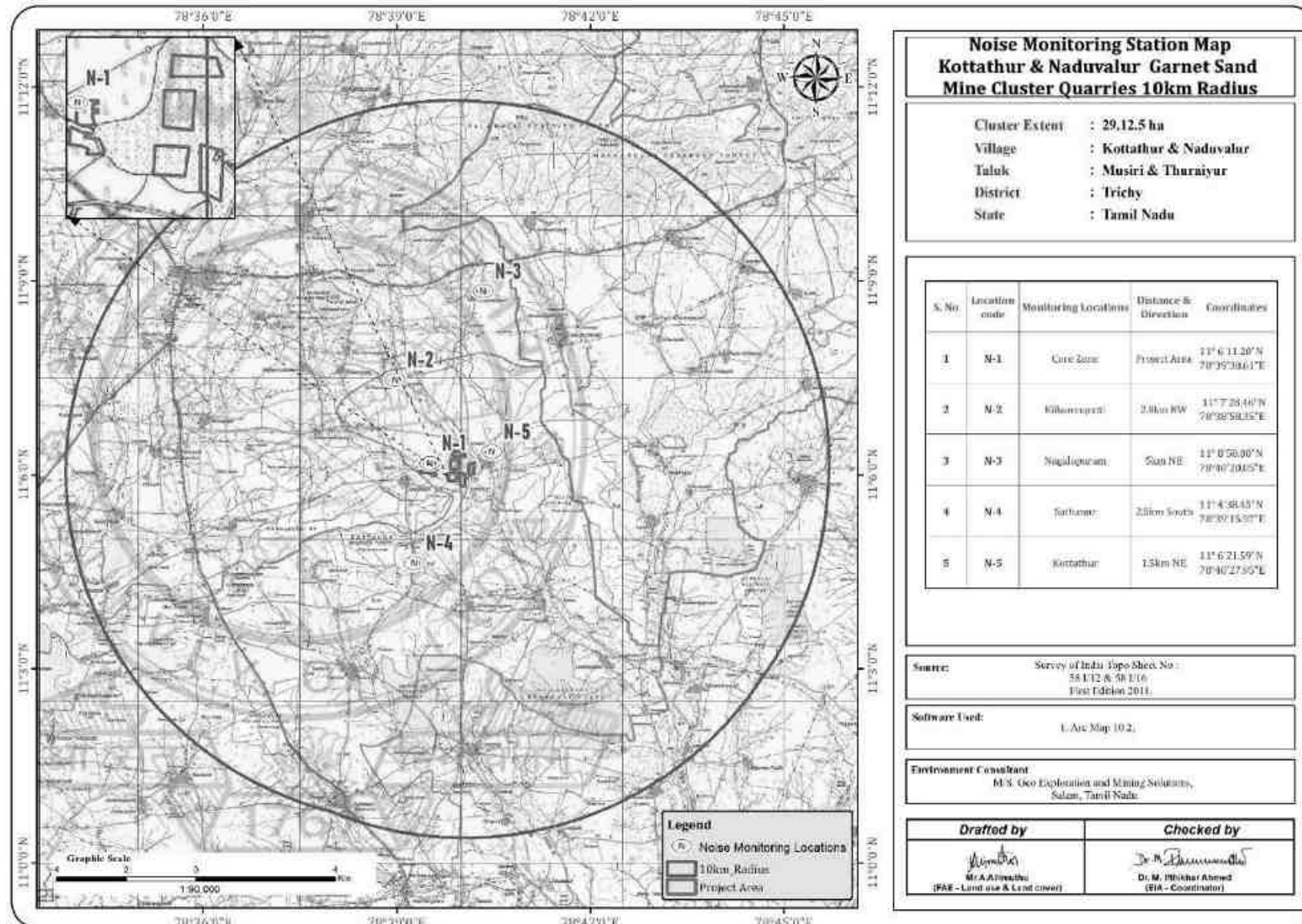
$$Leq = 10 \log L / T \sum (10L_n/10)$$

Where L = Sound pressure level at function of time dB (A)

T = Time interval of observation

Measured noise levels, displayed as a function of time, is useful for describing the acoustical climate of the community. Noise levels recorded at each station with a time interval of about 60 minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels.

FIGURE 3.21: NOISE MONITORING STATIONS AROUND 10 KM RADIUS



3.4.3 Analysis of Ambient Noise Level in the Study Area

The Digital Sound pressure level has been measured by a sound level meter (Model: HTC SL-1352) An analysis of the different Leq data obtained during the study period has been made. Variation was noted during the day-time as well as night-time. The results are presented in below Table 3.32.

Day time: 6:00 hours to 22.00 hours.

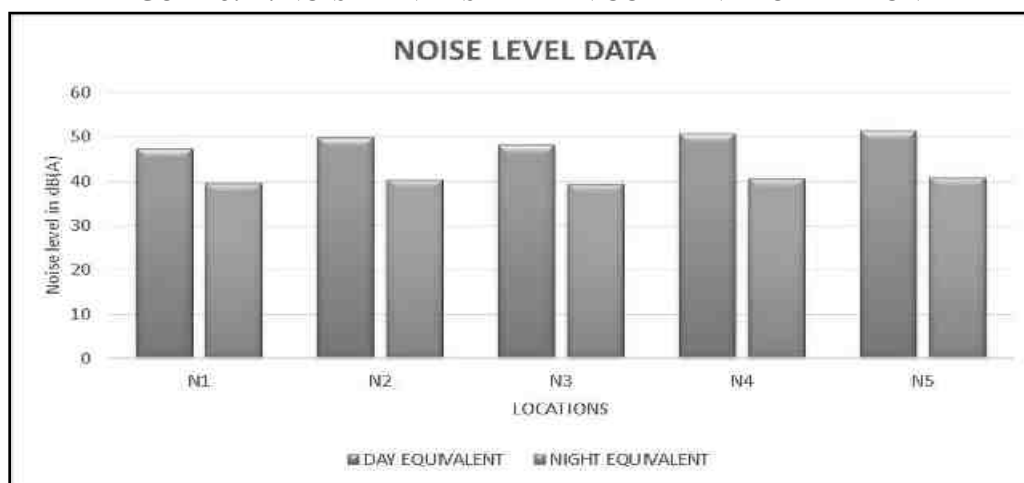
Night time: 22:00 hours to 6.00 hours.

TABLE 3.19: AMBIENT NOISE QUALITY RESULT

Particulars	N1	N2	N3	N4	N5
Day Equivalent	47.4	49.9	48.1	50.7	51.4
Night Equivalent	39.4	40.3	39.3	40.5	40.7
Day & Night Equivalent	45.9	48.4	46.6	49.2	49.8

Source: On-site monitoring/sampling by Creative Engineers & Consultants in association with GEMS

FIGURE 3.22: NOISE LEVELS DATA IN CORE AND BUFFER ZONE



3.4.4 Interpretation & Conclusion:

In the core zone location (1 location), it is found that the Day Equivalent Noise (Leq-d) level is 47.4 dB(A) and Night Equivalent Noise (Leq-n) level is 39.4 dB(A) which are below the work zone exposure limit of 90 dB(A).

In the five buffer zone locations, it is found that the Day Equivalent Noise (Leq-d) level were ranging from 48.1 to 51.4 dB(A) and Night Equivalent Noise (Leq-n) level were ranging from 39.3 to 40.7 dB(A) for buffer zone.

Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

3.5 ECOLOGICAL ENVIRONMENT

3.5.1. Introduction

The study of the biological environment is one of the important aspects of Environmental Impact Assessments. The biotic component comprises both plant and animal communities which interact within the community and between themselves but also with abiotic i.e. physical and chemical components of the environment. A general ecological survey was carried out in the study area of 10 km radius around the Mine area. The study Area is not part of any National Park, Sanctuary, Biosphere Reserve, Wildlife Corridors, Migratory Path, etc. The primary data was generated by preparing a general checklist of all plants encountered in the study area. The species of vegetation found were identified and listed according to their families. The division of core and buffer zone is the best way to study the pattern of biodiversity for environmental impact assessment.

3.5.2. Objectives of Biological Studies

A. Terrestrial Ecology:

- Identification and listing of flora and fauna are important as per the Wildlife (Protection) Act 1972.
- To identify the impacts of mining on agricultural lands and how it affects.
- Proper collection of information about wildlife Sanctuaries/ national parks/ biosphere reserves of the project area.
- Devise management & conservation measures for biodiversity.

B. Aquatic Ecology

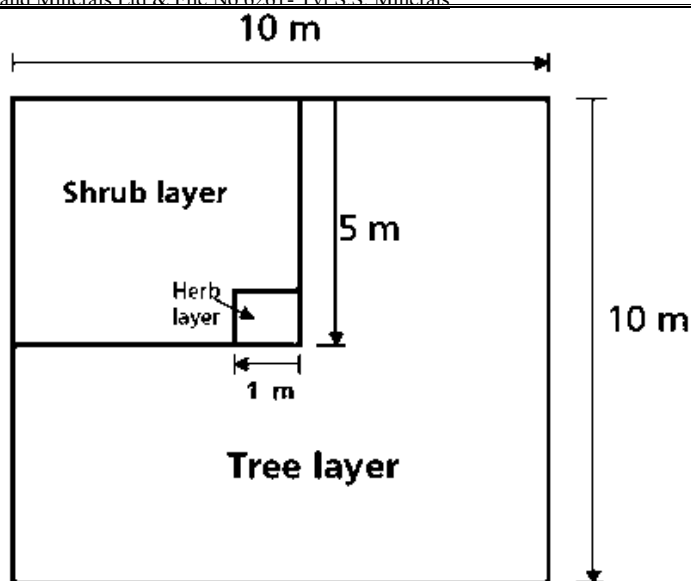
- Generating data through actual field collection in these locations over the study period.
- Impacts on aquatic fauna/flora
- Impacts on spawning and breeding grounds for aquatic species.

3.5.3. Methodology of Sampling

The main baseline survey was carried out to examine the current habitat and species composition. From October to December 2024, an ecology and biodiversity study was carried out within a 10-kilometer radius of the sand mine site. Plant taxonomy books, published literature and reports, and Websites (BSI, ZSI, and State/District Forest Departments) were used to identify the plant species. Also, information regarding vernacular names of plant species was gathered from local residents.

The Phyto-sociology study was carried out using the square quadrats technique through random sampling procedure. All the plots sampled were representative of the most common types of suitable areas. Quadrats of 10m x 10m for tree species, 5m x 5m for shrub species and 1m x 1m for herb species were used for sampling purposes.

Different sampling techniques were employed for documenting different faunal groups. For herpetofauna (Amphibians and Reptiles), visual encounter survey; for birds, point count and transect methods and for mammals direct, and indirect sightings (signs like tracks, pellets and pugmarks) were adopted. The water bodies in the area were also assessed for the status of the aquatic life and fishes.



3.5.4. Flora

The quadrat sampling technique was used for sampling vegetation. Sampling quadrats of the regular shape of dimensions 10 × 10 m, 5 × 5 m, and 1 × 1 m, were nested within each other and were defined as the units for sampling the area and measuring the diversity of trees, Shrubs, and herbs respectively.

TABLE NO: 3.20. FLORA IN THE CORE ZONE OF LEASE AREA KOTTATHUR & NADUVALURVILLAGE

Sl.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Neem Tree	Vembu	<i>Azadirachta Indica</i>	Meliaceae
2.	Mesquite Tree	Karuvelam	<i>Vachellia Nilotica</i>	Fabaceae
3.	White Bark Acacia	Vellai Velam	<i>Vachellia Leucophloea</i>	Babesiae
Shrubs				
4.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae
5.	Indian mallow	Thuthi	<i>Abutilon Indicum</i>	Meliaceae
Herbs				
6.	Cleome viscosa	Nai kadugu	<i>Celome viscosa</i>	Capparidaceae
7.	Hogweed	Mookirattai	<i>Boerhaavia Diffusa</i>	Nyctaginaceae
8.	Ivy Gourd	Kovakkai	<i>Trichosanthes Dioica</i>	Cucurbitaceae
9.	Adamant Creeper	Perendai	<i>Cissus Quadrangularis</i>	Vitaceae
10.	Thumba	Thumbai	<i>Leucas Aspera</i>	Lamiaceae
Grasses				
11.	Eragrostis	Pullu	<i>Eragrostis ferruginea</i>	Poaceae
12.	Softstem bulrush	-	<i>Schoenoplectus tabernaemontani</i>	Cyperaceae
13.	Umbrella-sedge	Vattakorai	<i>Cyperus difformis</i>	Cyperaceae
14.	Watergrass	Mukkutikorei	<i>Bulbostylis barbatta</i>	Cyperaceae
Creepers				
15.	Bitter Apple	Thumati kai	<i>Colocynthis citrullus</i>	Cucurbitaceae
16.	Bayhops	Atappan-koti	<i>Ipomoea pes-caprae</i>	Convolvulaceae

3.5.5. Flora's Composition of the Core Zone

Taxonomically a total of 16 species belonging to Eleven families have been recorded from the core sand mining lease area. The lease-applied area exhibits flat topography of Kottathur and Naduvalur Villages. Based on the habitat classification of the enumerated plants the majority of species were herbs 5 followed by Grass 5, Shrubs 2, Creepers 2 and trees 1. The result of the core zone of flora studies shows that Meliaceae, and Cyperaceae, Cucurbitaceae are the main dominating species in the study area. No species were found in the threatened category.

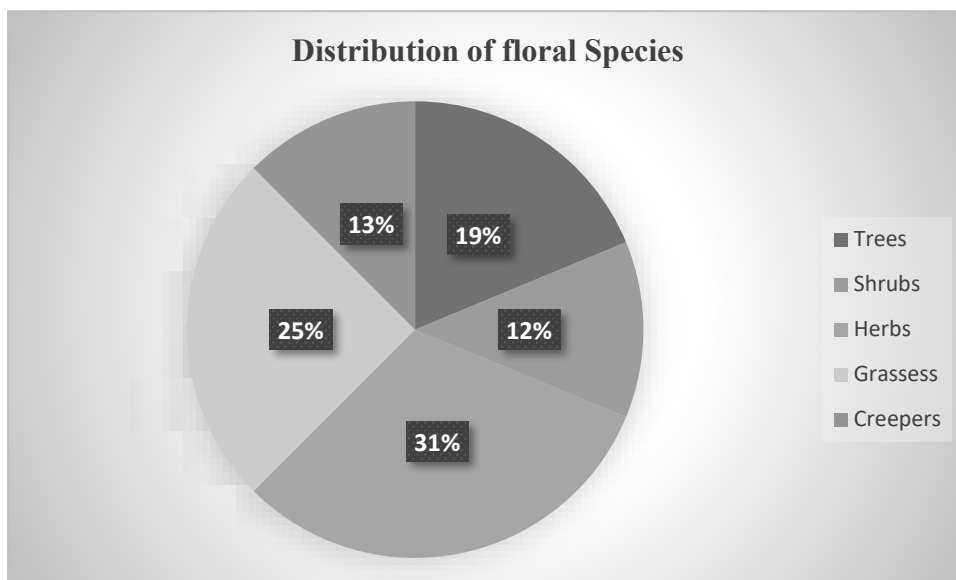


Fig No. 3.23: Pie diagram showing % distribution of floral life forms

3.5.6. Flora Composition in the Buffer Zone

The buffer region has a similar type of habitat, but it has a wider variety of vegetation than the core zone area. The proposed lease area has plain terrain. There are 120 different species identified in the buffer zone. Among the identified, floral (120) species were 44 trees, 29 herbs, 21 shrubs, 11 climbers, 5 Creepers, 8 grasses, and Cactus 2. According to the findings of the buffer zone flora studies, the dominant species in the study area are Fabaceae, Asteraceae, and Euphorbiaceae, as shown in Table No.3.2. Apart from the proposed project area, there is agricultural land. Horticulture and agricultural land are untouched. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. Details of flora with the scientific name were mentioned in Table No.3.2.

A list of floral species has been prepared based on a primary survey (site observations) and discussion with local people. The total number of different plant life forms under trees, shrubs, herbs, and climbers is shown in Table 3.2 and their % distribution is shown in Figure 3.2.

TABLE 3.21: NUMBER OF FLORAL LIFE FORMS IN THE STUDY AREA

S. No	Plant Life Form	Number of Species
1	Trees	44
2	Shrubs	21
3	Herbs	29
4	Climber	11
5	Creepers	5
6	Grassess	8
7	Cactus	2
Total No. of Species		120

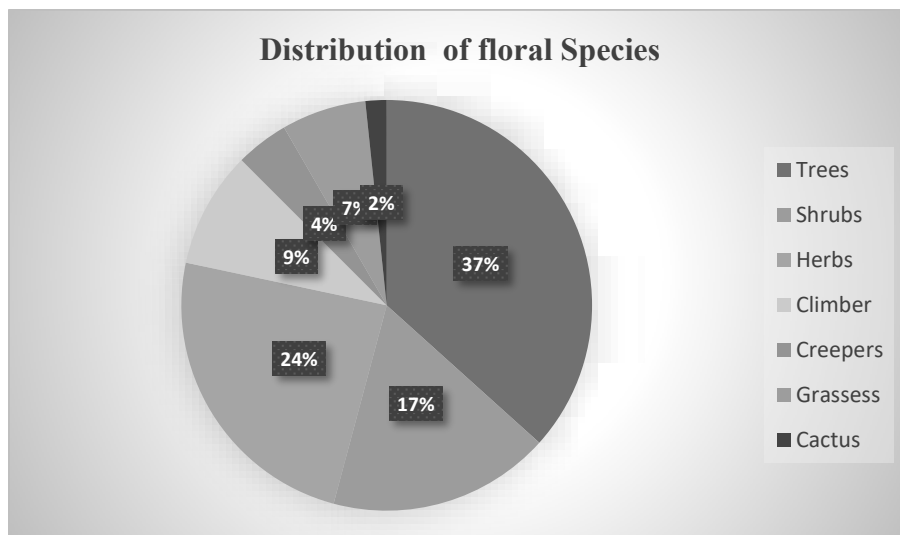


Fig No. 3.24: Pie diagram showing % distribution of floral life forms

The floral composition along with the common name, and family name of the study area is listed below in Table No: 3.3.

TABLE NO: 3.22. FLORA IN THE BUFFER ZONE OF STUDY AREA.

S.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Neem or Indian lilac	Vembu	<i>Azadirachta indica</i>	Meliaceae
2.	Acacia Nilotica	Karuvelam maram	<i>Vachellia nilotica</i>	Fabaceae
3.	Asian Palmyra palm	Panai maram	<i>Borassus flabellifer</i>	Arecaceae
4.	Tamarind	Puliyamaram	<i>Tamarindus indica</i>	Legumes
5.	Millettia Pinnata	Pongam oiltree	<i>Pongamia pinnata</i>	Fabaceae
6.	Gooseberry	Arai nelli	<i>Phyllanthus acidus</i>	Euphorbiaceae
7.	Gum arabic tree	Karuvelam	<i>Acacia nilotica</i>	Mimosaceae
8.	Indian plum	Elanthai maram	<i>Ziziphus mauritiana</i>	Rhamnaceae
9.	Coconut	Thennai maram	<i>Cocos nucifera</i>	Arecaceae
10.	Lemon	Ezhumuchaipalam	<i>Citrus lemon</i>	Rutaceae
11.	Indian Mulberry	Manjanati	<i>Morinda coreia</i>	Rubiaceae
12.	Drumstick tree	Karimurungai	<i>Moringa olefera</i>	Moraginaceae
13.	Banana tree	Vazhaimaram	<i>Musa</i>	Musaceae
14.	Senna siamea	Manjal Konnai	<i>Sennasiamea</i>	Fabaceae
15.	Creamy Peacock Flower	Vadanarayani	<i>Delonix elata</i>	Fabaceae
16.	Beauty leaf	Punnai	<i>Calophyllu inophyllum</i>	Calophyllaceae
17.	Mango	Manga	<i>Mangifera indica</i>	Anacardiaceae
18.	Indian fig tree	Athi	<i>Ficus recemosa</i>	Moraceae
19.	Jujube	Ilanthai	<i>Ziziphus jujubha</i>	Rhamnaceae
20.	Oil cake tree	Arappu	<i>Albizia amara</i>	Mimosaceae
21.	Woman's tongue	Vagai	<i>Albizia lebbeck</i>	Mimosaceae
22.	Banyan tree	Alamaram	<i>Ficus benghalensis</i>	Moraceae
23.	Rain Tree	Thoongu moonji	<i>Albizia saman</i>	Mimosaceae
24.	Muntingia calabura	Singapore cherry	<i>Muntingiacalabura</i>	Malvaceae
25.	Chinesh cheery	Thenpazham	<i>Muntingia calabura</i>	Tiliaceae
26.	Indian bael	Vilvam	<i>Aegle marmelos</i>	Rutaceae
27.	Umbrella thorn	Kodaivelam	<i>Acacia planifrons</i>	Mimosaceae

28.	Henna	Marudaani	<i>Lawsonia inermis</i>	Lythraceae
29.	Eucalyptus	Eucalyptus	<i>Eucalyptus globules</i>	Myrtaceae
30.	Black plum	Navalmaram	<i>Sygygium cumini</i>	Myrtaceae
31.	Jack fruit	Palamaram	<i>Artocarpus heterophyllus</i>	Moraceae
32.	Curry tree	Karivembu	<i>Murraya kentia</i>	Rubiaceae
33.	Robber-thorn tree	Anaimullu	<i>Acacia horrida</i>	Mimosaceae
34.	Teak	Thekku	<i>Tectona grandis</i>	Verbenaceae
35.	Indian gooseberry	Nelli	<i>Emblica officinalis</i>	Phyllanthaceae
36.	Chinese chaste tree	Nochi	<i>Vote negundo</i>	Verbenaceae
37.	Madras Thorn	Kuduka puli	<i>Pithecellobium dulce</i>	Mimosaceae
38.	Cutch tree	Karungali	<i>Acacia sundra</i>	Legumes
39.	Noni	Nuna maram	<i>Morinda citrifolia</i>	Rubiaceae
40.	Five leaf chastera	Nochi	<i>Vitex negundo</i>	Lamiaceae
41.	Papaya	Pappali maram	<i>Carica papaya L</i>	Caricaceae
42.	Peepal	Arasnamaram	<i>Ficus religiosa</i>	Moraceae
43.	Monoon longifolium	Nettilingam	<i>Polyalthia longifolia</i>	Annonaceae
44.	Bamboo	Moonghil	<i>Bambusa bambo</i>	Poaceae
Shrubs				
1.	Milk Weed	Erukku	<i>Calotropis gigantea</i>	Apocynaceae
2.	Shoe flower	Chemparuthi	<i>Hibiscu rosa-sinensis</i>	Malvaceae
3.	Avaram	Avarai	<i>Senna auriculata</i>	Fabaceae
4.	Touch-me-not	Thottalchinungi	<i>Mimosa pudica</i>	Mimosaceae
5.	Rosy Periwinkle	Nithyakalyani	<i>Cathranthus roseus</i>	Apocynaceae
6.	Chrozophora tinctoria	Puramuttai	<i>Chrozophora rottleri</i>	Euphorbiaceae
7.	Purging nut	Kattamanakku	<i>Jatropha curcas</i>	Euphorbiaceae
8.	Triangular spruge	Chaturakalli	<i>Euphorbia antiquorum</i>	Euphorbiaceae
9.	Jackal jujube	Surai Ilantai	<i>Ziziphus oenoplia</i>	Rhamnaceae
10.	Plumeria alba	Malaiarali	<i>Plumeria alba</i>	Appocynaceae
11.	Senna alata	Seemaigaththi	<i>Cassia alata</i>	Caesalpinaceae
12.	Indian Oleander	Arali	<i>Nerium indicum</i>	Apocynaceae
13.	Giant reed	Naanal	<i>Arunudo donax</i>	Poaceae
14.	Malabar nut	Adathodai	<i>Justicia adhatoda</i>	Acanthaceae
15.	Ipomoea cornea	Neivelikattamanaku	<i>Ipomoea carnea</i>	Convolvulaceae
16.	Indian mallow	Thuthi	<i>Abutilon indicum</i>	Meliaceae
17.	Solanum pubescens	Malaisundai	<i>Solanum pubescens Willd</i>	Solanaceae
18.	Hygrophila spinosa	Neermulli	<i>Hydrophila auriculata</i>	Acanthaceae
19.	Datura metel	Uumaththai	Datura metel	Solanaceae
20.	Night shade plan	Sundaika	<i>Solanum torvum</i>	Solanaceae
21.	Ceylon Date Palm	Icham	<i>Phoenix pusilla</i>	Arecaceae
Herbs				
1.	Gotu kola	Vallarai	<i>Centella asiatica</i>	Apiaceae
2.	Common leucas	Thumbai	<i>Leucas aspera</i>	Lamiaceae
3.	Holy basil	Thulasi	<i>Ocimum tenuiflorum</i>	Lamiaceae
4.	Sessile joyweed	Ponnanganni	<i>Alternanthera sessilis</i>	Amaranthaceae
5.	Cyperus difformis	Kudai koori	<i>Cyperus difformis</i>	Cyperaceae
6.	Cat's claw	Thael Kodukku	<i>Martynia annua</i>	Pedaliaceae
7.	Poor land flatsedg	Kunnakora	<i>Cyperus compressus</i>	Cyperaceae
8.	Goatweed	Pumpillu	<i>Ageratum conyzoides</i>	Asteraceae
9.	Mexican prickly poppy	Eli-yotti	<i>Argemone mexicana</i>	Papaveraceae
10.	Indian doab	Arugampul	<i>Cynodon dactylon</i>	Poaceae
11.	Chinese Spinach	Thandukeerai	<i>Amaranthus tricolor</i>	Amaranthaceae
12.	Tridax daisy	Veetukaayapoond	<i>Tridax procumbens</i>	Asteraceae
13.	Digeria muricata	Thoiya keerai	<i>Digeria muricata</i>	Amaranthaceae
14.	Indian Copperleaf	Kuppaimeni	<i>Acalypha indica</i>	Euphorbiaceae
15.	Chocolate weed	Punnakku poond	<i>Melochia corchorifolia</i>	Sterculiaceae

16.	Riceweeds	Seruppada	<i>Coldenia procumbens</i>	Boraginaceae
17.	Goatweed	Kallurukki	<i>Scoparia dulcis</i>	Plantaginaceae
18.	East Indian globe thistle	kottai-k-karantai	<i>Sphaeranthus indicus</i>	Asteraceae
19.	False daisy	Karisilanganni	<i>Eclipta prostrata</i>	Asteraceae
20.	Carrot grass	Partiniyam	<i>Parthenium hysterophorus</i>	Asteraceae
21.	Black Mustard Seed	Kaduku	<i>Brassica juncea</i>	Brassicaceae
22.	Slender amaranth	Sirukeerai	<i>Amaranthus polygonoides</i>	Amaranthaceae
23.	European black nightshade	Manathakkali	<i>Solanum nigrum</i>	Solanaceae
24.	Cleome viscosa	Nai kadugu	<i>Celome viscosa</i>	Capparidaceae
25.	Prickly chaff flower	Nayuruv	<i>Achyranthes aspera</i>	Amaranthaceae
26.	Punarnava	Mukkirattai	<i>Boerhaavia diffusa</i>	Nyctaginaceae
27.	Prickly amaranth	Mullukkeerai	<i>Amaranthus spinosus</i>	Amaranthaceae
28.	Porcupine flower	Kundan	<i>Barleria prionitis</i>	Acanthaceae
29.	Billygoat weed	Pumpillu	<i>Ageratum conyzoides</i>	Asteraceae
Climbers				
1.	Butterfly-pea	Sangupoo	<i>Clitoria ternata</i>	Fabaceae
2.	Ivy gourd	Kovai	<i>Coccinia grandis</i>	Cucurbitaceae
3.	Balloon vine	Mudakkotan	<i>Cardiospermum helicacabum</i>	Sapindaceae
4.	Rosary pea	Kuntumani	<i>Abrus precatorius L</i>	Fabaceae
5.	Pointed gourd	Kovakkai	<i>Trichosanthes dioica</i>	Cucurbitaceae
6.	Indian sarsparilla	Nannari	<i>Hemidesmus indicus</i>	Asclepiadaceae
7.	Coral vine	Kodi rose	<i>Antigonon leptopus</i>	Polygonaceae
8.	Stemmed vine	Perandai	<i>Cissus quadrangularis</i>	Vitaceae
9.	Wild jasmine	Malli	<i>Jasminum augustifolium</i>	Oleaceae
10.	Bottle Guard	Sorakkai	<i>Lagenaria siceraria</i>	Cucurbitaceae
11.	Bitter gourd	Pavakkai	<i>Momordica charantia</i>	Cucurbitaceae
Creepers				
1.	Ground Spurge	Sithrapaalavi	<i>Euphorbia prostrata</i>	Euphorbiaceae
2.	Ipomoea reniformis chois	Elikkathilai	<i>Merremia gangetica</i>	Convolvulaceae
3.	Bitter Apple	Thumattikai	<i>Cucumis callosus</i>	Cucurbitaceae
4.	Merremia	Muthiyar koontha	<i>Merremia tridentata</i>	Convolvulaceae
5.	Frog fruit	Poduthalai	<i>Phyla nodifolia</i>	Verbenaceae
Grasses				
1.	Apluda	Kattu kanchippul	<i>Apluda mutica</i>	Poaceae
2.	Finger grass	Kuruthupillu	<i>Chloris dolichostachya</i>	Poaceae
3.	Nut grass	Korai	<i>Cyperus rotundus</i>	Poaceae
4.	Marvel grass	Marvel grass	<i>Dichanthium annulatum</i>	Poaceae
5.	Jungle rice	Kuthirai vaal Kattu arusi	<i>Echinochloa colona</i>	Poaceae
6.	Windmill grass	Chevvarakupul	<i>Chloris barbata</i>	Amaranthaceae
7.	Eragrostis	Pullu	<i>Eragrostis ferruginea</i>	Poaceae
8.	Umbrella-sedge	Vattakorai	<i>Cyperus difformis</i>	Cyperaceae
Cactus				
1.	Prickly pear	Nagathali	<i>Opuntia</i>	Cactaceae
2.	Triangular spruce	Chaturakalli	<i>Euphorbia antiquorum</i>	Euphorbiaceae

*E- Economical, M- Medicinal, EM- Both Economical and Medicinal, NE- Not evaluated.

Source:

- Nair.N.C and A.N. Henry, Flora of Tamil Nadu 1983, Series 1, Botanical Survey of India, Southern Circle.

3.5.7. Agricultural Resources

The district's economy is primarily agricultural. Agricultural produce not only supports the district's food needs, but is also exported to other regions of Tamil Nadu. Agriculture employs around 33% of the district's workforce and serves as the foundation for a wide market of consumer goods and agro-based industries. Pulses are primarily grown as rain-fed crops.

Major Field Crops cultivated: Banana, Paddy, Coconut, Sugar cane, brinjal and black gram.

Horticulture crops: Banana and Chilly are the two main horticultural crops in this district.

3.5.8. The vegetation in the RF / PF areas, ecologically sensitive areas

There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves/(existing as well as proposed) within 10 km of the mine lease area. There are no protected forests within the project area. Hence submission of clearance from the National Board of Wildlife does not arise. No Wildlife Sanctuary in the study area. In addition, No Biosphere Reserves, Wildlife corridors, or, Tiger / Elephant reserves within 10 km of the project area. No protected (PF) forests either in the mine lease area or in the buffer zone. Thus, no forest land is involved in any manner.

There are no protected or ecologically sensitive areas such as National parks or Important Bird Areas (IBAs), or Wetlands or migratory routes of fauna or water bodies or human settlements within the proposed mine lease area. There are no Biosphere reserves or wildlife sanctuaries or National parks or Important Bird Areas (IBAs), or migratory routes of fauna. Thus, the area under study (Mine lease area and the 10 Km buffer zone) is not ecologically sensitive.

Thus, no forest land is involved in any manner. There are no impacts due to this mining activity. There are neither forests nor forest dwellers nor forest-dependent communities in the mine lease area. There shall be no forest-impacted families (PF) or people (PP). Thus, the rights of Traditional Forest Dwellers will not be compromised on account of the project.

Fauna

3.5.9. Fauna Composition in the Core Zone

A total of 15 varieties of species were observed in the Core zone of the (Naduvalur Village) Garnet Sand mining (Table No.3.4) among them numbers Insects 5, Reptiles 2, and Avian 8. None of these species are threatened or endemic in the study area and surroundings. There is no Schedule I species according to the Indian Wildlife Act 1972. A total of eight species of bird were sighted in the mining lease area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

TABLE NO: 3.23. FAUNA IN THE CORE ZONE OF LEASE AREA, SAND MINING

Sl. No	Scientific Name	Common Name	IUCN Red List data
Insects			
1.	<i>Trithemis pallidinervis</i>	Long legged marsh skimmer	LC
2.	<i>Brachythemis contaminata</i>	Ditch jewel	LC
3.	<i>Danaus genutia</i>	Striped Tiger	LC
4.	<i>Diplocodes trivialis</i>	Ground skimmer	-
5.	<i>Hieroglyphus sp</i>	Grasshopper	LC
Reptiles			
1.	<i>Mabuya carinatus</i>	Common skink	LC
2.	<i>Calotes versicolor</i>	Garden lizard	LC
Aves			
1.	<i>Accipiter badius</i>	Shikra	LC
2.	<i>Corvus splendens</i>	House crow	LC
3.	<i>Alcedo atthis</i>	Small blue kingfisher	LC

4.	<i>Dicrurus macrocercus</i>	Black drongo	LC
5.	<i>Nycticorax nycticorax</i>	Night Heron	IV
6.	<i>Bubulcus ibis</i>	Cattle egret	LC
7.	<i>Saxicoloides fulicata</i>	Indian Robin	LC
8.	<i>Milvus migrans</i>	Black kite	LC

*NL- Not listed, LC- Least Concern

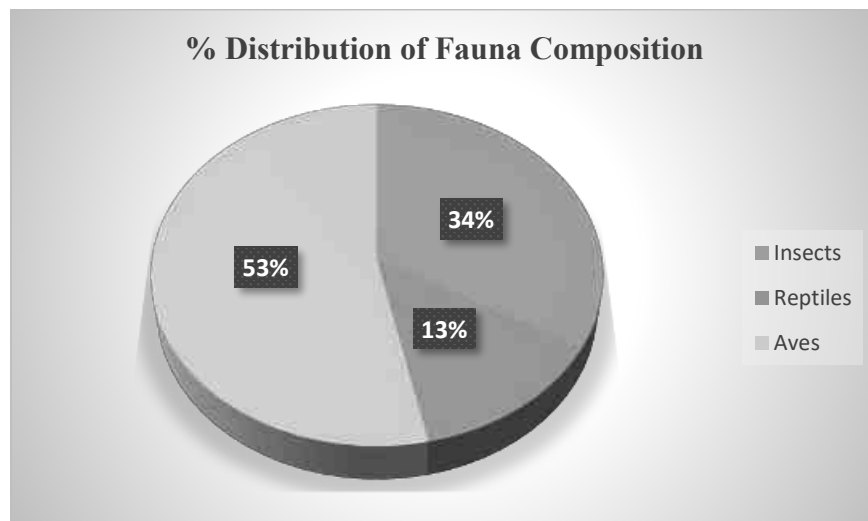


Fig No. 3.25: Pie diagram showing % distribution of fauna

3.5.10. Fauna Composition in the Buffer Zone

As animals, especially vertebrates move from place to place in search of food, shelter, mate or other biological needs, separate lists for core and buffer areas are not feasible however, a separate list of fauna pertaining to core and buffer zone are listed separately. Though there are no reserved forest in the buffer zone. As such there are no chances of occurrence of any rare or endangered or endemic or threatened (REET) species within the core or buffer area.

There are no Sanctuaries, National Parks, Tiger Reserve or Biosphere Reserve or Elephant Corridor or other protected areas within 10 km radius from the core area. It is evident from the available records, reports, and circumstantial evidence that the entire study area including the core and buffer areas were free from any endangered animals. There were no resident birds other than common bird species such as green bee-eaters, Indian blue robin, Common Mynas, Black drongos, Crows, etc.

The list of bird species recorded during the field survey and literature from the study area is given in Table 3.6. The list of reptilian species recorded during the field survey and literature from the study area are given in Table 3.7. The list of insect species recorded during the field survey and literature from the study area are given in Table 3.8. The list of Amphibian species recorded during the field survey and literature from the study area are given in Table 3.11 and List of Butterflies identified from the project site and their conservation status is given in Table No.3.9. It is apparent from the list that none of the species either spotted or reported is included in Schedule I of the Wildlife Protection Act. Similarly, none of them comes under the REET category.

Taxonomically a total of 74 species were identified from the project site. Based on habitat classification the majority of species were Insects 5, followed by birds 33, Reptiles 8, Mammals 4, Amphibians 4, and Butterflies 20. A total of 33 species of bird were sighted in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed. There are no impacts on nearby fauna species.

Dominant species are mostly birds and buffer flies, and four Amphibians were observed during the extensive field visit *Duttaphrynus melanostictus*, *Rana tiger*, *Euphlyctis*, and, *Hoplobatrachus tigerinus*. There is no Schedule I

Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

**TABLE 3.24. LIST OF FAUNA & THEIR CONSERVATION STATUS,
 Mammals: (*directly sighted animals & Secondary data)**

Sl. No	Scientific Name	Common Name	IUCN Conservation Status
1.	<i>Funambulus palmarum</i>	Indian palm squirrel	LC
2.	<i>Mus booduga</i>	Indian Field Mouse	LC
3.	<i>Herpestes javanicus</i>	Asian Small Mongoose	LC
4.	<i>Rattus norvegicus</i>	Brown rat	LC

Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated

TABLE 3.25. LISTED BIRDS

Sl. No	Scientific Name	Common Name	IUCN Conservation Status
1.	<i>Orthotomus sutorius</i>	Tailor Bird	IV
2.	<i>Passer domesticus</i>	House Sparrow	LC
3.	<i>Bubulcus ibis</i>	Cattle Egret	LC
4.	<i>Saxicoloidesfulicata</i>	Indian Robin	LC
5.	<i>Anthus rufulus</i>	Paddy field pipit	LC
6.	<i>Columba livia</i>	Blue rock pigeon	IV
7.	<i>Streptopeliachinensis</i>	Spotted Dove	LC
8.	<i>Accipiter badius</i>	Shikra	LC
9.	<i>Corvus macrorhynchos</i>	Jungle Crow	LC
10.	<i>Alcedo atthis</i>	Small blue kingfisher	LC
11.	<i>Turdoides caudatus</i>	Common babbler	LC
12.	<i>Cuculus micropterus</i>	Indian cuckoo	LC
13.	<i>Nectarinia minima</i>	Small Sunbird	LC
14.	<i>Acridotherestrictis</i>	Common Myna	LC
15.	<i>Apus affinis</i>	House swift	LC
16.	<i>Centropus sinensis</i>	Southern Coucal	LC
17.	<i>Dicrurusmacrocerus</i>	Black Drongo	LC
18.	<i>Cinnyris asiaticus</i>	Purple Sunbird	IV
19.	<i>Ardeola grayii</i>	Pond Heron	LC
20.	<i>Passer domesticus</i>	House sparrow	LC
21.	<i>Nycticorax nycticorax</i>	Night Heron	IV
22.	<i>Turdoides affinis</i>	White headed Babbler	LC
23.	<i>Corvussplendens</i>	House Crow	LC
24.	<i>Eudynamys</i>	Koel	LC
25.	<i>Psittacula krameni</i>	Rose ringed parakeet	LC
26.	<i>Dicrurus macrocercus</i>	Black drongo	LC
27.	<i>Corvus splendens</i>	House crow	LC
28.	<i>Alcedo atthis</i>	Small blue kingfisher	LC
29.	<i>Cuculus canorus</i>	Common Cukoo	LC
30.	<i>Pycnonotus cafer</i>	Red vented Bulbul	LC
31.	<i>Milvus migrans</i>	Black kite	LC
32.	<i>Meropsorientalis</i>	Small Bee-eater	LC
33.	<i>Halcyon smyrnensis</i>	White-breasted Kingfisher	LC

Not Evaluated (NE) Least Concern (LC) Near Threatened (NT) Endangered (E)

TABLE 3.26. LIST OF REPTILES EITHER SPOTTED OR REPORTED FROM THE STUDY AREA.

SI. No	Scientific Name	Common Name	IUCN Red List data
1.	<i>Mabuya carinatus</i>	Common skink	LC
2.	<i>Calotes versicolor</i>	Oriental garden lizard	LC
3.	<i>Ptyas mucosa</i>	Rat snake	NA
4.	<i>Ahaetulla nasuta</i>	Green vine snake	LC
5.	<i>Bungarus caeruleus</i>	Common krait	LC
6.	<i>Nerodipiscator</i>	Freshwater snake	NA
7.	<i>Hemidactylus flaviviridis</i>	House lizards	NL
8.	<i>Naja naja</i>	Indian cobra	LC

TABLE 3.27. LIST OF INSECTS SPOTTED OR REPORTED FROM THE STUDY AREA

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	<i>Brachythemis contaminata</i>	Ditch jewe	LC
2.	<i>Diplocodes trivialis</i>	Ground skimmer	LC
3.	<i>Trithemis aurora</i>	Crimson marsh glider	LC
4.	<i>Apis cerana</i>	Indian honey bee	
5.	<i>Trithemis pallidinervis</i>	Long legged marsh skimmer	-

TABLE.3.28. LIST OF BUTTERFLIES IDENTIFIED FROM THE PROJECT SITE AND THEIR CONSERVATION STATUS

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	<i>Danaus genutia</i>	Striped Tiger	LC
2.	<i>Danaus chrysippuschrysippus</i>	Plain Tiger	LC
3.	<i>Acraea terpsicore</i>	Tawny Coster	LC
4.	<i>Papiliopolytespolytes</i>	Common Mormon	LC
5.	<i>Papiliopolytesromulus</i>	Common Mormon	LC
6.	<i>Papiliodemoleusdemoleus</i>	Lime Butterfly	LC
7.	<i>Hypolimnasmisippus</i>	DanaidEggfly	LC
8.	<i>Junoniahierta</i>	Yellow Pansy	LC
9.	<i>Junonialemonias</i>	Lemon Pansy	LC
10.	<i>Hypolimnasmisippus</i>	DanaidEggfly	LC
11.	<i>Phalantaphalanthia</i>	Common Leopard	LC
12.	<i>Zizulahlax</i>	Tiny Grass Blue	LC
13.	<i>Catochrysopsstrabo</i>	Forget-Me-Not	LC
14.	<i>Euchrysopsenejus</i>	Gram Blue	LC
15.	<i>Lampidesboeticus</i>	Pea Blue	LC
16.	<i>Euploea core</i>	Common Crow	LC
17.	<i>Melanitisledaleda</i>	Common Evening Brown	LC
18.	<i>Jamidescelenoceleno</i>	Common Cerulean	LC
19.	<i>Evereslacturnus</i>	Indian Cupid	LC
20.	<i>Pachlioptaaristolochiae</i>	Common Rose	LC

3.5.11. Aquatic Ecology

There are several small village tanks on all sides within the 10 Km buffer zone. Most tanks were either totally or partially dry during the period of the survey. The present survey is confined to freshwater environment only. Apart from the River and the tanks, the aquatic environment is also represented by paddy field,s, and a few stagnant water ponds. In addition to these village tanks, drains, and paddy fields provide the aquatic habitat for a variety of very common aquatic plants and animals. Typha angustata can be found growing all along the drains of villages, small water-logged depressions, and agricultural fields lacking water but containing enough moisture to support its growth. And where water is present, Eichhornia crassipes has taken its roots and covers the entire water surface by its sprawl and invasion. All the aquatic plant species listed in Table 3.10 is found in the study area only.

3.5.12. Objectives of Aquatic Studies

- Generating data through actual field collection in these locations over the study period.
- Impacts on aquatic fauna/flora
- Consulted with locals to obtain knowledge about aquatic flora and animals.

3.5.13 Macrophytes

The macrophytes observed within the study area are tabulated in Table 3.10.

TABLE NO.3.29. DESCRIPTION OF MACROPHYTES

S.No	Scientific name	Common Name	IUCN Red List of Threatened Species
1.	<i>Eichornia crassipe</i>	Water hyacinth	NA
2.	<i>Aponogeton natans</i>	Floating laceplant	NA
3.	<i>Carex cruciata</i>	Cross Grass	NA
4.	<i>Nymphaea nouchali</i>	Blue waterlily	LC
5.	<i>Chrysopogon aciculatus</i>	Golden false beardgrass	NA
6.	<i>Hydrilla verticillata</i>	Waterthymes	LC
7.	<i>Cyperus exaltatus</i>	Tall Flat Sedge	LC
8.	<i>Marsilea quadrifolia</i>	Water clover	LC

3.5.14. Aquatic Faunal Diversity

Amphibian species like the common Indian Burrowing frog, and Indian Pond Frog, Indian Toad, Indian Bull Frog, were sighted near the water bodies located in the study area.

TABLE NO. 3.30. AMPHIBIANS OBSERVED/RECORDED FROM THE STUDY AREA

Sl. No	Scientific Name	Common Name	IUCN Red List data
1.	<i>Duttaphrynus melanostictus</i>	Common Indian Toad	IV
2.	<i>Rana tiger</i>	Common Frog	NA
3.	<i>Euphlyctis hexadactylus</i>	Indian Pond Frog	LC
4.	<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	IV/LC

*Status assigned by the IUCN, where – CR – Critically Endangered; EN – Endangered; LC – Least Concern; NT – Near Threatened; VU – Vulnerable, DA – Data Deficient, NE – Not Evaluated

3.5.15. Other Aquatic species

There are also a few canals and ponds in the study region. The presence of a few common/local fish species, as well as a broad range of plankton, has been documented in ponds in the communities listed below.

3.5.16. Phytoplanktons: Nitzschia, Microcystis, Oscillatoria, Navicula and Pediatrum sps.

3.5.17. Zooplanktons: These consist of microscopic organisms from groups Protozoa, Rotifers, Cladocera and Copepoda etc. Some common species of zooplanktons are; Deflandre, Arcella vulgaris, Centropyxis spinosa Arcella discoides, Arcella hemispherica, Centropyxis aculeate, Trigonopyxis arcula, Brachionus calyciflorus, Lecane curvicornis, Brachionus angularis, Polyarthra vulgaris, Filinia longisetia.

3.5.18. Fishes

Fish is commonly found in all types of natural water bodies and very common source of food in Easterner South India. The local fishermen were enquired and also the secondary resources were reviewed to collect information on the fishes found in the study area. Few common species are; Catla (Catla catla), Dwarf panchax (Aplocheilus parvus), Mrigal (Cirrhinus mrigala), Tank goby (Glossogobius giuris), Ticto barb (Pethia ticto), Greenstripe barb (Puntius vittatus), Roho (Labeo rohita) and Pool barb (Puntius sophore) etc., Species of fish reported in the study area are given in table 3.12.

TABLE 3.31. BASED ON ACTUAL SIGHTING, BASED ON INPUTS FROM LOCALS AND PERUSED FROM SECONDARY DATA

S.No	Common name	Scientific name	Family
1.	Catla	<i>Catla Catla</i>	Cyprinidae
2.	Dwarf panchax	<i>Aplocheilus parvus</i>	Aplocheilidae
3.	Tank goby	<i>Glossogobius giuris</i>	Gobiidae
4.	Ticto barb	<i>Pethia ticto</i>	Cyprinidae
5.	Rohu	<i>Labeo rohita</i>	Cyprinidae
6.	Catfish	<i>Siluriformes</i>	Diplomystidae
7.	Mrigal	<i>Cirrhinus mrigala</i>	Chordata
8.	Greenstripe barb	<i>Puntius vittatus</i>	Cyprininae
9.	Pool barb	<i>Puntius sophore</i>	Cyprinidae

3.5.19. Findings/Results

The assessment was carried out during the Post Monsoon season. The inspection day was quite all right with respectable weather. The details of the flora and fauna observed are given below.

Records of threatened species in the area

No threatened species were observed

Endangered Species as per Wildlife (Protection) Act

No Endangered fauna was recorded in the project area.

Endemic Species of the Project areas

No endemic species were observed in the project area.

Migratory species of the Project areas

No migratory fauna observed in project area.

Migratory corridors and Flight paths

No migratory corridors and Flight paths were observed in project area.

Breeding and spawning grounds

No breeding and spawning grounds were earmarked for the wildlife fauna in project area.

There are no critically endangered, endangered, vulnerable, and endemic species were observed. As the rainfall in the area is scanty and as no toxic wastes are produced or discharged on account of mining, the proposed mining activity is not going to have any additional and adverse impacts on these RET species. There are no

ecologically sensitive areas or protected areas within the 10 Km radius. Hence no specific conservation for conservation of any RET species or Wildlife is envisaged. There are no National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar sites, Tiger/Elephant Reserves/(existing as well as proposed) within 10 km of the mine lease area.

3.5.20. Conclusion

The observations and assessment of the overall ecological scenario involve details such as classification of Biogeographic zone, eco-region, habitat types, and land cover, distances from natural habitats, vegetation/forest types, and sensitive ecological habitats such as Wetlands sites, Important Bird areas, migration corridors of important wildlife etc. Such baseline information provides better understanding of the situation and overall ecological importance of the area. This baseline information viewed against proposed project activities help in predicting their impacts on the wildlife and their habitats in the region. Data collected and information gathered from secondary literature on flora, fauna, protected area, natural habitats, and wildlife species etc., and consulted and discussed with local people, from the villages, herders and farmers who inhabit close to the proposed project area.

3.6 SOCIO ECONOMIC ENVIRONMENT

Socio-economic study is an essential part of environmental study. 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.

It is expected that the Socio-Economic Status of the area will substantially improve because of this proposed project. As the proposed project will provide direct and indirect employment and improve the infrastructural facilities in that area and, thus, improve their standard of living.

3.6.1 Objectives of the Study

The objectives of the socio-economic study are as follows:

- To study the socio-economic status of the people living in the study area of the proposed mining project.
- To assess the impact of the project on Quality of life of the people in the study area.
- To recommend Community Development measures needs to be taken up in the study Area.

3.6.2 Scope of Work

- To study the Socio-economic Environment of the area from the secondary sources;
- Data Collection & Analysis
- Prediction of project impact
- Mitigation Measures

3.6.3 District Profile

Tiruchirappalli District is located along the Kaveri River in Tamil Nadu, India. The main town in Tiruchirappalli District is the city of Tiruchirappalli, also known as Trichy. During the British Raj, Tiruchirappalli was known as Trichinopoly, and was a district of the Madras Presidency; it was renamed upon India's declaration of independence in 1947. As of 2011, The district had a population of 2,722,290 with 1,013 females for every 1,000 males. Tiruchirappalli district lies within Tamil Nadu. The district has an area of 4,404 square kilometers. It is bounded in the north by Salem district, in the northwest by Namakkal district, in the northeast by Perambalur district and Ariyalur district, in the east by Thanjavur District, in the southeast by Pudukkottai district, in the south by Madurai district and Sivagangai district, in the southwest by Dindigul district and, in the west by Karur district. The Kaveri river flows through the length of the district and is the principal source of irrigation and drinking water.

3.6.4 Study area:

KOTTATHUR VILLAGE

Kottathur is a large village located in Musiri Taluka of Tiruchirappalli district, Tamil Nadu with total 1373 families residing. The Kottathur village has population of 4532 of which 2140 are males while 2392 are females as per Population Census 2011.

In Kottathur village population of children with age 0-6 is 428 which makes up 9.44 % of total population of village. Average Sex Ratio of Kottathur village is 1118 which is higher than Tamil Nadu state average of 996. Child Sex Ratio for the Kottathur as per census is 954, higher than Tamil Nadu average of 943.

Kottathur village has lower literacy rate compared to Tamil Nadu. In 2011, literacy rate of Kottathur village was 74.12 % compared to 80.09 % of Tamil Nadu. In Kottathur Male literacy stands at 82.20 % while female literacy rate was 67.02 %.

As per constitution of India and Panchyati Raaj Act, Kottathur village is administrated by Sarpanch (Head of Village) who is elected representative of village. Our website, don't have information about schools and hospital in Kottathur village.

TABLE 3.32: KOTTATHUR VILLAGE POPULATION FACTS

Number of Households	1373
Population	4532
Male Population	2140
Female Population	2392
Children Population	428
Sex-ratio	1118 females per 1000 males
Literacy	74.12%
Male Literacy	82.20%
Female Literacy	67.02%
Scheduled Tribes (ST) %	0
Scheduled Caste (SC) %	48.63%

Source: <https://www.census2011.co.in/data/village/635716-kottathur-tamil-nadu.html>

Gram Panchayat name of the Kottathur village is kottathur. Block name is Musiri and Teshil/Taluk or sub-district is Musiri. Data Reference year is 2009 of Census 2011. Sub District HQ Name is Musiri and Sub District HQ Distance is 14 Km from the village. District Head Quarter name is Trichy and it's distance from the village is 38Km. Nearest Town of the Kottathur village is Thuraiyur and nearest town distance is 15 km. Pincode of Kottathur village is 621004. As per census 2011 village code of village Kottathur is 635716

TABLE 3.33: DEMOGRAPHICS POPULATION OF VILLAGE KOTTATHUR

Total Population	Male Population	Female Population
4532	2140	2392

Source: <https://www.census2011.co.in/data/village/635716-kottathur-tamil-nadu.html>

Sex Ratio of Kottathur Village -Census 2011

As per the Census Data 2011 there are 1118 Females per 1000 males out of 4532 total population of village. There are 955 girls per 1000 boys under 6 years of age in the village.

Literacy of Kottathur Village

Out of total population total 4532 people in Kottathur Village are literate, among them 1759 are male and 1603 are female in the village. Total literacy rate of Kottathur is 74.12%, for male literacy is 82.2% and for female literacy rate is 67.02%.

Worker's profile of Kottathur Village

Total working population of Kottathur is 2665 which are either main or marginal workers. Total workers in the village are 2665 out of which 1356 are male and 1309 are female. Total main workers are 2645 out of which female main workers are 1295 and male main workers are 1350. Total marginal workers of village are 20

NADUVALUR VILLAGE

Naduvalur village is situated in Teshil Thuraiyur, District Tiruchirappalli and in State of Tamil Nadu India. Village has population of 1991 as per census data of 2011, in which male population is 992 and female population is 999. Total geographical area of Naduvalur village is 982.39 Hectares. Population density of Naduvalur is 2 persons per Hectares. Total number of house hold in village is 559.

TABLE 3.34: NADUVALUR VILLAGE POPULATION FACTS

Number of Households	559
Population	1991
Male Population	992
Female Population	999
Children Population	178
Sex-ratio	1007 females per 1000 males
Literacy	81.58%
Male Literacy	87.64%
Female Literacy	75.73%
Scheduled Tribes (ST) %	0
Scheduled Caste (SC) %	18.4%

Source: <https://etrace.in/census/village/naduvalur-thuraiyur-district-tiruchirappalli-tamil-nadu-635809>

Gram Panchayat name of the Naduvalur village is Nadvalur. Block name is Thuraiyur and Teshil/Taluk or sub-district is Thuraiyur. Data Reference year is 2009 of Census 2011. Sub District HQ Name is Thuraiyur and Sub District HQ Distance is 10 Km from the village. District Head Quarter name is Trichy and its distance from the village is 50Km. Nearest Town of the Naduvalur village is Thuraiyur and nearest town distance is 10 km. Pincode of Naduvalur village is 621004. As per census 2011 village code of village Naduvalur is 635809

TABLE 3.35: DEMOGRAPHICS POPULATION OF VILLAGE NADUVALUR

Total Population	Male Population	Female Population
1991	992	999

Source: <https://etrace.in/census/village/naduvalur-thuraiyur-district-tiruchirappalli-tamil-nadu-635809>

Sex Ratio of Naduvalur Village -Census 2011

As per the Census Data 2011 there are 1007 Females per 1000 males out of 1991 total population of village. There are 745 Females per 1000 Males under 6 years of age in the village.

Literacy of Naduvalur Village

Out of total population total 1991 people in Naduvalur Village are literate, among them 780 are male and 699 are female in the village. Total literacy rate of Kottathur is 81.6%, for male literacy is 87.64% and for female literacy rate is 75.73%.

Worker's profile of Naduvalur Village

Total working population of Kottathur is 2665 which are either main or marginal workers. Total workers in the village are 1218 out of which 658 are male and 560 are female. Total main workers are 1054 out of which female main workers are 539 and male main workers are 515. Total marginal workers of village are 164

TABLE 3.36: POPULATION DATA OF STUDY AREA

Sl.No.	Village Name	No HH	Total Population	Male	Female	Total SC Population	Male SC	Female SC	Total ST Population	Male ST	Female ST	Total Literate Population	Male Literate	Female Literate	Total Illiterate	Male Illiterate	Female Illiterate
1	Abinimangalam	351	1248	636	612	195	103	92	0	0	0	908	505	403	340	131	209
2	Adanur	821	3024	1493	1531	1273	629	644	0	0	0	1872	1066	806	1152	427	725
3	Ammapatti	401	1499	751	748	149	73	76	0	0	0	1012	570	442	487	181	306
4	Edumalai	1074	3916	1967	1949	741	368	373	5	3	2	2633	1504	1129	1283	463	820
5	Kannapady	458	1599	784	815	776	391	385	0	0	0	1079	597	482	520	187	333
6	Karattampatti	698	2564	1274	1290	297	156	141	7	4	3	1842	1011	831	722	263	459
7	Keerambur	1972	6756	3337	3419	1846	897	949	29	11	18	4706	2562	2144	2050	775	1275
8	Kollapatti	449	1552	760	792	0	0	0	0	0	0	1009	570	439	543	190	353
9	Kombai	611	2418	1239	1179	14	9	5	2197	1124	1073	1700	922	778	718	317	401
10	Kottathur	1373	4532	2140	2392	2204	1033	1171	0	0	0	3042	1579	1463	1490	561	929
11	Manparai	689	2392	1166	1226	282	138	144	0	0	0	1529	839	690	863	327	536
12	Mavilingai	322	1106	548	558	282	138	144	0	0	0	686	384	302	420	164	256
13	Muthiampalayam	1247	4443	2269	2174	771	388	383	20	9	11	2936	1675	1261	1507	594	913
14	Naduvalur	559	1991	992	999	367	177	190	0	0	0	1479	780	699	512	212	300
15	Nagalapuram	1704	6157	3138	3019	1085	544	541	1	1	0	4133	2374	1759	2024	764	1260
16	Nekkaselam	1073	3799	1935	1864	1714	865	849	3	3	0	2546	1410	1136	1253	525	728
17	Pagalavadi	1286	4732	2315	2417	377	173	204	11	6	5	3115	1724	1391	1617	591	1026
18	Palaiyur	668	2303	1183	1120	786	396	390	0	0	0	1579	872	707	724	311	413
19	Perakambi	813	2632	1272	1360	1295	625	670	2	1	1	1912	983	929	720	289	431
20	Peramangalam	1038	3774	1872	1902	481	237	244	0	0	0	2667	1456	1211	1107	416	691
21	Puduammampalayam	356	1446	731	715	334	167	167	0	0	0	929	533	396	517	198	319
22	Pulivalam	1252	4696	2325	2371	1044	517	527	0	0	0	3384	1781	1603	1312	544	768
23	Puthanampatti	844	3009	1515	1494	740	384	356	0	0	0	2249	1192	1057	760	323	437
24	Singalandapuram	1548	5708	2868	2840	2549	###	###	49	28	21	4271	2315	1956	1437	553	884
25	Sirugudi	417	1472	730	742	140	71	69	0	0	0	945	542	403	527	188	339

26	Siruvayalur	1638	5800	2855	2945	1971	968	###	14	8	6	3839	2089	1750	1961	766	1195
27	Thenur	702	3256	1626	1630	942	474	468	0	0	0	1947	1160	787	1309	466	843
28	Thinnanur	919	3016	1508	1508	554	271	283	4	2	2	2173	1172	1001	843	336	507
29	Thuraiyur	202	753	380	373	111	60	51	12	8	4	558	293	265	195	87	108
30	Thuraiyur pudupatti	1375	4793	2430	2363	402	196	206	0	0	0	3111	1805	1306	1682	625	1057
31	Vadakkuvveli	927	3526	1731	1795	327	158	169	18	9	9	2316	1230	1086	1210	501	709
32	Valaiyur	1075	3916	1915	2001	316	146	170	0	0	0	2455	1357	1098	1461	558	903
33	Venkatesapuram	1986	7348	3623	3725	1556	779	777	69	34	35	5679	2928	2751	1669	695	974

Source: www.censusindia.gov.in - Tamilnadu Census of India – 2011

TABLE 3.37: WORKERS PROFILE OF STUDY AREA

Sl. No.	Village Name	Total Workers Population	Male Workers	Female Workers	Total Main Workers	Main Workers Male	Main Workers Female	Main Cultivation Workers	Main Cultivation Workers Male	Main Cultivation Workers Female	Main Agriculture Workers	Main Agriculture Workers Male	Main Agriculture Workers Female	Main Other Workers	Main Other Workers Male	Main Other Workers Female	Total Margin Workers	Marginal Workers Male	Marginal Workers Female
1	Abinimangalam	677	357	320	613	348	265	54	40	14	320	162	158	8	7	1	231	139	92
2	Adanur	1918	1006	912	1440	765	675	592	333	259	509	192	317	27	6	21	312	234	78
3	Ammapatti	1000	523	477	967	509	458	191	120	71	650	289	361	2	2	0	124	98	26
4	Edumalai	2291	1315	976	2251	1298	953	266	213	53	1607	788	819	52	24	28	326	273	53
5	Kannapady	994	485	509	928	462	466	340	157	183	449	197	252	5	2	3	134	106	28
6	Karattampatti	1330	780	550	1317	773	544	261	186	75	683	283	400	12	6	6	361	298	63
7	Keerambur	3683	2074	1609	3170	1893	1277	607	345	262	1440	670	770	21	11	10	1102	867	235
8	Kollapatti	906	478	428	884	473	411	257	163	94	428	133	295	0	0	0	199	177	22
9	Kombai	1477	750	727	1450	734	716	1288	655	633	85	32	53	8	2	6	69	45	24
10	Kottathur	2665	1356	1309	2645	1350	1295	872	463	409	1299	534	765	89	48	41	385	305	80
11	Manparai	1302	709	593	1185	673	512	261	130	131	683	332	351	10	6	4	231	205	26
12	Mavilingai	771	380	391	670	324	346	347	173	174	271	121	150	4	2	2	48	28	20
13	Muthiampalayam	2614	1472	1142	2512	1424	1088	545	327	218	927	379	548	29	16	13	1011	702	309
14	Naduvalur	1218	631	587	1054	567	487	120	77	43	679	317	362	28	1	27	227	172	55
15	Nagalapuram	3333	1923	1410	3236	1878	1358	1063	593	470	1318	565	753	54	36	18	801	684	117
16	Nekkasalam	2236	1180	1056	1993	1052	941	923	470	453	805	384	421	36	21	15	229	177	52

17	Pagalavadi	2662	1437	1225	2168	1235	933	640	345	295	897	407	490	36	18	18	595	465	130
18	Palaiyur	1238	711	527	1214	700	514	106	57	49	530	272	258	3	3	0	575	368	207
19	Perakambi	1430	794	636	1417	784	633	296	231	65	918	397	521	4	2	2	199	154	45
20	Peramangalam	2115	1222	893	1936	1145	791	478	313	165	992	481	511	48	15	33	418	336	82
21	Puduamma palayam	907	454	453	723	374	349	3	3	0	605	306	299	1	1	0	114	64	50
22	Pulivalam	2099	1354	745	1979	1296	683	177	126	51	1109	595	514	8	5	3	685	570	115
23	Puthanampatti	1635	936	699	1476	869	607	170	112	58	754	327	427	23	15	8	529	415	114
24	Singalanda puram	2694	1664	1030	2570	1623	947	156	121	35	1193	556	637	76	39	37	1145	907	238
25	Sirugudi	750	445	305	546	330	216	217	122	95	191	84	107	5	4	1	133	120	13
26	Siruvayalur	3490	1811	1679	3191	1667	1524	1749	978	771	1007	381	626	77	38	39	358	270	88
27	Thenur	1857	995	862	1785	968	817	104	58	46	1189	583	606	157	80	77	335	247	88
28	Thinnanur	1793	984	809	1628	926	702	241	150	91	938	453	485	12	5	7	437	318	119
29	Thuraiyur	318	219	99	312	217	95	13	8	5	72	37	35	17	12	5	210	160	50
30	Thuraiyur pudupatti	2805	1523	1282	2546	1452	1094	1442	830	612	602	198	404	10	7	3	492	417	75
31	Vadakkuveli	1895	1063	832	1614	958	656	344	205	139	590	250	340	33	16	17	647	487	160
32	Valaiyur	2174	1162	1012	2117	1139	978	754	407	347	737	327	410	66	31	35	560	374	186
33	Venkatesapuram	2733	1991	742	2577	1902	675	276	227	49	597	275	322	58	30	28	1646	1370	276

Source: www.censusindia.gov.in – Tamil Nadu Census of India – 2011

TABLE 3.38: COMMUNICATION & TRANSPORT FACILITIES IN THE STUDY AREA

Sl	Village Name	PO	SP O	PT O	T	PC O	MP	IC / CS C	PC F	BS	PB S	RS	NH	SH	MD R	BT R	GR	NW R	FP
1	Abinimangalam	2	1	2	1	1	1	1	2	1	1	2	2	2	1	1	1	2	1
2	Adanur	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
3	Ammapatti	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
4	Edumalai	2	1	2	1	1	1	1	2	2	1	2	2	1	1	1	1	2	1
5	Kannapady	2	1	2	2	2	1	2	2	1	1	2	2	2	1	1	1	2	1
6	Karattampatti	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
7	Keerambur	1	2	1	1	1	2	2	2	1	1	2	2	2	1	1	1	2	1
8	Kollapatti	2	2	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
9	Kombai	2	2	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
10	Kottathur	1	2	1	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
11	Manparai	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
12	Mavilingai	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	2	2	1
13	Muthiampalayam	2	1	2	1	1	1	2	2	1	1	2	2	2	2	1	1	2	1
14	Naduvalur	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
15	Nagalapuram	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
16	Nekkaselam	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
17	Pagalavadi	1	1	1	1	1	1	1	2	1	1	2	2	1	1	1	1	2	1
18	Palaiyur	2	2	2	2	2	1	2	2	1	1	2	2	1	1	1	1	2	1
19	Perakambi	2	1	2	1	1	1	2	2	1	2	2	2	1	1	1	1	2	1
20	Peramangalam	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
21	Puduammampalayam	2	1	2	2	1	2	2	2	1	1	2	2	2	2	1	1	2	1
22	Pulivalam	1	1	1	1	1	1	2	1	1	1	2	2	1	1	1	1	2	1
23	Puthanampatti	1	2	1	1	1	1	1	2	1	1	2	2	2	1	1	1	2	1
24	Singalandapuram	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
25	Sirugudi	2	2	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
26	Siruvayalur	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
27	Thenur	2	1	2	1	2	1	2	2	1	1	2	2	2	1	1	1	2	1

28	Thinnanur	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
29	Thuraiyur	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	1
30	Thuraiyur pudupatti	2	1	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1
31	Vadakkuvveli	2	1	2	2	2	1	2	2	1	1	2	2	1	1	1	1	2	1
32	Valaiyur	2	1	2	1	1	1	2	2	1	1	2	2	1	1	1	1	2	1
33	Venkatesapuram	2	2	2	1	1	1	2	2	1	1	2	2	2	1	1	1	2	1

Abbreviations: PO - Post Office; MP - Mobile Phone Coverage; RS - Railway Station; GR - Gravel Roads; SPO - Sub Post Office; IC / CSC - Internet Cafe/Common Service Centre; NH - National Highways; NWR - Navigate waterways River; PTO - Post & Telegraph office; PCF - Private Courier Facility; SH - State Highways; FP - Foot path; T- Telephone (Landline); BS - Public Bus Service; MDR - Major District Road; PCO - Public call office / Mobile; PBS - Private Bus Service; BTR - Black Topped (Pucca Roads). Note: 1 - Available within the village 2 - Not available

TABLE 3.39: WATER & DRAINAGE FACILITIES IN THE STUDY AREA

Sl	Village Name	TP	CW	UCW	HP	TW/BH	S	R/C	T/P/L	CD	OD	CT
1	Abinimangalam	1	1	1	1	1	1	1	1	1	1	2
2	Adanur	1	1	1	1	1	1	1	1	1	1	2
3	Ammapatti	1	1	1	1	1	1	1	1	1	1	1
4	Edumalai	1	1	1	1	1	1	1	1	1	1	1
5	Kannapady	1	2	2	1	2	2	2	2	2	2	2
6	Karattampatti	1	1	1	1	1	1	1	1	1	1	2
7	Keerambur	1	1	1	1	1	1	1	1	1	1	2
8	Kollapatti	1	1	1	1	1	1	1	1	1	1	2
9	Kombai	1	1	1	1	1	1	1	1	1	1	2
10	Kottathur	1	2	1	1	1	1	1	1	1	1	2
11	Manparai	1	2	1	1	1	1	1	1	1	1	1
12	Mavilingai	1	1	2	2	1	2	2	2	2	1	1
13	Muthiampalayam	1	1	1	1	1	1	1	1	1	1	1
14	Naduvalur	1	1	1	1	1	2	2	1	1	1	1
15	Nagalapuram	1	1	1	1	1	1	1	1	1	1	2
16	Nekkaselam	1	1	1	1	1	1	2	2	2	2	2
17	Pagalavadi	1	1	1	1	1	2	2	2	1	1	2
18	Palaiyur	1	1	1	1	1	1	1	1	1	1	2
19	Perakambi	2	2	1	2	1	2	1	2	2	2	2
20	Peramangalam	1	1	1	1	1	1	1	1	1	1	1
21	Puduammampalayam	1	2	2	2	2	2	2	2	2	2	2
22	Pulivalam	1	1	1	1	1	1	1	1	1	1	2
23	Puthanampatti	1	1	1	1	1	1	1	1	1	1	1
24	Singalandapuram	1	1	1	1	1	1	1	1	1	1	1
25	Sirugudi	1	1	1	1	1	1	1	1	1	1	1
26	Siruvayalur	1	1	1	1	1	2	2	2	2	2	2
27	Thenur	1	2	1	2	1	2	2	2	2	1	2
28	Thinnanur	1	1	1	1	1	1	1	1	1	1	2

29	Thuraiyur	1	1	1	1	1	1	1	1	1	1	1
30	Thuraiyur pudupatti	1	1	1	1	1	1	1	1	1	1	1
31	Vadakkuvveli	1	1	1	1	1	1	1	1	1	1	2
32	Valaiyur	1	1	1	1	1	1	1	1	1	1	1
33	Venkatesapuram	1	1	1	1	1	1	1	1	1	1	1

Abbreviations: T - Tap Water; R / C - River / Canal; CW - Covered Well; T/P/L - Tank / Pond / Lake; UCW - Uncovered Well; CD - Covered Drainage; HP - Hand Pump; OD - Open Drainage; TW/BH - Tube / Bore Well; CT - Community Toilet Complex for General public; S - Spring

Note – 1 - Available within the village; 2 - Not available

TABLE 3.40: OTHER FACILITIES IN THE STUDY AREA

Sl	Village Name	ATM	CB	CO B	ACS	SH G	PDS	RM	AMS	NC	NC- AC	CC	SF	PL		NP S	AP S	BDR O	PS
1	Abinimangalam	2	2	2	2	1	1	2	2	1	1	2	1	1		1	1	1	1
2	Adanur	2	2	2	2	1	1	2	2	1	1	1	2	1		1	1	1	1
3	Ammapatti	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
4	Edumalai	2	1	1	1	1	1	2	2	1	1	1	1	1		1	1	1	1
5	Kannapady	2	2	2	2	1	1	2	2	1	1	1	2	1		1	1	1	1
6	Karattampatti	2	2	2	2	1	1	2	2	1	1	2	1	2		1	1	1	1
7	Keerambur	2	1	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
8	Kollapatti	2	2	2	2	1	1	2	2	1	1	2	1	1		1	1	1	1
9	Kombai	2	2	2	2	1	1	2	2	1	1	1	1	2		1	1	1	1
10	Kottathur	2	2	1	1	1	1	2	2	1	1	1	1	1		1	1	1	1
11	Manparai	2	2	2	1	1	1	2	2	1	1	1	1	1		1	1	1	1
12	Mavilingai	2	2	2	2	1	1	2	2	2	1	2	2	1		1	1	2	1
13	Muthiampalayam	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
14	Naduvalur	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
15	Nagalapuram	2	2	2	1	1	1	2	2	1	1	1	1	1		1	1	1	1
16	Nekkaselam	2	1	2	1	1	1	2	2	1	1	1	2	1		1	1	1	1
17	Pagalavadi	2	2	2	2	1	1	2	2	1	1	1	1	2		1	1	1	1
18	Palaiyur	2	2	2	2	1	1	2	2	1	1	2	1	1		1	1	1	1
19	Perakambi	2	2	2	1	1	1	2	2	1	1	1	1	1		1	1	1	1
20	Peramangalam	2	2	2	1	1	1	2	2	1	1	1	1	1		1	1	1	1
21	Puduammampalayam	2	2	2	2	1	1	2	2	1	1	2	2	1		1	1	1	1
22	Pulivalam	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	2	1
23	Puthanampatti	2	1	2	2	1	1	2	2	1	1	2	1	2		1	2	1	1
24	Singalandapuram	2	2	2	1	1	1	2	2	1	1	1	2	1		1	1	1	1
25	Sirugudi	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
26	Siruvayalur	2	2	2	2	1	1	2	2	1	1	2	2	1		1	1	1	1
27	Thenur	2	2	2	2	1	1	2	2	1	1	2	2	1		1	1	1	1

28	Thinnanur	2	2	2	2	1	1	2	2	1	1	2	1	1		1	1	1	1
29	Thuraiyur	1	1	1	1	1	1	2	1	1	1	1	1	1		1	1	1	1
30	Thuraiyur pudupatti	2	2	2	2	1	1	2	2	1	1	1	1	1		1	1	1	1
31	Vadakkuvveli	2	2	2	2	1	1	2	2	1	1	2	1	1		1	1	1	1
32	Valaiyur	2	2	2	2	1	1	2	2	1	1	2	1	1		1	1	1	1
33	Venkatesapuram	2	1	1	1	1	1	2	2	1	1	1	1	1		1	1	1	1

Abbreviations: ATM - Automatic Teller Machine; PDS - Public Distribution System (Shop); CB - Commerical Bank; RM - Regular Market; COB - Co-operative Bank; AMS - Agricultural Market Society; ACS - Agricultural Credit Societies; NC - Nutritional Centres; SHG - Self Help Group; NC-AC - Nutritional Centres - Anganwadi Centre; DBRO - Birth & Death Registration Office; PS - Power Supply Note – 1 - Available within the village; 2 - Not available

TABLE 3.41: EDUCATIONAL FACILITIES IN THE STUDY AREA

Sl	Village Name	PPS		PS		MS		SS		SSS		DC		EC		MC		MI		PT		VTS		SSD	
		G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P	G	P
1	Abinimangalam	1	2	2	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
2	Adanur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	Ammapatti	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Edumalai	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5	Kannapady	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	Karattampatti	1	1	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	Keerambur	1	1	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	Kollapatti	1	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	Kombai	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
10	Kottathur	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	Manparai	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	Mavilingai	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
13	Muthiampalayam	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	Naduvalur	1	2	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
15	Nagalapuram	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
16	Nekkaselam	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	Pagalavadi	1	2	1	1	1	1	2	2	2	2	2	2	2	1	2	2	2	1	2	1	2	1	2	2
18	Palaiyur	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
19	Perakambi	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	Peramangalam	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21	Puduammampalayam	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
22	Pulivalam	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
23	Puthanampatti	1	1	1	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
24	Singalandapuram	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1	2	2	2
25	Sirugudi	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
26	Siruvayalur	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
27	Thenur	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

28	Thinnanur	1	1	1	1	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
29	Thuraiyur	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2
30	Thuraiyur pudupatti	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
31	Vadakkuveli	1	1	1	1	1	2	1	2	2	2	2	1	2	1	2	2	2	1	2	1	2	2	2
32	Valaiyur	1	2	1	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
33	Venkatesapuram	1	1	1	1	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2

Abbreviations: PPS-Pre Primary School; SSS-Senior Secondary School; DC-Degree School; PT-Polytechnic; PS-Primary School; G-Government ; EC-Engineering College; VTS-Vocational School /ITI; MS-Middle School; P-Private; MC-Medical College; SSD-Special School For Disabled; SS-Secondary School; MI-Management College/Institute;

Note – 1 - Available within the village; 2 - Not available

TABLE 3.42: MEDICAL FACILITIES IN THE STUDY AREA

Sl. No.	Village Name	CHC	PHC	PHSC	MCW	TBC	HA	HAM	D	VH	MHC	FWC	NGM-I/O
1	Abinimangalam	0	0	1	0	0	0	0	0	0	0	0	b
2	Adanur	0	0	1	0	0	0	0	0	0	0	0	b
3	Ammapatti	0	0	0	0	0	0	0	0	0	0	0	a
4	Edumalai	0	1	1	1	1	0	0	1	1	0	1	a
5	Kannapady	0	0	1	1	0	0	0	0	0	0	0	b
6	Karattampatti	0	0	2	0	0	0	0	0	1	0	0	b
7	Keerambur	0	0	1	0	0	0	0	0	0	0	0	a
8	Kollapatti	0	0	0	0	0	0	0	0	0	0	0	a
9	Kombai	0	0	1	0	0	0	0	0	1	0	0	c
10	Kottathur	0	1	1	1	1	0	0	1	1	0	1	b
11	Manparai	0	0	0	0	0	0	0	0	0	0	0	b
12	Mavilingai	0	0	0	0	0	0	0	0	0	0	0	a
13	Muthiampalayam	0	0	1	0	0	0	0	0	0	0	0	b
14	Naduvalur	0	0	0	0	0	0	0	0	0	0	0	a
15	Nagalapuram	0	0	1	0	0	0	0	0	1	0	0	a
16	Nekkaselam	0	0	1	1	0	0	0	0	1	0	0	a
17	Pagalavadi	0	0	2	0	0	0	0	0	0	0	0	b
18	Palaiyur	0	0	2	0	0	0	0	0	0	0	0	a
19	Perakambi	0	1	2	1	1	0	0	1	0	0	1	b
20	Peramangalam	0	0	1	0	0	0	0	0	0	0	0	a
21	Puduammampalayam	0	0	0	0	0	0	0	0	0	0	0	b
22	Pulivalam	0	1	1	1	1	0	0	1	0	0	1	b
23	Puthanampatti	0	0	1	0	0	0	0	0	1	0	0	b
24	Singalandapuram	0	0	3	0	0	0	0	0	0	0	0	b
25	Sirugudi	0	0	1	0	0	0	0	0	0	0	0	b
26	Siruvayalur	0	0	1	1	0	0	0	0	1	0	0	a
27	Thenur	0	0	0	0	0	0	0	0	0	0	0	b

28	Thinnanur	0	0	1	0	0	0	0	0	0	0	0	a
29	Thuraiyur	0	0	1	0	0	0	0	0	1	0	0	b
30	Thuraiyur pudupatti	0	1	1	1	1	0	0	1	0	0	1	a
31	Vadakkuveli	0	0	1	0	0	0	0	0	0	0	0	a
32	Valaiyur	0	0	1	0	0	0	0	0	0	0	0	a
33	Venkatesapuram	0	0	1	0	0	0	0	0	0	0	0	b

Abbreviations: CHC-Community Health Centre; TBC-TB Clinic; VH- Veternity Hospital; PHC-Primary Health Centre; HA-Aallopathic Hospital ; FWC-Family Welfare Centre; PHSC-Primary Health Sub Centre ; HAM-Alternative Medicine Hospital; MH-Mobile Health Clinic; MCW-Maternity and Child Welfare Centre; D-Dispensary; NGM-I/O-Non Government Medical Facilities In & Out Patient

Note – 1 - Available within the village; 2 - Not available a-facility available at <5kms b-facility available at>10kms

Source: www.censusindia.gov.in – Tamil Nadu Census of India – 2011

3.6.6 Recommendation and Suggestion

- Awareness program to be conducted to make the population aware to get education and a better livelihood.
- Vocational training programme can be organized to make the people self - employed, particularly for women and unemployed youth.
- On the basis of qualification and skills local community may be preferred. Long term and short-term employments can be generated.
- Health care centre and ambulance facility can be provided to the population to get easy access to medical facilities. Maternity facility should be made available at the place to avoid going to distant places for treatment which involves risks. Apart from that as these areas are prone to various diseases a hospital with modern facilities should be opened on a priority basis in a central place to provide better health facilities to the villagers around the project.
- While developing an Action Plan, it is very important to identify the population who falls under the marginalized and vulnerable groups. So that special attention can be given to these groups with special provisions while making action plans.

3.6.7 Summary & Conclusion

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 project will aim to provide preferential employment to the local people there by improving the employment opportunity in the area and in turn the social standards will improve.

4. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4.0 GENERAL

Environmental impacts both direct and indirect on various environmental attributes due to proposed mining activity will be created in the surrounding environment, during the operational and post-operational phases. The occurrence of mineral deposits, being site specific, their exploitation, often, does not allow for any choice except adoption of eco-friendly operation. The methods are required to be selected in such a manner, so as to maintain environmental equilibrium ensuring sustainable development.

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.

Several scientific techniques and methodologies are available to predict impacts of physical environment. Mathematical models are the best tools to quantitatively describe the cause-and-effect relationships between sources of pollution and different components of environment. In cases where it is not possible to identify and validate a model for a particular situation, predictions have been arrived at based on logical reasoning / consultation / extrapolation.

The following parameters are of significance in the Environmental Impact Assessment and are being discussed in detail

- Land environment
- Soil environment
- Water Environment
- Air Environment
- Noise Environment
- Socio economic environment
- Biological Environment

Based on the baseline environmental status at the project site, the environmental factors that are likely to be affected (Impacts) are identified, quantified and assessed.

4.1 LAND ENVIRONMENT:

4.1.2 Anticipated Impact from Proposed Projects

- 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

4.1.2 Mitigation Measures for Proposed Projects

- 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.

4.1.3 Soil Environment

The proposed project area is covered by thin layer of clay/alluvium formation and the average thickness is about 0.5m, after Mining, excavated top soil is reused to cover backfilled pits, allowing vegetation to regrow.

4.1.4 Impact on Soil Environment from Proposed Project

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).

4.1.5 Mitigation Measures for Proposed Project

- Run-off diversion – Garland drains will be constructed all around the project boundary to prevent surface flows from entering the Mine 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 Mine 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.

4.1.6 Waste Dump Management

The waste generated from this garnet Mining operation is not economically valuable. Therefore, the waste from the Mining is utilized in the backfilling process.

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact from Proposed Project

- 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

Detail of water requirements in KLD as given below:

TABLE 4.1: WATER REQUIREMENT

P1		
*Purpose	Quantity	Source
Dust Suppression	0.4 KLD	From Existing bore wells from nearby area
Green Belt development	0.4 KLD	From Existing bore wells from nearby area
Sanitation & Drinking	0.2 KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	1.0 KLD	
P2		
*Purpose	Quantity	Source
Dust Suppression	0.4 KLD	From Existing bore wells from nearby area
Green Belt development	0.4 KLD	From Existing bore wells from nearby area
Sanitation & Drinking	0.2 KLD	From existing, bore wells and drinking water will be sourced from Approved water vendors.
Total	1.0 KLD	

* Water for drinking purpose will be brought from approved water vendors

Source: Approved Mining Plan Pre-Feasibility Report

4.2.2 Common Mitigation Measures for Proposed Project

- Garland drain, settling tank will be constructed along the proposed mining lease 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 months once) analysis of Mine 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 months once) and analysing the quality of water in open well, bore wells and surface water

4.3 AIR ENVIRONMENT

4.3.1. Anticipated Impact from Proposed Project

- 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.

4.3.1.1. Modelling of Incremental Concentration from Proposed Projects

Wind erosion of the exposed areas and the air borne particulate matter generated by Mining operation, and transportation are mainly PM₁₀ & PM_{2.5} due to excavation/loading equipment and vehicles plying on haul roads are the cause of air pollution in the project area.

Similarly, loading - unloading and transportation of Garnet, wind erosion of the exposed area and movement of light vehicles causes of pollution. This leads to an impact on the ambient air environment around the project area.

Anticipated incremental concentration due to this Mining activity and net increase in emissions due to Mining activities within 500 meters around the project area is predicted by Open Pit Source modelling using

AERMOD Software.

The impact on Air Environment is due to the mining and allied activities during Land Development phase, Mining process and Transportation. The emissions of Sulphur dioxide (SO₂), Oxides of Nitrogen (NO_x) due to excavation/loading equipment and vehicles plying on haul roads are marginal. Loading - unloading and transportation of Garnet, wind erosion. Mining activities releasing Particulate Matter (PM₁₀) affecting Ambient Air of the area. Prediction of impacts on air environment has been carried out taking into consideration cumulative production three proposed quarries. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software.

4.3.2.1 Emission Estimation

An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.

The general equation for emissions estimation is:

$$E = A \times EF \times (1-ER/100)$$

Where:

E = emissions;

A = activity rate;

EF = emission factor, and

ER =overall emission reduction efficiency, %

The proposed mining activity includes various activities like ground preparation, excavation, handling and transport of Garnet. These activities have been analysed systematically basing on USEPA-Emission Estimation Technique Manual, for Mining AP-42, to arrive at possible emissions to the atmosphere and estimated emissions are given in Table 4-2.

4.3.2 Frame work of Computation & Model details

By using the above-mentioned inputs, ground level concentrations due to the mining activities have been estimated to know the incremental concentration in ambient air quality and impact in the study area. The effect of air pollutants upon receptors are influenced by concentration of pollutants and their dispersion in the atmosphere. Air quality modelling is an important tool for prediction, planning and evaluation of air pollution control activities besides identifying the requirements for emission control to meet the regulatory standards and to apply mitigation measures to reduce impact caused by Mining activities. Suspended Particulate Matter (SPM) is the major pollutant occurred during Mining activities. The prediction included the impact of Excavation, loading and movement of vehicles during transportation and meteorological parameters such as wind speed, wind direction, temperature, rainfall, humidity and Cloud cover.

Impact was predicted over the distance of 10 km around the source to assess the impact at each receptor separately at the various locations and maximum incremental GLC value at the project site. Maximum impact of PM₁₀ was observed close to the source due to low to moderate wind speeds. Incremental value of PM₁₀ was superimposed on the base line data monitored at the proposed site to predict total GLC of PM₁₀ due to combined impacts

AIR QUALITY IMPACT PREDICTION:

The model simulations are done for the air pollutant arising from the mining operations, namely, PM₁₀, PM_{2.5}. Ground Level Concentration (GLC) have been computed using hourly meteorological data.

TABLE 4.2: EMISSION SOURCES

Activity	Source Type
A. Mining Operations	Open pit
B.Transportation	Line

Emission Factors

Quantification of particulate emissions has been carried out by the emission factor technique. Emission factor is a statistical average of the rate at which a pollutant is released during an activity. This factor when multiplied by the level of that activity in a given situation will give the overall effect. Fugitive emissions have been predicted by using standard equations given and suggested by AP-42, USEPA(1998), Coal S&T Project and for mining & allied activities and other factors. The modeling is done for the peak production to know the worst-case scenario on individual basis as well as cumulative basis. Modelling for transportation which is the only source is carried out and its details are provided below:

TABLE 4.3: EMISSION FACTORS

S.No.	Activity	PM10	PM2.5	Unit
1	Hauling inside lease area	0.19	0.019	g/VKT

Emission Rates:

Based on the emission factors, after adopting necessary control measures like dust suppression, Proper maintenance of HEMM, using better quality diesel, using latest equipment, proper maintenance of roads, etc. the expected peak emission rate due to various operations in this project is calculated and is given below:

EMISSION RATE

Activity	Source type	Value	
S.No	Parameters	6261	6260
1	PM10	0.01	0.01
2	PM2.5	0.002	0.002

TABLE 4.4: PEAK INCREMENTAL CONCENTRATION

Activity	Source type	Value	
S.No	Parameters	6261	6260
1	PM10	0.39	0.52
2	PM2.5	0.17	0.18

It is observed that the peak incremental concentration for PM10, PM2.5 occurring very near the source. At away from the source the values are getting reduced due to dispersion effects. The Isopleths of PM10, PM2.5 concentrations with control measures scenario have also been drawn and these are given in Figure No.4.1 and 4.2. The incremental and predicted concentrations at the locations of ambient air quality have been discussed in the following section.

FIGURE 4.1: AERMOD TERRAIN MAP

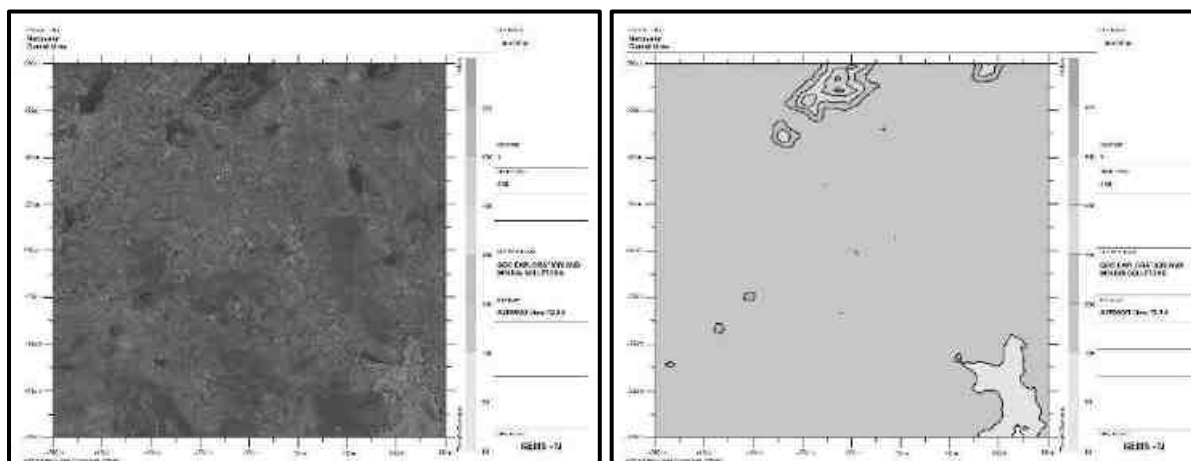


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM₁₀

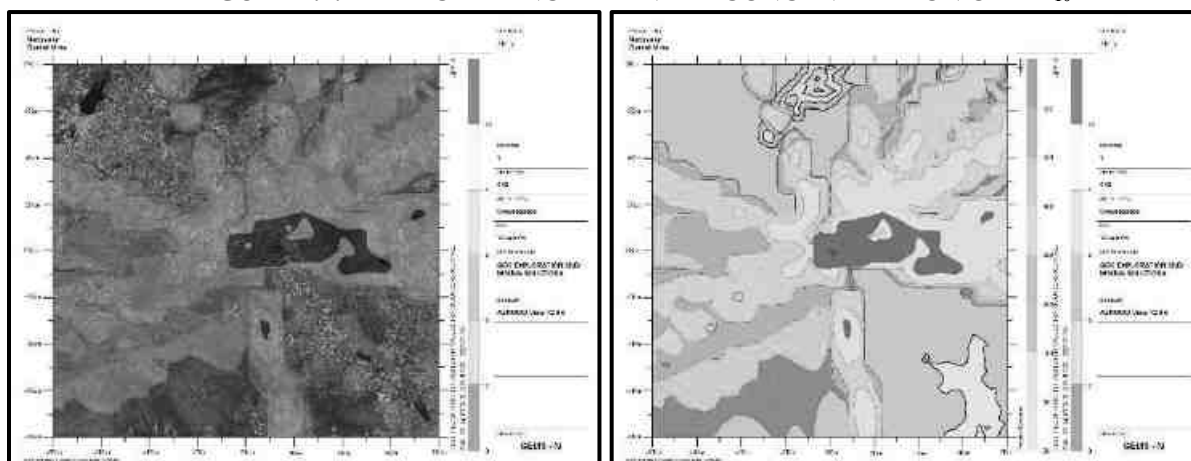
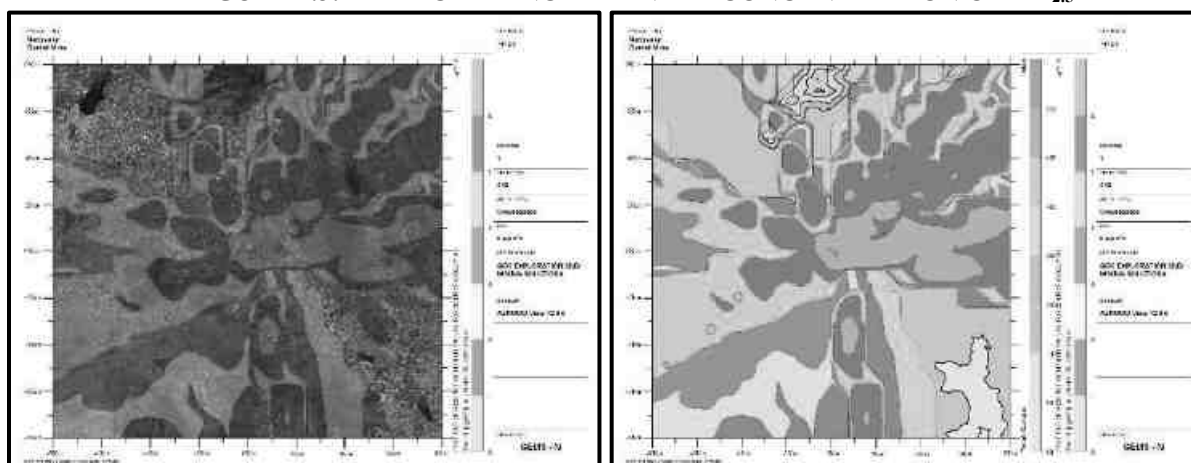


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM_{2.5}



4.3.2.1 Model Results

The post project Resultant Concentrations of PM10, PM2.5, SO2& NOX (GLC) is given in Table below:

TABLE 4.5: Concentration of PM10 after Project Implementation

Station Code	Location	Background Concentration	Predicted Incremental Concentration		Post Project Concentration	Statutory Limits
			6261	6260		
1	Naduvalur (Near Mine Lease)	52.1	<1.0	<1.0	53.1	-
2	Kilkunnuppatti Village	53.1	<1.0	<1.0	54.1	100
3	Nagalapuram Village	55.5	<1.0	<1.0	56.5	
4	Sathanur Village	51.4	<1.0	<1.0	52.4	
5	Kottathur Village	60.1	<1.0	<1.0	61.1	

TABLE 4.6: Concentration of PM2.5 after Project Implementation

Station Code	Location	Background Concentration	Predicted Incremental Concentration		Post Project Concentration	Statutory Limits
			6261	6260		
1	Naduvalur (Near Mine Lease)	24.0	<1.0	<1.0	25.0	-
2	Kilkunnuppatti Village	24.6	<1.0	<1.0	25.6	100
3	Nagalapuram Village	25.3	<1.0	<1.0	26.3	
4	Sathanur Village	23.2	<1.0	<1.0	24.2	
5	Kottathur Village	27.6	<1.0	<1.0	28.6	

It can be seen that the resultant added concentrations with baseline figures even at worst scenario, show that the values of ambient air quality with respect to PM10 are in the range of 52.4 µg/m³ to 61.1 µg/m³ and with respect to PM2.5 are in the range of 24.2 µg/m³ to 28.6 µg/m³ which are within the statutory limits in each case. For preservation of environment in this mine strict enforcement of management schemes and regular air quality monitoring will be undertaken for taking corrective actions, as needed. By adopting the effective implementation of all the mitigative measures, no adverse impact on Air quality due to the mining operation in this lease area is expected.

Additionally, cumulative impact due working of 5 projects on ambient quality is assessed, and the details regarding the same has been provided below:

Emission Rate - Cumulative

Activities/Pollutants	PM10(g/sec)	PM2.5(g/sec)
Hauling Inside lease area	0.05	0.01
Total	0.05	0.01

Peak Incremental Concentration - Cumulative

Parameters	Peak Incremental Concentration
PM10	2.01
PM2.5	0.87

The post project concentrations of PM10, PM2.5, (GLC) (base line + incremental) after adopting necessary control measures is provided below:

Post Project Concentrations of PM10 -Cumulative

S.No	Location	Background Concentration	Incremental Conc	Post Project Conc	Statutory Limits
1	Naduvalur(Near Mine Lease)	52.1	2.0	54.0	-
2	Kilkunnuppatti Village	53.1	<1.0	54.1	100
3	Nagalapuram Village	55.5	<1.0	56.5	
4	Sathanur Village	51.4	<1.0	52.4	
5	Kottathur Village	60.1	<1.0	61.1	

Post Project Concentrations of PM2.5 -Cumulative

S.No	Location	Background Concentration	Incremental Conc	Post Project Conc	Statutory Limits
1	Naduvalur(Near Mine Lease)	24.0	<1.0	25.0	-
2	Kilkunnuppatti Village	24.6	<1.0	25.6	100
3	Nagalapuram Village	25.3	<1.0	26.3	
4	Sathanur Village	23.2	<1.0	24.2	
5	Kottathur Village	27.6	<1.0	28.6	

The cumulative post project concentration with respect to PM10 is in the range of 52.4 µg/m³ to 61.1 µg/m³ and with respect to PM2.5 are in the range of 24.2µg/m³ to 28.6 µg/m³ which are within the statutory limits in each case. For preservation of environment in this mine strict enforcement of management schemes and regular air quality monitoring will be undertaken for taking corrective actions, as needed. By adopting the effective implementation of all the mitigative measures, no adverse impact on Air quality due to the mining operation in these leases are expected.

4.3.4. Common Mitigation Measures for Respective Individual Proposed Projects

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 checkups, 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

4.4 NOISE ENVIRONMENT

Impact of Noise on Working Environment

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.

Noise Generated due to Excavation and Transportation

Some noise will be generated due to hydraulic excavator which will be deployed for removal of overburden and movement of truck/tippers on hire basis. Earplugs is being/will be provided to operator and mine workers.

Noise modeling is carried out using the following formula:

$Lp2 = Lp1 - 20 \log R2/R1$, Where, $Lp1$ and $Lp2$ are sound pressure levels at points located at distances $R1$ and $R2$ respectively from the source. The study results are as follows:

Post Project Noise Levels

Sl.No	Location	Baseline Day Eq.in dB(A)	Post Project noise Eq in dB(A)	Limit dB(A) as per MoEF & CC
1	Kilkunnuppatti Village	49.9	50.2	55
2	Nagalapuram Village	48.1	48.4	55
3	Sathanur Village	50.7	50.9	55
4	Kottathur Village	51.4	51.7	55

From the studies, it is found that the predicted Noise Levels due to mining operations at the periphery of the eri itself will be less even without considering any attenuation factor. However, practically there will be attenuation due to vegetation etc., and as such there will not be any adverse noise propagation outside the lease boundary. Since the habitations are also away the effect of noise due to mining operations will not be felt at all in the surrounding villages.

4.4.2 Common Mitigation Measures for Respective Individual Proposed Projects

The following noise mitigation measures are proposed for control of Noise

- 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 through 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

4.5 ECOLOGY AND BIODIVERSITY

4.5.1 Impact on Ecology and Biodiversity

The impact on biodiversity is difficult to quantify because of its diverse and dynamic characteristics, mining activities generally result in the deforestation, land degradation, water, air and noise pollution which directly or indirectly affect the faunal and floral status of the project area. However, occurrence and magnitude of these impacts are entirely dependent upon the project location, mode of operation and technology involved. Impact prediction is the main footstep in impact evaluation and identifies project actions that are likely to bring significant changes in the project environment. The present study was carried out to predict the likely impacts of the proposed project at Kottathur & Naduvalur villages and the surrounding environment with special reference to biological attributes covering habitats/ecosystems and associated biodiversity.

The proposed mining activities include removal of some scattered bushes and other thorny species. Although impacts on key habitat elements will occur on a local scale, but on a regional scale they would not be critical for the life cycle needs of the species observed or expected. Moreover, during conceptual stage, the mined-out areas on the top bench will be re-vegetated by planting local /native species and lower benches will be converted into rainwater harvesting structure following completion of mining activities, which will replace habitat resources for fauna species in this locality over a longer time. Existing roads will be used; new roads will not be constructed to reduce impact on flora. Wild life is not commonly found in the project area and its immediate environs because of lack of vegetal cover and surface water. Except few domestic animals, reptiles, hares and some common birds are observed in the study area.

- I. None of the plants will be cut during operational phase of the mine.
- II. There shall be negligible air emissions or effluents from the project site. During loading the truck, dust generation will be likely. This shall be a temporary effect and not anticipated to affect the surrounding vegetation significantly.
- III. Most of the land in the buffer area is undulating terrain with crop lands, grass patches and small shrubs. Hence, there will be no effect on flora of the region

4.5.2 Common Mitigation Measures for Proposed Project

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 are given in Table 4.13.

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.

4.5.2.2.1. Species Recommendation for Plantation granted in the district

Following points have been considered while recommending the species for plantation:

- Natural growth of existing species and survival rate of various species.
- Suitability of a particular plant species for a particular type of area.
- Creating of biodiversity.
- Fast growing, thick canopy copy, perennial and evergreen large leaf area.
- Efficient in absorbing pollutants without major effects of natural growth.
- The following species may be considering primary for plantation best suited for the prevailing climate condition in the area.

TABLE 4.7: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN

Sl.No	Name of the plant (Botanical)	Family Name	Common Name	Habit
1	<i>Azadirachta indica</i>	Meliaceae	Neem, Vembu	Tree
2	<i>Albiziafalcatoria</i>	Fabaceae	Tamarind, Puliymaram	Tree
3	<i>Polyalthialongifolia</i>	Annonaceae	Kattumaram	Tree
4	<i>Borassus Flabellifer</i>	Arecaceae	Palmyra Palm	Tree

The 7.5m Safety distance along the boundary has been identified to be utilized for subsequent Afforestation. However, the afforestation should always be carried out in a systematic and scientific manner. Regional trees like Neem, Pongamia, Pinnata, and Casuarina will be planted along the Lease boundary and avenue plantation will be carried out in respective proposed projects. The rate of survival expected to be 80% in this area. Afforestation Plan is given in Table No.4.13 and budget of green belt development plan are given in Table No.4.14.

TABLE 4.8: GREENBELT DEVELOPMENT PLAN

Code	Year	No. of tress proposed to be planted	Area to be covered in m ²	Name of the species
P1	I	1000	Plantation along 7.5m safety distance, along approach road.	Neem, Pongamia Pinnata, Casuarina etc.,
P2	I	1500		

4.5.3. Anticipated Impact on Fauna

- There is no Wildlife Sanctuary and Biosphere Reserve within 10 km radius of the project site.
- No rare, endemic & endangered species are reported in the buffer zone. However, during the course of mining, the management will practice scientific method of mining with proper Environmental Management Plan including pollution control measures especially for air and noise, to avoid any adverse impact on the surrounding wildlife.
- Fencing around all the proposed mine lease areas will be constructed to restrict the entry of stray animals
- Green belt development will be carried out which will help in minimizing adverse impact on the flora found in the area.

4.5.3.1. Measures for protection and conservation of wildlife species

- Undertaking mitigative measures for conducive environment to the flora and fauna in consultation with Forest Department.

- Dust suppression system will be installed within mine and periphery of mine for all proposed projects
- Plantation around mine area will help in creating habitats for small faunal species and to create better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

4.5.3.2. Mitigation Measures

- All the preventive measures will be taken for growth & development of fauna.
- Creating and development awareness for nature and wildlife in the adjoin villages.
- The workers shall be trained to not harm any wildlife, should it come near the project site. No work shall be carried out after 6.00 pm.

4.5.4. Impact on Aquatic Biodiversity

Mining activities will not disturb the existing aquatic ecology as there is no effluent discharge proposed from the Garnet Mine. There is no natural perennial surface water body within the mine lease area. Hence, aquatic biodiversity is not observed in the mine lease area.

4.5.5. Impact Assessment on Biological Environment

A detail of impact and assessments was mentioned in Table No 4.16.

TABLE 4.9: ECOLOGICAL IMPACT ASSESSMENTS

Sl.No	Attributes	Assessment
1	Proximity to national park/wildlife sanctuary/reserve forest /mangroves/ coastline/estuary/sea	Karaivetti Bird Sanctuary-42km-SE Sattanur R.F-660 m South
2	Proposed mining project impact surface water quality that also provide water to wildlife	'NO' 'scheduled or threatened wildlife animal sighted regularly core in core area.
3	Located near an area populated by rare or endangered species	NO endangered, critically endangered, vulnerable species sighted in core mining lease area.
4	Proposed project restricts access to waterholes for wildlife	'NO'
5	Project likely to affect migration routes	'NO' 'migration route observed during monitoring period.
6	Proposed mining project increase siltation that would affect nearby biodiversity area.	Surface runoff management such as garland drains is proposed to be constructed, so there will be no siltation nearby mining area.
7	Risk of fall/slip or cause death to wild animals due to project activities	'NO'
8	Activities of the project affects the breeding/nesting sites of birds and animals	No breeding and nesting site was identified in mining lease site. The fauna sighted mostly migrated from buffer area.
9	Mining project effect the forest-based livelihood/ any specific forest product on which local livelihood depended	'NO'
10	The project release effluents into a water body that also supplies water to a wildlife	No water body near to core zone so chances of water become polluted is low.
11	The project likely to affect wetlands, Fish breeding grounds, marine ecology	'NO'. Wetland was not present in near core Mining lease area. No breeding and nesting ground present in core mining area.
12	Project likely to affect flora of an area, which have medicinal value	'NO'
13	Forestland is to be diverted, has carbon high sequestration	'NO' 'There was no forest land diverted.

TABLE 4.10: ANTICIPATED IMPACT OF ECOLOGY AND BIODIVERSITY

Sl. No	Aspect Description	Likely Impacts on Ecology and Biodiversity (EB)	Impact Consequence - Probability Description / Justification	Significance	Mitigation Measures
Pre-Mining Phase					
1	Uprooting of vegetation of lease area	Site specific loss of common floral diversity (Direct impact)	Site possesses common floral (not trees) species. Clearance of these species will not result in loss of flora	Less severe	No immediate action required. However, Greenbelt /plantation will be developed in project site and in periphery of the project boundary, which will improve flora and fauna diversity of the project area.
		Site specific loss of associated faunal diversity (Partial impact)	Site supports only common species, which use wide variety of habitats of the buffer zone reserve forest area. So there is no threat of faunal diversity.		
		-Loss of Habitat (Direct impact)	Site does not form Unique / critical habitat structure for unique flora or fauna.		
Mining phase					
2	Excavation of mineral using machine and labours, Transportation activities will generate noise.	Site-specific disturbance to normal faunal movements at the site due to noise. (Partial impact)	Site does not form unique / critical habitat structure for unique flora or fauna.	Less severe	Mining activity should not be operated after 5PM. Excavation of dump and transportation work should stop before 7PM.
3	Vehicular Movement for transportation of materials will result in generation of dust (SPM) due to haul roads and emission of SO2, NO2, CO etc.	Impact on surrounding agriculture and associated fauna due to deposition of dust and Emission of CO. (Indirect impact)	Impact is less as the agricultural land far from core area.	Less severe	All vehicles will be certified for appropriate Emission levels. More plantation has been suggested Upgrade the vehicles with alternative fuel such biodiesel, methanol and biofuel around the mining area.

4.6 SOCIO ECONOMIC

4.6.1 Anticipated Impact from Proposed Project

- 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.

4.6.2 Common Mitigation Measures for Proposed Project

- 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 Mining operations will have highly beneficial positive impact in the area

4.7 OCCUPATIONAL HEALTH AND SAFETY

Occupational health and safety hazards occur during the operational phase of mining and primarily include the following:

- Respiratory hazards
- Noise
- Physical hazards
- Explosive storage and handling

4.7.1 Respiratory Hazards

Long-term exposure to silica dust may cause silicosis the following measures are proposed:

- Cabins of excavators and tippers will be enclosed with AC and sound proof
- Use of personal dust masks will be made compulsory

4.7.2 Noise

Workers are likely to get exposed to excessive noise levels during mining activities. The following measures are proposed for implementation

- No employee will be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection
- The use of hearing protection will be enforced actively when the equivalent sound level over 8 hours reaches 85 dB(A), the peak sound levels reach 140 dB(C), or the average maximum sound level reaches 110 dB(A)
- Ear muffs provided will be capable of reducing sound levels at the ear to at least 85 dB(A)
- Periodic medical hearing checks will be performed on workers exposed to high noise levels

4.7.3 Physical Hazards

The following measures are proposed for control of physical hazards

- Specific personnel training on work-site safety management will be taken up;
- Natural barriers, temporary railing, or specific danger signals will be provided along rock benches or other pit areas where work is performed at heights more than 2m from ground level;
- Maintenance of yards, roads and footpaths, providing sufficient water drainage and preventing slippery surfaces with an all-weather surface, such as coarse gravel will be taken up

4.7.4 Occupational Health Survey

All the persons will undergo pre-employment and periodic medical examination. Employees will be monitored for occupational diseases by conducting the following tests

- General physical tests
 - Audiometric tests
 - Full chest, X-ray, Lung function tests, Spirometry tests
 - Periodic medical examination – yearly
-

- Lung function test – yearly, those who are exposed to dust
- Eye test

Essential medicines will be provided at the site. The medicines and other test facilities will be provided at free of cost. The first aid box will be made available at the mine for immediate treatment.

First aid training will be imparted to the selected employees regularly. The lists of first aid trained members shall be displayed at strategic places.

4.8 MINE WASTE MANAGEMENT

No waste is anticipated from any of the proposed quarries.

4.9 MINE CLOSURE

The primary aim is to ensure that the following broad objectives along with the abandonment of the mine can be successfully achieved:

- To create a productive and sustainable after-use for the site, acceptable to mine owners, regulatory agencies, and the public
- To protect public health and safety of the surrounding habitation
- To minimize environmental damage
- To conserve valuable attributes and aesthetics
- To overcome adverse socio-economic impacts.

4.9.1 Mine Closure Criteria

The criteria involved in mine closure are discussed below:

4.9.1.1 Physical Stability

All anthropogenic structures, which include mine workings, buildings, rest shelters etc., remaining after mine decommissioning should be physically stable. They should present no hazard to public health and safety as a result of failure or physical deterioration and they should continue to perform the functions for which they were designed. The design periods and factors of safety proposed should take full account of extreme events such as floods, hurricane, winds or earthquakes, etc. and other natural perpetual forces like erosion, etc.,

4.9.1.2 Chemical Stability

The solid wastes on the mine site should be chemically stable. This means that the consequences of chemical changes or conditions leading to leaching of metals, salts or organic compounds should not endanger public health and safety nor result in the deterioration of environmental attributes. If the pollutant discharges likely to cause adverse impacts is predicted in advance, appropriate mitigation measures like settling of suspended solids or passive treatment to improve water quality as well as quantity, etc., could be planned. Monitoring should demonstrate that there is no adverse effect of pollutant concentrations exceeding the statutory limits for the water, soil and air qualities in the area around the closed mine.

4.9.1.3 Biological Stability

The stability of the surrounding environment is primarily dependent upon the physical and chemical characteristics of the site, whereas the biological stability of the mine site itself is closely related to rehabilitation and final land use. Nevertheless, biological stability can significantly influence physical or chemical stability by stabilizing soil cover, prevention of erosion/wash off, leaching, etc.,

A vegetation cover over the disturbed site is usually one of the main objectives of the rehabilitation programme, as vegetation cover is the best long-term method of stabilizing the site. When the major earthwork components of the rehabilitation programme have been completed, the process of establishing a stable vegetation community begins. For re-

vegetation, management of soil nutrient levels is an important consideration. Additions of nutrients are useful under three situations.

- Where the nutrient level of spread topsoil is lower than material in-situ e.g. for development of social forestry
- Where it is intended to grow plants with a higher nutrient requirement than those occurring naturally e.g. planning for agriculture
- Where it is desirable to get a quick growth response from the native flora during those times when moisture is not a limiting factor e.g. development of green barriers

The Mine closure plan should be as per the approved mine plan. The mine closure is a part of approved mine plan and activities of closure shall be carried out as per the process described in mine closure plan.

5. ANALYSIS OF ALTERNATIVES (TECHNOLOGY AND SITE)

5.0 INTRODUCTION

Consideration of alternatives to a project proposal is a requirement of EIA process. During the scoping process, alternatives to a proposal can be considered or refined, either directly or by reference to the key issues identified. A comparison of alternatives helps to determine the best method of achieving the project objectives with minimum environmental impacts or indicates the most environmentally friendly and cost-effective options.

5.1 FACTORS BEHIND THE SELECTION OF PROJECT SITE

Tvl.S.S. Minerals and Tvl. Riverways Mines and Minerals Ltd Garnet Sand Mining Project at Kottathur & Naduvalur Villages is a mining project for excavation of Garnet, which is site specific. The proposed project has following advantages: -

- The mineral deposit occurs in a non-forest area.
- There is no habitation within the project area; hence no R & R issues exist.
- Availability of skilled, semi-skilled and unskilled workers in this region.
- All the basic amenities such as medical, firefighting, education, transportation, communication and infrastructural facilities are well connected and accessible.
- The mining operations will not intersect the ground water level. Hence, no impact on ground water environment.
- Study area falls in seismic zone – II, there is no major history of landslides, earthquake, subsidence etc., recorded in the past history.

5.2 ANALYSIS OF ALTERNATIVE SITE

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

5.3 FACTORS BEHIND SELECTION OF PROPOSED TECHNOLOGY

The method of mining is by open cast method, No Drilling and Blasting Activities has been proposed. All the applied mining lease areas have following advantages –

- As the mineral deposition is homogeneous and batholith formation, therefore opencast method of working is preferred over underground method
- The material will be loaded with the help of excavators into dumpers / trippers and transported to the needy customers.
- Semi-skilled labours fit for Mining operations are easily available around the nearby villages.

5.4 ANALYSIS OF ALTERNATIVE TECHNOLOGY

Open cast mechanized method is being practiced in this project. This technology is having least gestation period, economically viable, safest and less labour intensive. The method has inbuilt flexibility for increasing or decreasing the production as per market condition.

6. ENVIRONMENTAL MONITORING PROGRAMME

6.0 GENERAL

The monitoring and evaluation of environmental parameters indicates potential changes occurring in the environment, which paves way for implementation of rectifying measures wherever required to maintain the status of the natural environment. Evaluation is also a very effective tool to judge the effectiveness or deficiency of the measures adopted and provides insight for future corrections.

Environmental monitoring is mandatory to meet compliance of statutory provisions under the Environment (Protection) Act, 1986, relevant conditions regarding monitoring covered under EC orders issued by the SEIAA as well as the conditions set forth under the order issued by Tamil Nadu Pollution Control Board while granting CTO.

6.1 METHODOLOGY OF MONITORING MECHANISM

Implementation of EMP and periodic monitoring will be carried out by Project Proponents. A comprehensive monitoring mechanism has been devised for monitoring of impacts due to proposed projects; Environmental protection measures like dust suppression, control of noise and blast vibrations, maintenance of machinery and vehicles, housekeeping in the mine premises, plantation, implementation of Environmental Management Plan and environmental clearance conditions will be monitored by the Respective Mine Management. On the other hand, implementation of area level protection measures like green belt development, environmental quality monitoring etc., are taken up by a senior executive who reports to their Mine Management.

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:

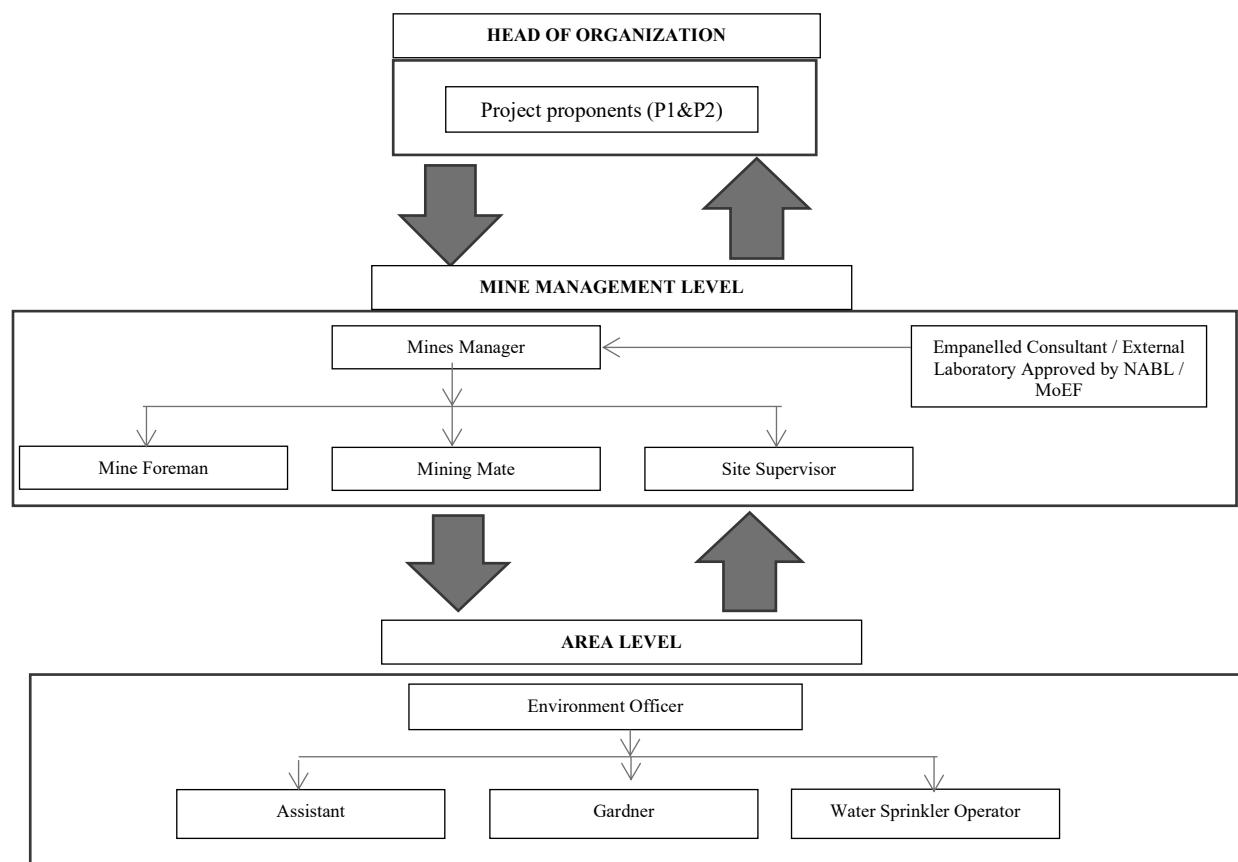
- Implementation of pollution control measures
- Monitoring programme implementation
- Post-plantation care
- To check the efficiency of pollution control measures taken
- Any other activity as may be related to environment
- Seeking expert's advice when needed.

The environmental monitoring cell will co-ordinate all monitoring programs at site and data thus generated will be regularly furnished to the State regulatory agencies as compliance status reports.

The sampling and analysis report of the monitored environmental attributes will be submitted to the Tamil Nadu Pollution Control Board (TNPCB) at a frequency of half-yearly and yearly by each proposed project proponent. The half-yearly reports are submitted to Ministry of Environment and Forest, Regional Office and SEIAA as well.

The sampling and analysis of the environmental attributes will be as per the guidelines of Central Pollution Control Board (CPCB)/Ministry of Environment, Forest and Climate Change (MoEF & CC).

FIGURE 6.1: PROPOSED ENVIRONMENTAL MONITORING CELL



6.2 IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES

The mitigation measures proposed in Chapter-4 will be implemented so as to reduce the impact on the environment due to the operations of the proposed project. Implementation schedule of mitigation measures is given in Table 6.1.

TABLE 6.1 IMPLEMENTATION SCHEDULE

SI No.	Recommendations	Time Period	Schedule
1	Land Environment Control Measures	Before commissioning of the project	Immediately after the commencement of project
2	Soil Quality Control Measures	Before commissioning of the project	Immediately after the commencement of project
3	Water Pollution Control Measures	Before commissioning of the project and along with mining operation	Immediately and as project progress
4	Air Pollution Control Measures	Before commissioning of the project and along with mining operation	Immediately and as project progress
5	Noise Pollution Control Measures	Before commissioning of the project and along with mining operation	Immediately and as project progress
6	Ecological Environment	Phase wise implementation every year along with mine operations	Immediately and as project progress

6.3 MONITORING SCHEDULE AND FREQUENCY

Monitoring shall confirm that commitments are being met. This may take the form of direct measurement and recording of quantitative information, such as amounts and concentrations of discharges, emissions and wastes, for measurement against statutory standards. Monitoring may include socio-economic interaction, through local liaison activities or even assessment of complaints.

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

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

The details of monitoring are detailed in Table 6.2

TABLE 6.2: PROPOSED MONITORING SCHEDULE POST EC

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, PM _{2.5} , PM ₁₀ , SO ₂ and NO _x .
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

Source: Guidance of manual for mining of minerals, February 2010

6.4 BUDGETARY PROVISION FOR EMP

The cost in respect of monitoring of environmental attributes, parameter to be monitored, sampling/monitoring locations with frequency and cost provision against each proposal is shown in Table 6.3. Monitoring work will be outsourced to external laboratory approved by NABL / MoEF.

The proposed capital cost for Environmental Monitoring Programme is Rs 76,000/- and the recurring cost is Rs 76,000/- per annum.

TABLE 6.3 ENVIRONMENT MONITORING BUDGET

Sl.No.	Parameter	Capital Cost	Recurring Cost per annum
1	Air Quality	Rs. 76,000/-	Rs. 76,000/-
2	Meteorology		
3	Water Quality		
4	Hydrology		
5	Soil Quality		
6	Noise Quality		
7	Vibration Study		
Total		Rs 76,000/-	Rs 76,000/-

Source: Approved Mining Plan

6.5 REPORTING SCHEDULES OF MONITORED DATA

The monitored data on air quality, water quality, noise levels and other environmental attributes will be periodically examined by the Mine Management Coordinator and Head of Organization for taking necessary corrective measures. The monitoring data will be submitted to Tamil Nadu State Pollution Control Board in the Compliance to CTO Conditions & environmental audit statements every year to MoEF & CC and Half-Yearly Compliance Monitoring Reports to MoEF & CC Regional Office and SEIAA.

Periodical reports to be submitted to: -

- MoEF & CC – Half yearly status report
- TNPCB - Half yearly status report
- Department of Geology and Mining: quarterly, half yearly annual reports

Besides the Mines Manager/Agent of respective project will submit the periodical reports to –

- Director of mines safety,
- Labour enforcement officer,
- Controller of explosives as per the norms stipulated by the department.

7. ADDITIONAL STUDIES

7.0 GENERAL

The following Additional Studies were done as per items identified by project proponent and items identified by regulatory authority. And items identified by public and other stakeholders will be incorporated after Public Hearing.

- Public Consultation
- Risk Assessment
- Disaster Management Plan
- Cumulative Impact Study
- Plastic Waste Management

7.1. PUBLIC CONSULTATION

Application to The Member Secretary of the Tamil Nadu Pollution Control Board (TNPCB) to conduct Public Hearing in a systematic, time bound and transparent manner ensuring widest possible public participation at the project site or in its close proximity in the district is submitted along with this Draft EIA / EMP Report and the outcome of public hearing proceedings will be detailed in the Final EIA/EMP Report.

7.2 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 Mining 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 all proposed projects. Risk Assessment is all about prevention of accidents and to take necessary steps to prevent it from happening.

Factors of risks involved due to human induced activities in connection with these proposed mining & allied activities with detailed analysis of causes and control measures for the mine is given in below Table 7.1.

TABLE 7.1 RISK ASSESSMENT& CONTROL MEASURES

S. No	Risk factors	Causes of risk	Control measures
1	Accidents due to explosives and heavy mining machineries	Explosives will not be used. Minerals will be excavated manually and loaded directly into the tippers/ tractors	All safety precautions and provisions of Mine Act, 1952, Metalliferous Mines Regulation, 1961 and Mines Rules, 1955 will be strictly followed during all mining operations;
2	Drilling	Drilling is not required	Not Applicable
4	Blasting	Blasting is not required	Not Applicable
5	Transportation	Potential hazards and unsafe workings contributing to accident and injuries	Before commencing work, drivers personally check the vehicles for oil(s), fuel and water levels, tyre inflation, general cleanliness and inspect the brakes, steering system, warning devices including automatically operated audio-visual reversing alarm, rear view mirrors, side indicator lights etc., are in good condition.

		Overloading of material	
6	Natural calamities	Unexpected happenings	Escape Routes will be provided to prevent inundation of storm water Fire Extinguishers & Sand Buckets

Source: Analysed and Proposed by FAE & EC

7.3 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

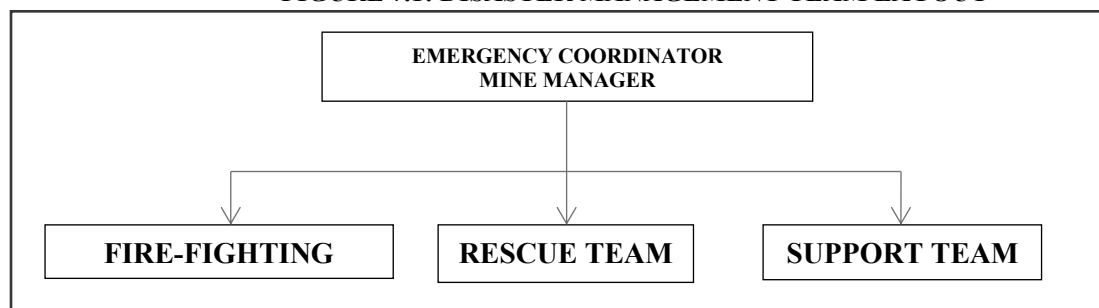
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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.

In case a disaster takes place, despite preventive actions, disaster management will have to be done in line with the descriptions below. There is an organization proposed for dealing with the emergency situations and the coordination among key personnel and their team has been shown in Fig 7.1.

FIGURE 7.1: DISASTER MANAGEMENT TEAM LAYOUT



The emergency organization shall be headed by emergency coordinator who will be qualified competent mine manager. In his absence senior most people available at the mine shall be emergency coordinator till arrival of mine manager. There would be three teams for taking care of emergency situations – Fire-Fighting Team, Rescue Team and Support Team. The proposed composition of the teams is given in Table 7.2.

TABLE 7.2: PROPOSED TEAMS TO DEAL WITH EMERGENCY SITUATION

DESIGNATION	QUALIFICATION
FIRE-FIGHTING TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Team Member	Mines Foreman
Team Member	Mining Mate
RESCUE TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager

Team Member/ Incident Controller (IC)	Environment Officer
Team Member	Mining Foreman
SUPPORT TEAM	
Team Leader/ Emergency Coordinator (EC)	Mines Manager
Assistant Team Leader	Environment Officer
Team Member	Mining Mate
Security Team Leader/ Emergency Security Controller	Mines Foreman

Once the mine becomes operational, the above table along with names of personnel will be prepared and made easily available to workers for respective proposed quarries. A mobile communication network and wireless shall connect Mine Emergency Control Room (MECR) to control various departments of the mine, fire station and neighbouring industrial units/mines.

Proposed fire extinguishers at different locations –

The following type of fire extinguishers has been proposed at strategic locations within the mine.

TABLE 7.3: PROPOSED FIRE EXTINGUISHERS AT DIFFERENT LOCATIONS

LOCATION	TYPE OF FIRE EXTINGUISHERS
Electrical Equipment's	CO ₂ type, foam type, dry chemical powder type
Fuel Storage Area	CO ₂ type, foam type, dry chemical powder type, Sand bucket
Office Area	Dry chemical type, foam type

7.4 CUMULATIVE IMPACT STUDY

For easy representation of Proposed and Existing Quarries in the Cluster are given unique codes and identifies and studied in this EIA/ EMP Report.

TABLE 7.4: LIST OF QUARRIES WITHIN 500 METER 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	Tvl. 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	

- Cluster area is calculated as per MoEF & CC Notification – S.O. 2269 (E) Dated: 01.07.2016

TABLE 7.5: SALIENT FEATURES OF PROPOSAL “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	

TABLE 7.6: SALIENT FEATURES OF PROPOSAL “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	

Source: Approved Mining Plan

TABLE 7.7: SALIENT FEATURES OF PROPOSAL “P3”

Name of the Mine	Tvl. Riverways Mines and Minerals Ltd	
Land Ownership	It is a Government Land	
SF No & Area (Ha)	390(P)	
Village,Taluk & District	Kottathur village, Musiri Taluk and Trichy District	

Toposheet No	58-I/12
Latitude between	11°05.907'N to 11°06.020' N
Longitude between	78°39.796'E to 78°39.930' E
Highest Elevation	144-147m MSL
Proposed Depth of Mining	2.5m below the ground level
Geological Resources	Garnet in Tonnes 61191
Mineable Reserves	Garnet in Tonnes 42,048
Yearwise Production	Garnet in Tonnes 42,048
Yearwise Production @10% Garnet Recovery	Garnet in Tonnes 4,205
Peak production capacity	13,814 Tonnes
Ultimate Pit Dimension	Pit – I: 225m (L) x 185m (W) x 2.0m (D) bgl

Source: Approved Mining Plan

TABLE 7.8: SALIENT FEATURES OF PROPOSAL “P4”

Name of the Mine	Tvl. Riverways Mines and Minerals Ltd
Land Ownership	It is a Government Land
SF No & Area (Ha)	390(P)
Village, Taluk & District	Kottathur village, Musiri Taluk and Trichy District
Toposheet No	58-I/12
Latitude between	11°06'13.08"N to 11°06'11.75"N
Longitude between	78°39'51.90"E to 78°39'52.23"E
Highest Elevation	145m MSL
Proposed Depth of Mining	2.0m below the ground level
Geological Resources	Garnet in Tonnes 40007
Mineable Reserves	Garnet in Tonnes 20,736
Yearwise Production	Garnet in Tonnes 20,736
Yearwise Production @10% Garnet Recovery	Garnet in Tonnes 2,074
Peak production capacity	6912 Tonnes
Ultimate Pit Dimension	Pit – I : 225m (L) x 189m (W) x 2.0m (D) bgl
Water Level in the surrounds area	33-35 m bgl
Method of Mining	Non-Conventional Opencast Mining Method without drilling and blasting

TABLE 7.9: SALIENT FEATURES OF PROPOSAL “P5”

Name of the Mine	Tvl. Riverways Mines and Minerals Ltd
Land Ownership	It is a Government Land
SF No & Area (Ha)	390(P)
Village, Taluk & District	Kottathur village, Musiri Taluk and Trichy District
Toposheet No	58-I/12
Latitude between	11°06'01.10"N to 11°06'12.76"N
Longitude between	78°40'05.95"E to 78°40'11.95"E
Highest Elevation	144-147m MSL
Proposed Depth of Mining	2.0m below the ground level
Geological Resources	Garnet in Tonnes

	50,223
Mineable Reserves	Garnet in Tonnes
	29,700
Yearwise Production	Garnet in Tonnes
	29,700
Yearwise Production @10% Garnet Recovery	Garnet in Tonnes
	2,970
Peak production capacity	9750 Tonnes
Ultimate Pit Dimension	Pit – I: 300m (L) x 135m (W) x 2.0m (D) bgl

Source: Approved Mining Plan

TABLE 7.10: SALIENT FEATURES OF PROPOSAL “P6”

Name of the Mine	Tvl. Riverways Mines and Minerals Ltd
Land Ownership	It is a Government Land
SF No & Area (Ha)	390(P)
Village, Taluk & District	Kottathur village, Musiri Taluk and Trichy District
Toposheet No	58-I/12
Latitude between	11°05'52.06"N to 11°06'02.77"N
Longitude between	78°39'56.71"E to 78°40'02.72"E
Highest Elevation	144-147m MSL
Proposed Depth of Mining	2.0m below the ground level
Geological Resources	Garnet in Tonnes
	49,182
Mineable Reserves	Garnet in Tonnes
	28,800
Yearwise Production	Garnet in Tonnes
	28,800
Yearwise Production @10% Garnet Recovery	Garnet in Tonnes
	2,880
Peak production capacity	9000 Tonnes
Ultimate Pit Dimension	Pit – I: 316m (L) x 150m (W) x 2.0m (D) bgl

Source: Approved Mining Plan

TABLE 7.11: SALIENT FEATURES OF PROPOSAL “P7”

Name of the Mine	Tvl.S.S. Minerals garnet Sand Mine
Land Ownership	It is a Government Land
SF No & Area (Ha)	390(P)
Village, Taluk & District	Kottathur village, Musiri Taluk and Trichy District
Toposheet No	58-I/12
Latitude between	11°06.284' to 11°06.364' N
Longitude between	78°39.862' to 78°40.059' E
Highest Elevation	141-147m MSL
Proposed Depth of Mining	2.0m below the ground level
Mineable Reserves	Garnet in Tonnes
	36,000
Yearwise Production	Garnet in Tonnes
	36,000
Yearwise Production @10% Garnet Recovery	Garnet in Tonnes
	1,080
Peak production capacity	10,800 Tonnes
Ultimate Pit Dimension	Pit – I: 300m (L) x 135m (W) x 2.0m (D) bgl

Water Level in the surrounds area	33-35 m bgl
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Source: Approved Mining Plan

TABLE 7.12: CUMULATIVE PRODUCTION LOAD OF GARNET

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

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Garnet is 165 Tonnes per day with a capacity of 8 trips of Garnet per day from the cluster.

TABLE 7.13: NEAREST HABITATION FROM EACH MINE

Location ID	Distance & Direction
Proposed	
Habitation Near P1	580m SW
Habitation Near P2	320m SW
Habitation Near P3	980m SW
Habitation Near P4	590m NE
Habitation Near P5	400m SE
Habitation Near P6	630m NE
Habitation Near P7	260m East

TABLE 7.14: EMPLOYMENT BENEFITS FROM CLUSTER MINES

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

A total of 87 people will get employment due to 7 proposed mines in cluster

TABLE 7.15: GREENBELT DEVELOPMENT

Code	No of Trees proposed to be planted	Area to be covered	Name of the Species
P1	1000	Safety barrier & village road	Neem, Pungam, Vilvam Etc
P2	1500		
P3	2400		
P4	2400		
P5	2400		
P6	2400		
P7	2400		
Total	14500		

Based on the Proposed Mining Plan it's anticipated that there shall growth of native species of Neem, Pungan, Vilvam etc., in the Cluster at a rate of 14500 Trees Planted over a period of 5 Years with Survival Rate of 80 %.

7.5 PLASTIC WASTE MANAGEMENT PLAN

The Project Proponent shall comply with Tamil Nadu Government Order (Ms) No. 84 Environment and Forest (EC.2) Department Dated: 25.06.2018 regarding ban on one time use and throw away plastics irrespective of thickness with effect from 01.01.2019 under Environment (Protection) Act, 1986.

Objective –

- To investigate the actual supply chain network of plastic waste.
- To identify and propose a sustainable plastic waste management by installing bins for collection of recyclables with all the plastic waste
- Preparation of a system design layout, and necessary modalities for implementation and monitoring.

8. PROJECT BENEFITS

8.0 GENERAL

The Proposed Project for Mining of Garnet at Kottathur and Naduvalur Villages aims to produce **88,280m³** 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

8.1 EMPLOYMENT POTENTIAL

It is proposed to provide employment to about 28 persons for carrying out mining operations and give preference to the local people in providing employment. In addition, there will be opportunity for indirect employment to many people in the form of contractual jobs, business opportunities, service facilities etc. the economic status of the local people will be enhanced due to mining project.

8.2 SOCIO-ECONOMIC WELFARE MEASURES PROPOSED

The impact of mining activity in the area will be more positive on the socio-economic environment in the immediate project impact area. The employment opportunities both direct and indirect will contribute to enhanced money incomes to job seekers with minimal skill sets especially among the local communities.

8.3 IMPROVEMENT IN PHYSICAL INFRASTRUCTURE

The project area is located in Kottathur & Naduvalur Villages, Musiri & Thuraiyur Taluk and Trichy District of Tamil Nadu and the area have communications, roads and other facilities already well established. The following physical infrastructure facilities will further improve due to this project.

- Road Transport facilities
- Communications
- Medical, Educational and social benefits will be made available to the nearby civilian population in addition to the workmen employed in the mine.

8.4 IMPROVEMENT IN SOCIAL INFRASTRUCTURE

Employment is expected during civil construction period, in trade, garbage lifting, sanitation and other ancillary services, Employment in these sectors will be primarily temporary or contractual and involvement of unskilled labour will be more. A major part of the labour force will be mainly from local villagers who are expected to engage themselves both in agriculture and mining activities. This will enhance their income and lead to overall economic growth of the area.

8.5 OTHER TANGIBLE BENEFITS

The proposed mine is likely to have other tangible benefits as given below.

- Indirect employment opportunities to local people in contractual works like construction of infrastructural facilities, transportation, sanitation, for supply of goods and services to the mine and other community services.
- Additional housing demand for rental accommodation will increase
- Cultural, recreation and aesthetic facilities will also improve

- Improvement in communication, transport, education, community development and medical facilities and overall change in employment and income opportunity
- The State Government will also benefit directly from the proposed mine, through increased revenue from royalties, cess, DMF, GST etc.,

CORPORATE SOCIAL RESPONSIBILITY

Project proponent will take responsibility to develop awareness among all levels of their staff about CSR activities and the integration of social processes with business processes. Those involved with the undertaking of CSR activities will be provided with adequate training and re-orientation.

Under this programme, the project proponents will take-up following programmes for social and economic development of villages within 10 km of the project site. For this purpose, separate budget will be provided every year. For finalization of these schemes, proponent will interact with LSG. The schemes will be selected from the following broad areas –

- Health Services
- Social Development
- Infrastructure Development
- Education & Sports
- Self-Employment

CSR Cost Estimation

- CSR activities will be taken up in the Kottathur & Naduvalur village mainly contributing to education, health, training of women self-help groups and contribution to infrastructure etc., CSR budget is allocated as 2.5% of the profit.

CORPORATE ENVIRONMENT RESPONSIBILITY

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.

The project proponents will have spent Rs 4,00,000/- towards Corporate Environmental Responsibility for the Nearby Government School

TABLE 8.1: CER – ACTION PLAN FOR P1 & P2

Activity	Beneficiaries	Total
Providing Sanitation facilities to the school	Kottathur & Naduvalur villagers	Rs 4,00,000/-
Planting and maintaining of trees in the school compound	Kottathur & Naduvalur villagers	
Providing Environmental related books to the school library	Kottathur & Naduvalur villagers	

Source: Field survey conducted by FAE, consultation with project proponent

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

Not Applicable, Since Environmental Cost Benefit Analysis not recommended at the Scoping stage.

10. ENVIRONMENTAL MANAGEMENT PLAN – P1

10.0. GENERAL

Environment Management Plan (EMP) aims at the preservation of ecological system by considering in-built pollution abatement facilities at the proposed site. Good practices of Environmental Management plan will ensure to keep all the environmental parameters of the project in respect of Ambient Air quality, Water quality, Socio – economic improvement standards.

Mitigation measures at the source level and an overall environment management plan at the study area are elicited so as to improve the supportive capacity of the receiving bodies. The EMP presented in this chapter discusses the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored after approval of the EIA.

10.1. ENVIRONMENTAL POLICY

The Project Proponent is committed to conduct all its operations and activities in an environmentally responsible manner and to continually improve environmental performance.

The Proponent Tvl. S.S. Minerals will –

- Meet the requirements of all laws, acts, regulations, and standards relevant to its operations and activities
- Implement a program to train employees in general environmental issues and individual workplace environmental responsibilities
- Allocate necessary resources to ensure the implementation of the environmental policy
- Ensure that an effective closure strategy is in place at all stages of project development and that progressive reclamation is undertaken as early as possible to reduce potential long-term environmental and community impacts
- Implement monitoring programmes to provide early warning of any deficiency or unanticipated performance in environmental safeguards
- Conduct periodic reviews to verify environmental performance and to continuously strive towards improvement

Description of the Administration and Technical Setup –

The Environment Monitoring Cell discussed under Chapter 6 will ensure effective implementation of environment management plan and to ensure compliance of environmental statutory guidelines through Mine Management Level of each Proposed Mine.

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.

10.2. LAND ENVIRONMENT MANAGEMENT –

Landscape of the area will be changed due to the Mining operation, restoration of the land by converting the mining pit into temporary reservoir and the remaining part of the area (un utilized areas, infrastructure, haul Roads) will be utilized for greenbelt development. Aesthetic of the Environment will not be affected. There is no major vegetation in the project area during the course of Mining operation and after completion of the mining operation thick plantation will be developed under greenbelt development programme.

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT

CONTROL	RESPONSIBILITY
Design vehicle wash-down areas so that all runoff water is captured and passed through oil water separators and sediment catchment devices.	Mines Manager
Re-fuelling to be undertaken in a safe location, away from vehicle movement pathways&100 m away of any watercourse Refuelling activity to be under visual observation at all times. Drainage of refuelling areas to sumps with oil/water separation	Mine Foreman & Mining Mate
Soil and groundwater testing as required following up a particular incident of contamination.	Mines Manager
At conceptual stage, the mining pits will be converted into Rain Water Harvesting. Remaining area will be converted into greenbelt area	Mines Manager
No external dumping i.e., outside the project area	Mine Foreman
Garland drains with catch pits / settlement traps to be provided all around the project area to prevent run off affecting the surrounding lands.	Mines Manager
The periphery of Project area will be planted with thick plantation to arrest the fugitive dust, which will also act as acoustic barrier.	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.3. SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

CONTROL	RESPONSIBILITY
Surface run-off from the project boundary via garland drains will be diverted to the mine pits	Mine Foreman & Mining Mate
Design haul roads and other access roads with drainage systems to minimize concentration of flow and erosion risk	Mines Manager
Empty sediment from sediment traps Maintain, repair or upgrade garland drain system	Mines Manager
Test soils for pH, EC, chloride, size & water holding capacity	Manager Mines

Source: Proposed by FAE's & EIA Coordinator

10.4. WATER MANAGEMENT

In the proposed Mining project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mine office. The mining operation is proposed upto a depth of 2 m BGL, the water table in the area is 32-35 m below ground level, hence the proposed projects will not intersect the Ground water table during entire mining period.

10.5. AIR QUALITY MANAGEMENT

The proposed mining activity would result in the increase of particulate matter concentrations due to fugitive dust. Daily water sprinkling on the haul roads, approach roads in the vicinity would be undertaken and will be continued as there is possibility for dust generation due to truck mobility. It will be ensured that vehicles are properly maintained to comply with exhaust emission requirements

TABLE 10.3: PROPOSED CONTROLS FOR AIR ENVIRONMENT

CONTROL	RESPONSIBILITY
Generation of dust during excavation is minimized by daily (twice) water sprinkling on working face and daily (twice) water sprinkling on haul road	Mines Manager
Maintenance as per operator manual of the equipment and machinery in the mines to minimizing air pollution	Mines Manager
Ambient Air Quality Monitoring carried out in the project area and in surrounding villages to access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.6. NOISE POLLUTION CONTROL

There will be intermittent noise levels due to vehicular movement, trucks loading. No mining activities are planned during night time.

TABLE 10.4: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

CONTROL	RESPONSIBILITY
Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.7.C GROUND VIBRATION

No drilling and blasting hence the vibration is not arised, the mining operation will be carried out manually and the minerals will be loaded directly.

10.8. BIOLOGICAL ENVIRONMENT MANAGEMENT

The proponent will take all necessary steps to avoid the impact on the ecology of the area by adopting suitable management measures in the planning and implementation stage. During mining, thick plantation will be carried out around the project periphery, on safety barrier zone, on top benches of quarried out area etc.,

Following control measures are proposed for its management and will be the responsibility of the Mines Manager.

- Greenbelt development all along the safety barrier of the project area
- It is also proposed to implement the greenbelt development programme and post plantation status will be regularly checked for every season.
- The main attributes that retard the survival of sapling is fugitive dust, this fugitive dust can be controlled by water sprinkling on the haul roads and installing a sprinkler unit near the newly planted area.
- Year wise greenbelt development will be recorded and monitored

- Based on the area of plantation.
- Period of plantation
- Type of plantation
- Spacing between the plants
- Type of manuring and fertilizers and its periods
- Lopping period, interval of watering
- Survival rate
- Density of plantation
- The ultimate reclamation planned leaves a congenial environment for development of flora & immigration of small fauna through green belt and water reservoir. The green belt and water reservoir developed within the Project at the end of mine life will attract the birds and animals towards the project area in the post mining period.

10.8.1. Green Belt Development Plan

About 1000 nos. of saplings is proposed to be planted for the Mining plan period in safety barrier of applied mine lease area with survival rate 80%. The greenbelt development plan has been prepared keeping in view the land use changes that will occur due to mining operation in the area.

TABLE 10.5. PROPOSED GREENBELT ACTIVITIES

Year	No. of trees proposed to be planted	Recommended area	Name of the species
I	1000	Safety barrier, Unutilized land, Village roads	Neem, Pungam, Vilvam etc.,

Source: Conceptual Plan of Approved Mining plan & Proposed by FAE's & EIA Coordinator

The objectives of the greenbelt development plan are –

- Provide a green belt around the periphery of the mining area to combat the dispersal of dust in the adjoining areas,
- Protect the erosion of the soil, Conserve moisture for increasing ground water recharging,
- Restore the ecology of the area, restore aesthetic beauty of the locality and meet the requirement of fodder, fuel and timber of the local community.

A well-planned Green Belt with multi rows (three tiers) preferably with long canopy leaves shall be developed with dense plantations around the boundary and haul roads to prevent air, dust noise propagation to undesired places and efforts will be taken for the enhancement of survival rate.

10.8.2. Species Recommended for Plantation

Following points have been considered while recommending the species for plantation:

- Creating of bio-diversity.
- Fast growing, thick canopy cover, perennial and evergreen large leaf area,
- Efficient in absorbing pollutants without major effects on natural growth

TABLE 10.6: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT

S.No	Botanical Name	Local Name	Importance
1.	Azadirachta indica	Neem, Vembu	Neem oil & neem products
2.	Tamarindus indica	Tamarind	Edible & Medicinal and other Uses
3.	Polyalthia longifolia	Nettilinkam	Tall and evergreen tree
4.	Borassus Flabellifer	Palmyra Palm	Tall Wind breaker tree and its fruits are edible

Source: Proposed by FAE's & EIA Coordinator

10.9. OCCUPATIONAL SAFETY & HEALTH MANAGEMENT

Occupational safety and health are very closely related to productivity and good employer-employee relationship. The main factors of occupational health impact in quarries are fugitive dust and noise. Safety of employees during mining operation and maintenance of mining equipment will be taken care as per Mines Act 1952 and Rule 29 of Mines Rules 1955. To avoid any adverse effect on the health of workers due to dust, noise and vibration sufficient measures have been provided.

10.9.1. Medical Surveillance and Examinations –

- Identifying workers with conditions that may be aggravated by exposure to dust & noise and establishing baseline measures for determining changes in health.
- Evaluating the effect of noise on workers
- Enabling corrective actions to be taken when necessary
- Providing health education

The health status of workers in the mine shall be regularly monitored under an occupational surveillance program. Under this program, all the employees are subjected to a detailed medical examination at the time of employment. The medical examination covers the following tests under mines act 1952.

- General Physical Examination and Blood Pressure
- X-ray Chest and ECG
- Sputum test
- Detailed Routine Blood and Urine examination

The medical histories of all employees will be maintained in a standard format annually. Thereafter, the employees will be subject to medical examination annually. The below tests keep upgrading the database of medical history of the employees.

TABLE 10.7.: MEDICAL EXAMINATION SCHEDULE

Sl.No	Activities	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year
1	Initial Medical Examination (Mine Workers)					
A	Physical Check-up					
B	Psychological Test					
C	Audiometric Test					
D	Respiratory Test					
2	Periodical Medical Examination (Mine Workers)					
A	Physical Check – up					
B	Audiometric Test					
C	Eye Check – up					
D	Respiratory Test					
3	Medical Camp (Mine Workers & Nearby Villagers)					
4	Training (Mine Workers)					

Medical Follow ups:- Work force will be divided into three targeted groups age wise as follows:-		
Age Group	PME as per Mines Rules 1955	Special Examination
Less than 25 years	Once in a Three Years	In case of emergencies
Between 25 to 40 Years	Once in a Three Years	In case of emergencies
Above 40 Years	Once in a Three Years	In case of emergencies
Medical help on top priority immediately after diagnosis/ accident is the essence of preventive aspects.		

10.9.2.: Proposed Occupational Health and Safety Measures –

- The mine site will have adequate drinking water supply so that workers do not get dehydrated.
- The personal protective equipment will be provided for mine workers.
- At noisy working activity, exposure time will be minimized.
- Dust generating sources will be identified and proper control measure will be adopted.
- Periodic medical examinations will be provided for all workers.
- Strict observance of the provisions of DGMS Acts, Rules and Regulations in respect of safety both by management and the workers.
- A safety committee meeting every month will be organized to discuss the safety of the mines and the persons employed.
- Celebration of annual mines safety week and environmental week in order to develop safety awareness and harmony amongst employees and co mining owners.

10.9.3.: Health and Safety Training Programme

The Proponent will provide special induction program along with machinery manufacturers for the operators and co-operators to run and maintain the machinery effectively and efficiently. The training program for the supervisors and office staffs will be arranged in the Group Vocational Training Centres in the State and engage Environmental Consultants to provide periodical training to all the employees to carry out the mining operation in and eco-friendly manner.

10.9.4.: Budgetary Provision for Environmental Management –

Adequate budgetary provision has been made by the Company for execution of Environmental Management Plan. The Table 10.11 gives overall investment on the environmental safeguards and recurring expenditure for successful monitoring and implementation of control measures.

TABLE 10.8: EMP BUDGET FOR PROPOSED PROJECT

Activities	Mitigation Measure	Provision for Implementation	Capital	Recurring per annum
Air Environment	Haul road maintenance & Water sprinkling	Lump sum fund allocation for daily maintenance of haul roads and thrice a day water sprinkling by fixed sprinklers or water tankers	5000	2000
	No overloading of trucks/tippers/tractors	Lump sum fund allocation Manual Monitoring through Security guard	5000	1000
	Mineral carrying trucks will be covered by tarpaulin	Lump sum fund allocation Manual Monitoring through Security guard	10000	1000
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	Nil	5000
		Installation of dust bins	Nil	1000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	Nil	Nil
Mine Closure	1. Progressive Closure Activity - Surface Runoff management	Provision made in Operating Cost	Nil	Nil
	2. Greenbelt development along the tank bund and haul roads	Provision made in Operating Cost	Nil	Nil
Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the mining Entrance as permanent structure mentioning Environmental Conditions	1000	Nil
	Workers will be provided with Personal Protective Equipment's	Lumpsum fund allocation	10000	Nil
	First aid facility will be provided	Lumpsum fund allocation	3000	Nil
	Appointment of Competent person for ensuring the safety operation	Provision made in operational cost	0	Nil
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Lumpsum fund allocation	200000	Nil
TOTAL			234000	10,000

10.10.: CONCLUSION –

Various aspects of mining activities were considered and related impacts were evaluated. Considering all the possible ways to mitigate the environmental concerns Environmental Management Plan was prepared and fund has been allocated for the same. The EMP is dynamic, flexible and subjected to periodic review. For project where the major 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.

10. ENVIRONMENTAL MANAGEMENT PLAN – P2

10.0. GENERAL

Environment Management Plan (EMP) aims at the preservation of ecological system by considering in-built pollution abatement facilities at the proposed site. Good practices of Environmental Management plan will ensure to keep all the environmental parameters of the project in respect of Ambient Air quality, Water quality, Socio – economic improvement standards.

Mitigation measures at the source level and an overall environment management plan at the study area are elicited so as to improve the supportive capacity of the receiving bodies. The EMP presented in this chapter discusses the administrative aspects of ensuring that mitigative measures are implemented and their effectiveness monitored after approval of the EIA.

10.1. ENVIRONMENTAL POLICY

The Project Proponent is committed to conduct all its operations and activities in an environmentally responsible manner and to continually improve environmental performance.

The Proponent Tvl. Riverways Mines and Minerals Ltd will –

- Meet the requirements of all laws, acts, regulations, and standards relevant to its operations and activities
- Implement a program to train employees in general environmental issues and individual workplace environmental responsibilities
- Allocate necessary resources to ensure the implementation of the environmental policy
- Ensure that an effective closure strategy is in place at all stages of project development and that progressive reclamation is undertaken as early as possible to reduce potential long-term environmental and community impacts
- Implement monitoring programmes to provide early warning of any deficiency or unanticipated performance in environmental safeguards
- Conduct periodic reviews to verify environmental performance and to continuously strive towards improvement

Description of the Administration and Technical Setup –

The Environment Monitoring Cell discussed under Chapter 6 will ensure effective implementation of environment management plan and to ensure compliance of environmental statutory guidelines through Mine Management Level of each Proposed mining.

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.

10.2. LAND ENVIRONMENT MANAGEMENT –

Landscape of the area will be changed due to the mining operation, restoration of the land by converting the mining pit into temporary reservoir and the remaining part of the area (un utilized areas, infrastructure, haul Roads) will be utilized for greenbelt development. Aesthetic of the Environment will not be affected. There is no major vegetation in the project area during the course of mining operation and after completion of the mining operation thick plantation will be developed under greenbelt development programme.

TABLE 10.1: PROPOSED CONTROLS FOR LAND ENVIRONMENT

CONTROL	RESPONSIBILITY
Design vehicle wash-down areas so that all runoff water is captured and passed through oil water separators and sediment catchment devices.	Mines Manager
Re-fuelling to be undertaken in a safe location, away from vehicle movement pathways & 100 m away of any watercourse Refuelling activity to be under visual observation at all times. Drainage of refuelling areas to sumps with oil/water separation	Mine Foreman & Mining Mate
Soil and groundwater testing as required following up a particular incident of contamination.	Mines Manager
At conceptual stage, the mining pits will be converted into Rain Water Harvesting. Remaining area will be converted into greenbelt area	Mines Manager
No external dumping i.e., outside the project area	Mine Foreman
Garland drains with catch pits / settlement traps to be provided all around the project area to prevent run off affecting the surrounding lands.	Mines Manager
The periphery of Project area will be planted with thick plantation to arrest the fugitive dust, which will also act as acoustic barrier.	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.3. SOIL MANAGEMENT

There is no overburden or waste anticipated from proposed project.

TABLE 10.2: PROPOSED CONTROLS FOR SOIL MANAGEMENT

CONTROL	RESPONSIBILITY
Surface run-off from the project boundary via garland drains will be diverted to the mine pits	Mine Foreman & Mining Mate
Design haul roads and other access roads with drainage systems to minimize concentration of flow and erosion risk	Mines Manager
Empty sediment from sediment traps Maintain, repair or upgrade garland drain system	Mines Manager
Test soils for pH, EC, chloride, size & water holding capacity	Manager Mines

Source: Proposed by FAE's & EIA Coordinator

10.4. WATER MANAGEMENT

In the proposed mining project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mine office. The mining operation is proposed upto a depth of 2 m BGL, the water table in the area is 32-35 m below ground level, hence the proposed projects will not intersect the Ground water table during entire mine period.

10.5. AIR QUALITY MANAGEMENT

The proposed mining activity would result in the increase of particulate matter concentrations due to fugitive dust. Daily water sprinkling on the haul roads, approach roads in the vicinity would be undertaken and will be continued as there is possibility for dust generation due to truck mobility. It will be ensured that vehicles are properly maintained to comply with exhaust emission requirements

TABLE 10.4: PROPOSED CONTROLS FOR AIR ENVIRONMENT

CONTROL	RESPONSIBILITY
Generation of dust during excavation is minimized by daily (twice) water sprinkling on working face and daily (twice) water sprinkling on haul road	Mines Manager
Maintenance as per operator manual of the equipment and machinery in the mines to minimizing air pollution	Mines Manager
Ambient Air Quality Monitoring carried out in the project area and in surrounding villages to access the impact due to the mining activities and the efficacy of the adopted air pollution control measures	Mines Manager
Provision of Dust Mask to all workers	Mines Manager
Greenbelt development all along the periphery of the project area	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.6. NOISE POLLUTION CONTROL

There will be intermittent noise levels due to vehicular movement, trucks loading. No mining activities are planned during night time.

TABLE 10.5: PROPOSED CONTROLS FOR NOISE ENVIRONMENT

CONTROL	RESPONSIBILITY
Development of thick greenbelt all along the Buffer Zone (7.5 Meters) of the project area to attenuate the noise and the same will be maintained	Mines Manager
Provision of earmuff / ear plugs to workers working in noise prone zones in the mines	Mining Mate
Provision of effective silencers for mining machinery and transport vehicles	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.7. GROUND VIBRATION

No drilling and blasting hence the vibration is not arised, the mining operation will be carried out manually and the minerals will be loaded directly.

10.8. BIOLOGICAL ENVIRONMENT MANAGEMENT

The proponent will take all necessary steps to avoid the impact on the ecology of the area by adopting suitable management measures in the planning and implementation stage. During mining, thick plantation will be carried out around the project periphery, on safety barrier zone, on top benches of quarried out area etc.,

Following control measures are proposed for its management and will be the responsibility of the Mines Manager.

- Greenbelt development all along the safety barrier of the project area
- It is also proposed to implement the greenbelt development programme and post plantation status will be regularly checked for every season.
- The main attributes that retard the survival of sapling is fugitive dust, this fugitive dust can be controlled by water sprinkling on the haul roads and installing a sprinkler unit near the newly planted area.
- Year wise greenbelt development will be recorded and monitored

- Based on the area of plantation.
- Period of plantation
- Type of plantation
- Spacing between the plants
- Type of manuring and fertilizers and its periods
- Lopping period, interval of watering
- Survival rate
- Density of plantation
- The ultimate reclamation planned leaves a congenial environment for development of flora & immigration of small fauna through green belt and water reservoir. The green belt and water reservoir developed within the Project at the end of mine life will attract the birds and animals towards the project area in the post mining period.

10.8.1. Green Belt Development Plan

About 1000 nos. of saplings is proposed to be planted for the Mining plan period in safety barrier of applied mine lease area with survival rate 80%. The greenbelt development plan has been prepared keeping in view the land use changes that will occur due to mining operation in the area.

TABLE 10.7. PROPOSED GREENBELT ACTIVITIES

Year	No. of trees proposed to be planted	Recommended area	Name of the species
I	1500	Safety barrier, Unutilized land, Village roads	Neem, Pungam, Vilvam etc.,

Source: Conceptual Plan of Approved Mining plan & Proposed by FAE's & EIA Coordinator

The objectives of the greenbelt development plan are –

- Provide a green belt around the periphery of the mine area to combat the dispersal of dust in the adjoining areas,
- Protect the erosion of the soil, Conserve moisture for increasing ground water recharging,
- Restore the ecology of the area, restore aesthetic beauty of the locality and meet the requirement of fodder, fuel and timber of the local community.

A well-planned Green Belt with multi rows (three tiers) preferably with long canopy leaves shall be developed with dense plantations around the boundary and haul roads to prevent air, dust noise propagation to undesired places and efforts will be taken for the enhancement of survival rate.

10.8.2. Species Recommended for Plantation

Following points have been considered while recommending the species for plantation:

- Creating of bio-diversity.
- Fast growing, thick canopy cover, perennial and evergreen large leaf area,
- Efficient in absorbing pollutants without major effects on natural growth

TABLE 10.8.: RECOMMENDED SPECIES TO PLANT IN THE GREENBELT

S.No	Botanical Name	Local Name	Importance
1	Azadirachta indica	Neem, Vembu	Neem oil & neem products
2	Tamarindus indica	Tamarind	Edible & Medicinal and other Uses
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Implementation of EC, Mining Plan & DGMS Condition	Size 6' X 5' with blue background and white letters as mentioned in MoM Appendix II by the SEAC TN	Fixed Display Board at the Mining Entrance as permanent structure mentioning Environmental Conditions	1000	Nil
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CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Lumpsum fund allocation	200000	Nil
TOTAL			234000	10,000

10.10.: CONCLUSION –

Various aspects of mining activities were considered and related impacts were evaluated. Considering all the possible ways to mitigate the environmental concerns Environmental Management Plan was prepared and fund has been allocated for the same. The EMP is dynamic, flexible and subjected to periodic review. For project where the major 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.

11. SUMMARY AND CONCLUSION

Environmental monitoring and audit mechanism have been recommended before and after commencement of the project, where necessary, to verify the accuracy of the EIA predictions and the effectiveness of recommended mitigation measures.

The main scope of the EIA study is to quantify the cumulative impact in the study area due to cluster quarries and formulate the effective mitigation measures for each individual leases. A detailed account of the emission sources, emissions control equipment, background Air quality levels, Meteorological measurements, Dispersion model and all other aspects of pollution like effluent discharge, Dust generation etc., have been discussed in this report. The baseline monitoring study has been carried out during the months October to December 2024 for various environmental components so as to assess the anticipated impacts of the cluster Mining projects on the environment and suitable mitigation measures for likely adverse impacts due to the proposed project is suggested individually for the respective proposed project under Chapter 10.

The project proponent ensures to obtain necessary clearances and mining will be carried out as per rules and regulations. The Mining Activity will be carried out in a phased manner as per the approved mining plan after obtaining EC, CTO from TNPCB, execution of lease deed and obtaining DGMS Permission and working will be carried out under the supervision of Competent Persons employed.

Overall, the EIA report has predicted that the project will comply with all environment standards and legislation after commencement of the project and operational stage mitigation measures are implemented.

Mining operations has positive impact on environment and socio economy such as landscape improvement, water as by-product, economy development and better public services, providing and supply of Garnet as per market demand.

Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for 28 people directly in the proposed project and indirectly around 10-20 people.

As discussed, it is safe to say that the proposed quarries are not likely to cause any significant impact to the ecology of the area, as adequate preventive measures will be adopted to keep the various pollutants within the permissible limits. Green belt development around the area will also be taken up as an effective pollution mitigate technique, as well as to serve as biological indicators for the pollutants released from the Kottathur & Naduvalur Garnet Sand Mines (Cluster Extent – 29.12.5 Ha)

12. DISCLOSURE OF CONSULTANT

The Project Proponents

- **Tvl.S.S. Minerals-P1**
- **Tvl. Riverways Mines and Minerals Ltd – P2**

have engaged M/s Geo Exploration and Mining Solutions, an Accredited Organization under Quality Council of India – National Accreditation Board for Education & Training, New Delhi, for carrying out the EIA Study as per the ToR Issued for the proposed project.

Name and address of the consultancy:

GEO EXPLORATION AND MINING SOLUTIONS

No 17, Advaita Ashram Road,
Alagapuram, Salem – 636 004
Tamil Nadu, India

Email: info@geoexploration@gmail.com

Web: www.gemssalem.com

Phone: 0427 2431989.

The Accredited Experts and associated members who were engaged for this EIA study as given below –

Sl.No.	Name of the expert	In house/ Empanelled	EIA Coordinator		FAE	
			Sector	Category	Sector	Category
1	Dr. M. Ifthikhar Ahmed	In-house	1	A	WP GEO SC	B A A
2	Dr. P. Thangaraju	In-house	-	-	HG GEO	A A
3	Mr. A. Jagannathan	In-house	-	-	AP NV SHW	B A B
4	Mr. N. Senthilkumar	Empanelled	38 28	B B	AQ WP RH	B B A
5	Mrs. Jisha parameswaran	In-house	-	-	SW	B
6	Mr. Govindasamy	In-house	-	-	WP	B
7	Mrs. K. Anitha	In-house	-	-	SE	A
8	Mrs. Amirtham	In-house	-	-	EB	B
9	Mr. Alagappa Moses	Empanelled	-	-	EB	A
10	Mr. A. Allimuthu	In-house	-	-	LU	B
11	Mr. S. Pavel	Empanelled	-	-	RH	B
12	Mr. J. R. Vikram Krishna	Empanelled	-	-	SHW RH	A A

Abbreviations			
EC	EIA Coordinator	EB	Ecology and bio-diversity
AEC	Associate EIA Coordinator	NV	Noise and vibration
FAE	Functional Area Expert	SE	Socio economics
FAA	Functional Area Associates	HG	Hydrology, ground water and water conservation
TM	Team Member	SC	Soil conservation
GEO	Geology	RH	Risk assessment and hazard management

WP	Water pollution monitoring, prevention and control	SHW	Solid and hazardous wastes
AP	Air pollution monitoring, prevention and control	MSW	Municipal Solid Wastes
LU	Land Use	ISW	Industrial Solid Wastes
AQ	Meteorology, air quality modeling, and prediction	HW	Hazardous Wastes

DECLARATION BY EXPERTS CONTRIBUTING TO THE EIA/EMP

Declaration by experts contributing to the EIA/EMP for Kottathur & Naduvalur Garnet Sand Mine Project over a Cluster Extent of 29.12.5 ha in Kottathur & Naduvalur Village of Musiri & Thuraiyur Taluk, Trichy District of Tamil Nadu. It is also certified that information furnished in the above EIA study are true and correct to the best of our knowledge.

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

Name: **Dr. M. Ifthikhar Ahmed**

Designation: **EIA Coordinator**

Date & Signature:

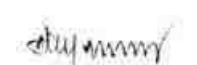
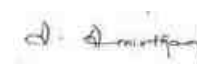


Period of Involvement: **Dec 2022 to till date**

Associated Team Member with EIA Coordinator:

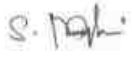
1. **Mr. S. Nagamani**
2. **Mr.P. Viswanathan**
3. **Mr. M. Santhoshkumar**
4. **Mr. S. Ilavarasan**

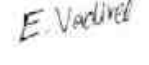
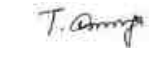
FUNCTIONAL AREA EXPERTS ENGAGED IN THE PROJECT

Sl. No.	Functional Area	Involvement	Name of the Expert/s	Signature
1	AP	- Identification of different sources of air pollution due to the proposed mine activity - Prediction of air pollution and propose mitigation measures / control measures	Mr. A. Jagannathan	
2	WP	- Suggesting water treatment systems, drainage facilities - Evaluating probable impacts of effluent/waste water discharges into the receiving environment/water bodies and suggesting control measures.	Dr. M. Ifthikhar Ahmed	
			Mr. N. Senthilkumar	
3	HG	- Interpretation of ground water table and predict impact and propose mitigation measures. - Analysis and description of aquifer Characteristics	Dr. P. Thangaraju	
4	GEO	- Field Survey for assessing the regional and local geology of the area. - Preparation of mineral and geological maps. - Geology and Geo morphological analysis/description and Stratigraphy/Lithology.	Dr. M. Ifthikhar Ahmed	
			Dr. P. Thangaraju	
5	SE	- Revision in secondary data as per Census of India, 2011. - Impact Assessment & Preventive Management Plan - Corporate Environment Responsibility.	Mrs. K. Anitha	
6	EB	- Collection of Baseline data of Flora and Fauna. - Identification of species labelled as Rare, Endangered and threatened as per IUCN list.	Mrs. Amirtham	

		- Impact of the project on flora and fauna. - Suggesting species for greenbelt development.	Mr. Alagappa Moses	
7	RH	- Identification of hazards and hazardous substances - Risks and consequences analysis - Vulnerability assessment - Preparation of Emergency Preparedness Plan - Management plan for safety.	Mr. N. Senthilkumar	
			Mr. S. Pavel	
			Mr. J. R. Vikram Krishna	
8	LU	- Construction of Land use Map - Impact of project on surrounding land use - Suggesting post closure sustainable land use and mitigative measures.	Mr. A. Allimuthu	
9	NV	- Identify impacts due to noise and vibrations - Suggesting appropriate mitigation measures for EMP.	Mr. A. Jagannathan	
10	AQ	- Identifying different source of emissions and propose predictions of incremental GLC using AERMOD. - Recommending mitigations measures for EMP	Mr. N. Senthilkumar	
11	SC	Assessing the impact on soil environment and proposed mitigation measures for soil conservation	Dr. M. Ifthikhar Ahmed	
12	SHW	- Identify source of generation of non-hazardous solid waste and hazardous waste. - Suggesting measures for minimization of generation of waste and how it can be reused or recycled.	Mr. A. Jagannathan	
			Mr. J. R. Vikram Krishna	

LIST OF TEAM MEMBERS ENGAGED IN THIS PROJECT

Sl.No.	Name	Functional Area	Involvement	Signature
1	Mr. S. Nagamani	AP; GEO; AQ	- Site Visit with FAE - Provide inputs & Assisting FAE with sources of Air Pollution, its impact and suggest control measures - Provide inputs on Geological Aspects - Analyse & provide inputs and assist FAE with meteorological data, emission estimation, AERMOD modelling and suggesting control measures	
2	Mr. Viswathanan	AP; WP; LU	- Site Visit with FAE - Provide inputs & Assisting FAE with sources of Air Pollution, its impact and suggest control measures - Assisting FAE on sources of water pollution, its impacts and suggest control measures - Assisting FAE in preparation of land use maps	
3	Mr. Santhoshkumar	GEO; SC	- Site Visit with FAE - Provide inputs on Geological Aspects - Assist in Resources & Reserve Calculation and preparation of Production Plan & Conceptual Plan - Provide inputs & Assisting FAE with soil conservation methods and identifying impacts	

4	Mr. Umamahesvaran	GEO	- Site Visit with FAE - Provide inputs on Geological Aspects - Assist in Resources & Reserve Calculation and preparation of Production Plan & Conceptual Plan	
5	Mr. A. Allimuthu	SE	- Site Visit with FAE - Assist FAE with collection of data's - Provide inputs by analysing primary and secondary data	
6	Mr. S. Ilavarasan	LU; SC	- Site Visit with FAE - Assisting FAE in preparation of land use maps - Provide inputs & Assisting FAE with soil conservation methods and identifying impacts	
7	Mr. E. Vadivel	HG	- Site Visit with FAE - Assist FAE & provide inputs on aquifer characteristics, ground water level/table - Assist with methods of ground water recharge and conduct pump test, flow rate	
8	Mr. D. Dinesh	NV	- Site Visit with FAE - Assist FAE and provide inputs on impacts due to proposed mine activity and suggest mitigation measures - Assist FAE with prediction modelling	
9	Mr. Panneer Selvam	EB	- Site Visit with FAE - Assist FAE with collection of baseline data - Provide inputs and assist with labelling of Flora and Fauna	
10	Mrs. Nathiya	EB	- Site Visit with FAE - Assist FAE with collection of baseline data - Provide inputs and assist with labelling of Flora and Fauna	

DECLARATION BY THE HEAD OF THE ACCREDITED CONSULTANT ORGANIZATION

I, Dr. M. Ifthikhar Ahmed, Managing Partner, Geo Exploration and Mining Solutions, hereby, confirm that the above-mentioned Functional Area Experts and Team Members prepared the EIA/EMP for Kottathur & Naduvalur Garnet Sand Mines Project over a Cluster Extent of 29.12.5 ha in Kottathur & Naduvalur Village of Musiri & Thuraiyur Taluk, Trichy District of Tamil Nadu. It is also certified that information furnished in the EIA study are true and correct to the best of our knowledge.

Signature& Date:



Name:

Dr. M. Ifthikhar Ahmed

Designation:

Managing Partner

Name of the EIA Consultant Organization:

M/s. Geo Exploration and Mining Solutions

NABET Certificate No & Issue Date:

NABET/EIA/2225/RA0276 Dated: 20.02.2023

Validity:

Valid till 06.08.2025