DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

&

ENVIRONMENT MANAGEMENT PLAN

FOR OBTAINING

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

"B1" CATEGORY (Cluster) – MINOR MINERAL – CLUSTER –

PATTA LAND - FRESH QUARRY

THIRU N. MURUGAN ROUGH STONE AND GRAVEL QUARRY

Extent – 0.96.50 Ha

Project Proponent

Thiru. N. Murugan,
S/o. Nagan,
No. 3, Navasi Street,
Thiruneermalai,
Chennai - 600 044.

PROJECT LOCATION	PROPOSED PRODUCTION
S.F. No 415/2A & 415/2B, Pinayur Village, Uthiramerur Taluk, Kancheepuram District.	Lease Period /Mining plan period- 10 years **Reserves:** 42,895 m^3 of Rough stone, 18,819m^3 of Weathered rock & 12,546m^3 of Gravel Peak Production = 6300m^3 of Rough Stone Proposed Depth = 20m bgl

ToR obtained vide

Lr No.SEIAA-TN/F.No.8782/SEAC/ToR-1069/2022 Dated: 01.03.2022

Environmental Consultant
GEO EXPLORATION AND MINING SOLUTIONS
Old No. 260-B, New No. 17,
Advaitha Ashram Road, Alagapuram,
Salem – 636 004, Tamil Nadu, India
Accredited for sector 1 Cat 'A', sector 31 & 38 Cat 'B'
Certificate No : NABET/EIA/2225/RA 0276
Phone: 0427-2431989,
Email: infogeoexploration@gmail.com
Web: www.gemssalem.com

Laboratory
EHS 360 LABS PRIVATE LIMITED,
10/2 Ground floor, 50th street, 7th Avenue,
Ashok Nagar, Chennai – 600 083.

Baseline Monitoring Period

DEC 2023 to FEB 2024

MAY 2024

UNDERTAKING

I N.Murugan given undertaking that this EIA & EMP report prepared for our Rough stone and Gravel quarry situated in S.F.No 415/2A & 415/2B, over an extent of 0.96.50 Ha in Pinayur Village, Uthiramerur Taluk and Kancheepuram District based on the ToR issued by the State Level Environmental Impact Assessment Authority (SEIAA), Tamil Nadu vide Letter No Lr No. SEIAA-TN/F.No.8782/SEAC/ToR-1069/2022 Dated: 01.03.2022

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

N.Murugan

Place: Kancheepuram
Dated:

DECLARATION

I Dr. M.Ifthikhar Ahmed – EIA Co Ordinator declare that the EIA & EMP report for the Rough stone and Gravel quarry in S.F.No 415/2A & 415/2B over over an extent of 0.96.50 Ha in Pinayur Village, Uthiramerur Taluk and Kancheepuram 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 Co Ordinator

Dr. M. Ifthikhar Ahmed

Managing Partner

M/s. Geo Exploration and Mining Solutions

Place : Salem

Dated :

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

PROPOSED QUARRY					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
P1	**Thiru.N.Murugan,** S/o. Nagan, No. 3, Navasi Street, Thiruneermalai, Chennai - 600 044.	Pinayur	415/2A & 415/2B	0.96.50	Lr.No. SEIAA-TN/ F.No. 8782/SEAC/ToR-1069/ 2022 Dated: 01.03.2022**.**
			TOTAL EXTENT	**0.96.50**	
EXISTING QUARRIES					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
E-1	Thiru S. Vinothkumar S/o,Subbiah Reddiar, No.8A, Duraisamy pillai street, Tambaram west, Chennai-600 045	Pinayur	394/1F,394/2B,394/2C	1.92.0	12.08.2017 to 11.08.2022
E-2	Thiru S.Ravisundar, S/o Sandhiyagu, No.1, 1178-A,1 st street, Bethel nagar, Injampakkam, Chennai- 115	Pinayur	415/A,415/1B	3.23.50	21.12.2017 to 20.12.2022
E-3	Thiru.S.Dharmaraj S/o,Shitrambala Reddiyar, No.2A,North street, Mundalaapuram,Ondipulinaickanur,	Pinayur	394/1A,394/1B,394/1C,394/1D,394/1E,412/1,412/2A,412/2B,414/2	4.93.50	31.07.2020 to 30.07.2025
E-4	Thiru S.Ravisundar, S/o Sandhiyagu, No.1, 1178-A,1 st street, Bethel nagar, Injampakkam, Chennai- 115	Pinayur	417	1.88.0	01.02.2021 to 31.01.2031
E-5	Tvl Udhayam Civil Construction pvt ltd., Managing Director Thiru D. Karthikeyan, No 66, Rajendra prasad road, Krishna Nagar, Kancheepuram.	Pazhaveri	203/1A1A, 204/1A,204/2, 205/1A, 2, 3, 206/1A,2A, 207/1, 2A,2B,2C,2D, 3, 4A,5A, 6A,7A & 8A	3.66.86	12.07.2019 to 11.07.2024
			TOTAL EXTENT	**15.63.86**	
ABANDONED QUARRIES					
Ex-1	Thiru S.udhayasooriyan	Pinayur	**415/1A**	2.42.5	20.09.2010 to 19.09.2015
Ex-2	Thiru.O.Ganesan	Pinayur	**415/1B**	0.81.0	24.09.2010 to 23.09.2015
			TOTAL EXTENT	**3.235**	
			TOTAL CLUSTER EXTENT	**16.60.36**	

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

TERMS OF REFERENCE (ToR) COMPLIANCE

Lr No. SEIAA-TN/F.No.8782/SEAC/ToR-1069/2022 Dated: 01.03.2022

ADDITIONAL CONDITIONS		
1	The proponent shall carry out the cumulative & comprehensive impact study due to mining operations carried out in the quarry cluster specifically with reference to the environment in terms of air pollution and health impacts, accordingly the environment management plan should be prepared keeping the concerned quarry and the surrounding habitations in the mind.	The cumulative & comprehensive impact study detailed in chapter-7 and Air pollution and health impacts detailed in chapter-4 environment management plan detailed in chapter-6 and 10
2	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, a. What was the period of the operation and stoppage of the earlier mines with last work permit issued by the AD/DD mines? b. Quantity of minerals mined out c. Highest production achieved in any one year d. Detail of approved depth of mining e. Actual depth of the mining achieved earlier f. Name of the person already mined in that leases area g. If EC and CTO already obtained, the copy of the same shall be submitted. h. whether the mining was carried out as per the approved mine plan (or EC if issued) with stipulated benches.	It is a fresh Lease application Depth of mining 20m bgl Highest Production 6300m^3 of Rough Stone For 10year plan.
3	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).	Satellite imagery of the project area along with boundary coordinates is given in the Chapter No 1 Geomorphology of the area is given in Chapter No 2 Land use pattern of the project area is tabulated in the Chapter No.2. Land use pattern of the Study area is tabulated in the Chapter No.31
4	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.	As per the recommendations during SEAC ToR Presentation of the proposal and commitment of PP a count of 500 Nos of trees were planted as a part of greenbelt development programme all along the periphery of the lease applied area and approach roads and village roads. As well the pp has provided wire fencing as recommended all along the boundary of the lease applied area.
5	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	Details of mineral reserves and mineable reserves, planned production capacity, proposed working methodology justifications are provided in Chapter 2. The anticipated impacts of the mining operations on the surrounding environment and the remedial measures for the same are provided in Chapter 4..
6	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.	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, 196l for carrying out the quarrying operations scientifically and systematically in order to ensure safety and to protect the environment chapter-6

7	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 will intersect groundwater. Necessary data and documentation in this regard may be provided.	The hydro-geological study was conducted to evaluate the possible impact on the ground water table. No significant impacts are anticipated on the water bodies around the project area. Details are discussed under Chapter No. 3.
8	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.	Baseline Data were collected for One Season (Winter season) Dec 2023 to Feb 2024 as per CPCB Notification and MoEF & CC Guidelines. Details in Chapter No. 3.
9	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.	Detailed in tree survey and species of diameter in chapter-3 Ecology environment
10	A detailed mine closure plan for the proposed project shall be included in EIA/EMP report which should be site-specific.	A detailed mine closure plan in chapter-4
11	The Public hearing advertisement shall be published in one major National daily and one most circulated vernacular daily.	Noted, as per instruct public hearing advertisement local language and circulated national daily news paper.
12	The recommendation for the issue of "Terms of Reference" is subjected to the outcome of the Hon'ble NGT, Principal Bench, New Delhi in O.A No.186 of 2016 (M.A.No.350/2016) and O.A. No.200/2016 and O.A.No.580/2016 (M.A.No.1182/2016) and O.A.No.102/2017 and O.A.No.404/2016 (M.A.No.758/2016, M.A.No.920/2016, M.A.No.112212016, M.A.No.1212017 & M.A. No. 843/2017) and O.A.No.40512016 and O.A.No.520 of 2016 (M.A.No.98 1/20 1 6, M.A.No.982 1201 6 & M.A.No.384/2017).	Noted and agreed
13	The purpose of green belt around the project is to capture the fugitive emissions, carbon sequestation 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 in consultation with the DFO, State Agriculture University and local school/college authorities. 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.	As per the recommendations during SEAC ToR Presentation of the proposal and commitment of PP a count of 500 Nos of trees were planted as a part of greenbelt development programme all along the periphery of the lease applied area and approach roads and village roads.
14	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	Detailed in chaper-3 Ecology biodiversity studies.
15	A Disaster management Plan shall be prepared and included in the EIA/EMP Report for the complete	Disaster management Plan details in Chapter-7

	life of the proposed quarry (or) till the end of the lease period.	
16	A Risk Assessment and management Plan shall be prepared and included in the ELA/EMP Report for the complete life of the proposed quarry (or) till the end of the lease period.	A Risk Assessment and management Plan Chapter-7
17	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.	Socio Economic study has been carried out the details are given in the Chapter No.3.
18	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.	Occupational Health impacts chapter- 10
19	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 (Protection) Act, 1986.	Noted & agreed
NORMAL CONDITIONS		
1	As per the MoEF& CC office memorandum F.No.22-65/2017-IA.III dated: 30.09.2020 and 20.10.2020 the proponent shall address the concerns raised during the public consultation and all the activities proposed shall be part of the Environment Management Plan.	Details in chapter.1 and 7 salient features of quarry with existing quarry.
2	The Environmental Impact Assessment shall study in detail the carbon emission and also suggest the measures to mitigate carbon emission including development of carbon sinks and temperature reduction including control of other emission and climate mitigation activities.	Details of carbon emission and mitigation activities are given int the Chapter No.4
3	The Environmental Impact Assessment should study the biodiversity, the natural ecosystem, the soil micro flora, fauna and soil seed banks and suggest measures to maintain the natural Ecosystem.	EIA study in biodiversity and natural ecosystem detailed in chapter-3 and 4
4	Action should specifically for suggested for sustainable management of the area and restoration of ecosystem for flow of goods and services.	EIA study in sustainable management of the area and restoration of ecosystem detailed in chapter-3 and 4
5	The project proponent shall study impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.	Impact on fish habitats and the food WEB/ food chain in chapter-4 biological environment
6	The Terms of Reference should specifically study impact on soil health, soil erosion, the soil physical, chemical components and microbial components.	Impact of soil and soil erosion detailed in chapter-3 soil environment.
7	The Environmental Impact Assessment should study impact on biodiversity, vegetation, endemic, vulnerable and endangered indigenous flora and fauna.	EIA study in biodiversity and natural ecosystem detailed in chapter-3 and 4
8	The Environmental Impact Assessment should study impact on standing trees and the trees should be numbered.	There in no standing trees in the study area. Detailed in chapter-3 Ecology and biodiversity environment.

9	The Environmental Impact Assessment should study on wetlands, water bodies, rivers, streams, lakes and farmer sites.	Detailed discussed in chapter 4-Water environment
10	The Environmental Impact Assessment should hold detailed study on EMP with budget for green belt development and mine closure plan including disaster management plan.	Detailed in EMP with budget in chapter-10 Mine closure plan including disaster management plan chapter-7
11	The Environmental Impact Assessment should study impact on climate change, temperature rise, pollution and above soil & below soil carbon stock.	Detailed discussed in chapter 7.
12	The Environmental Impact Assessment should study impact on protected areas, Reserve Forests, National Parks, Corridors and Wildlife pathways	Karkili Birds sanctuary-16km-SW Vedanthangal Birds sanctuary-22km-S There is no impact on protected area.

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 projects are 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.	Document is enclosed along with Approved Mining Plan as Annexure Volume 1 for the respective projects.
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.	Attached in Approved mining plan in Annexure volume.
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).	Satellite imagery of the project area along with boundary co-ordinates is given in the Chapter No 1 Figure No .1.1 Page No.10 Geomorphology of the area is given in Chapter No 2 Figure No 2.10. Page No.18 Land use pattern of the project area is tabulated in the Chapter No.2. Table No.2.3 Page No.16 Land use pattern of the Study area is tabulated in the Chapter No.3 Table No 3.2 Page No.31
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, Page No. 18 Geomorphology of the area is given in Chapter No 2 Figure No 2.10. Page No.41.
6	Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.	The applied area was inspected by the officers of Department of Geology along with revenue officials and found that the land is fit for quarrying under the policy of State Government.
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	The proponent has framed their Environmental Policy and the same is discussed in the Chapter No 10.1, Page No 124 Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report in chapter 6

	for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.	
8	Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.	It is an opencast quarrying operation proposed to operate in Mechanized method. The rough stone formation is a hard, compact and homogeneous body. The height and width of the bench will be maintained as 5m with 90^0 bench angles. Quarrying activities will be carried out under the supervision of Competent Persons like Mines Manager, Mines Foreman and Mining Mate. Necessary permissions will be obtained from DGMS after obtaining Environmental Clearance.
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.	Land use and land cover of the study area is discussed in Chapter No. 3, Page No. 54. 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, Page No 33.
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.** There is no waste anticipated during this quarry operation. The entire quarried out rough stone will be transported to the needy customers. No Dumps is proposed outside the lease area.
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.	Kaveripakkam R.F - 2.0 km- South side Idaimichi R.F - 5.40 km- SW side Appur R.F- 8.0 km- NE side The proposed project area is a Patta land. Approved Mining Plan is enclosed as Annexure Volume 1.
13	Status of forestry clearance for the brake 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.	Kaveripakkam R.F - 2.0 km- South side Idaimichi R.F - 5.40 km- SW side Appur R.F- 8.0 km- NE side
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.	Kaveripakkam R.F - 2.0 km- South side Idaimichi R.F - 5.40 km- SW side

		Appur R.F- 8.0 km- NE side
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	Karkili Birds sanctuary-16km-SW Vedanthangal Birds sanctuary-22km-S
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, Page No. 97. 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, Page No 97.
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.
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	**Not Applicable.** 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.

	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.	
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 (Dec 2023-Feb 2024 (Winter Season) 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.	Air Quality Modelling for prediction of incremental GLC's of pollutant was carried out using AERMOD view 12.0 Model. Details in 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.	Total Water Requirement for this project is given in the chapter No 2, Table No 2.13, Page No 54
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 obtained from accumulated rainwater/seepage water in mine pits. Drinking water will be sourced from the approved water vendors, No 2, Table No 2.13, Page No 54
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.	Impact Studies and Mitigation Measures of Water Quality discussed in Chapter No. 4, Page No. 110.
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.	The ground water table is at 45-50m below ground level. In these projects, ultimate depth is 20m Maximum from the general ground profile. It is inferred the quarrying activities in the Cumulative EIA project (Quarries) 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.	Highest elevation of the project area is 64m AMSL Ultimate depth of the mine is 20m bgl Water level in the area is 45m BGL to 50m BGL
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.	Progressive greenbelt development plan has been prepared and discussed along with Recommended Species details are given in the Chapter 4, Table No.4.12 Page No 125
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, Page No 52.
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.	Infrastructure & other facilities will be provided to the Mine Workers after the grant of quarry lease and the same has been discussed in the Chapter No.2. Page No. 55.
33	Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.	Discussed in chapter No 2.
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.	Details in Chapter 10.
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.	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.	Details in Chapter No. 4
37	Measures of socioeconomic 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.	Details of Socio-Economic is given in the Chapter No 3.

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.	Environment Management Plan Chapter 10.
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.	Public hearing points and commitment of the project proponent will be updated in the final EIA & EMP Report.
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.	Detailed under Chapter 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.	Total Water Requirement for this project is given in the chapter No 2, Table No 2.13.
44	**Besides the above, the below mentioned general points are also to be followed: -**	
A	Executive Summary of the EIA/EMP Report	Encloses as separate volume
B	All documents to be properly referenced with index and continuous page numbering.	All the documents are properly referenced with index and continuous page numbering.
C	Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.	List of Tables and source of the data collected are given properly.
D	Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF & CC / NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project	Copy of Baseline monitoring reports are enclosed with this draft as annexure
E	Where the documents provided are in a language other than English, an English translation should be provided.	Not Applicable.
F	The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.	Questionnaire of the project will be submitted in final EIA report after complying the public hearing points.
G	While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF & CC vide O.M. No. J-11013/41/2006-IA.II(I) Dated: 4th August, 2009, which are available on the website of this Ministry, should be followed.	Instructions issued by MoEF & CC O.M. No. J-11013/41/2006-IA. II (I) Dated: 4th August, 2009 are followed.
H	Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF & CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation	There are no changes in Form-I, Mining plan and Pre-feasibility report for all the projects.
I	As per the circular no. J-11011/618/2010-IA. II(I) Dated: 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of	Not applicable.

	the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.	
J	The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.	Satellite imagery of the project area along with boundary coordinates is given in the Chapter No 1 Figure No .1.1 Page No.3 Geomorphology of the area is given in Chapter No 2 Figure No 2.10. Page No.41

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1.INTRODUCTION

1.0 PREAMBLE

Project History: -

The project proponent Thiru N.Murugan applied for Rough stone and Gravel quarry over an extent of 0.96.50 Ha in S.F.No 415/2A,415/2B, Pinayur Village, Uthiramerur Taluk, Kancheepuram District.

- Proponent applied for Rough stone and Gravel quarry lease on 29.05.2017
- Precise area communication letter was issued by the District Collector vide RC.No. 618/Q3/2017 Dated 02.02.2021
- The Mining plan has been prepared by the Qualified person and got approval vide Letter RC.No. 618/Q3/2017 Dated 27.07.2021
- The Mining plan has been approved for the quantity of 42,895 m^3 of Rough stone, 18,819m^3 of Weathered rock and 12,546m^3 of Gravel up to the depth of 20m bgl for the period of Ten years.

As per the EIA Notification, 2006 and subsequent amendments and OM The proposal falls in the B1 Category (Cluster quarries - 1 proposal and 5 Exiting quarries forming Cluster Category {Total Extent of the Cluster is 16.60.36 Ha}- Cluster area calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016).

- Proponent applied for Terms of Reference vide Proposal No. SIA/TN/MIN/67203/2021 Dated 02.09.2021 and the ToR Was Granted vide Lr No.SEIAA-TN/F.No.8782/ToR-1069/2022 Dated: 01.03.2022

Based on the ToR Baseline Monitoring study has been carried out for one season i.e., **Dec 2023 to Feb 2024** and this EIA/EMP report is prepared for considering cumulative impacts arising out of these projects, the Cumulative Environmental Impact Assessment study is undertaken, which is followed by preparation of a detailed Environmental Management Plan (EMP) to minimize those adverse impacts.

Environmental Impact Assessment (EIA) is the management tool to ensure the sustainable development and it is a process, used to identify the environmental, social and economic impacts of a project prior to decision-making. It is a decision-making tool, which guides the decision makers in taking appropriate decisions for any project. EIA systematically examines both beneficial and adverse consequences of the project and ensures that these impacts are taken into account during the project designing. It also reduces conflicts by promoting community participation, information, decision makers, and helps in developing the base for environmentally sound project.

1.1 PURPOSE OF THE REPORT

The Ministry of Environment and Forests, Govt. of India, through its EIA notification S.O. 1533(E) of 14th September 2006 and its subsequent amendments as per Gazette Notification S.O. 1889 of 20thApril 2022, Mining Projects are classified under two categories i.e. A (> 250 Ha) and B (≤ 250 Ha), and Schematic Presentation of Requirements on Environmental Clearance of Minor Minerals including cluster situation in Appendix–XI.

Now, as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018 clarified the requirement for EIA, EMP and therefore, Public Consultation for all areas from 5 to 25 ha falling in Category B1 and appraised by SEAC/ SEIAA as well as for cluster situation.

The proposed projects are categorized under category "B1" Activity 1(a) (mining lease area in cluster situation) and will be considered at SEIAA – TN after conducting Public Hearing and Submission of EIA/EMP Report for Grant of Environmental Clearance.

"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 CLUSTER QUARRIES

1.2 IDENTIFICATION OF PROJECT AND PROJECT PROPONENTS

1.2.1 Identification of Project Proponent

TABLE 1.1: DETAILS OF PROJECT PROPONENT

Name of the Project Proponent	Thiru N.Murugan Rough Stone and Gravel Quarry
Address	S/o. Nagan, No.3, Navasi Street, Thiruneermalai, Chennai – 600 044
Mobile	96772 84502
Email	muruganquarry@gmail.com
Status	Individual

1.2.2 Identification of Project

TABLE 1.2: SALIENT FEATURES OF THE PROPOSED PROJECT

Name of the Project	Thiru N.Murugan Rough Stone and Gravel Quarry		
S.F. No.	415/2A & 415/2B		
Extent	0.96.50 ha		
Village Taluk and District	Pinayur Village, Uthiramerur Taluk, Kancheepuram District.		
Land Type	It is a patta land registered in the name of SAH foundations (P) Ltd, vide patta No.351. The applicant has obtained consent from the pattadhars.		
Toposheet No	57-P/14		
Latitude between	**12° 44' 45.44"N to 12° 44' 48.14"N**		
Longitude between	**79° 52' 41.25"E to 79° 52' 47.03"E**		
Lease period	10 Years		
Mining Plan period	10 Years		
Proposed Depth of Mining	20m bgl (2m Gravel + 3m Weathered Gravel + 15m Rough stone)		
Geological Resources	Rough Stone in m^3	Weathered Rock m^3	Gravel m^3
Mineable Reserves	1,42,725	28,545	19,030
	42,895	18,819	12,546
Year wise Production for first five years	13,915	18,819	12,546
Year wise Production for next five years	28,980	-	-
Ultimate Pit Dimension	153m (L) x 55m (W) x 20m(D) bgl		
Water Level in the region	45-50m bgl		
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives		
Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards eastern side. The altitude of the area is 64m (Max) above Mean Sea level. The area is covered by 2.0m thickness of Gravel, 3m Weathered Rock and followed by Massive Charnockite is found after 5.0m (Gravel + Weathered Rock) which is clearly inferred from the nearby existing quarrying pits.		
Machinery proposed	Jack Hammer	2 Nos	
	Compressor	1 No.	
	Excavator with Bucket and Rock Breaker	1 No.	
	Tippers	1 No.	
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.		
Proposed Manpower Deployment	13 Nos		

Project Cost	Rs. 22,08,000/-	
EMP Cost	Rs. 7,60,000/-	
Total Project cost	Rs. 29,68,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Tank	420m_NW
	Tank	430m_SW
	Vaikkaal	410m_NW
	Kavanipakkam Lake	1.5Km_SE
	Palar River	2Km_N
	Cheyyar River	2.7km_NW
	Palur Lake	3.5Km_NE
	Salavakkam Lake	6.2km_SE
Greenbelt Development Plan	Proposed to plant 500 Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	2.0 KLD	
Nearest Habitation	470m – South East	
Nearest Reserve Forest	Kaveripakkam R.F - 2.0 km- South side Idaimichi R.F - 5.40 km- SW side Appur R.F- 8.0 km- NE side	
Nearest Wild Life Sanctuary	Karkili Birds sanctuary-16km-SW Vedanthangal Birds sanctuary-22km-S	

Source: Approved Mining & Land Documents.

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Nature and Size of the Project

The quarrying operation is proposed to be carried out by Opencast Mechanized Mining method with 5.0m bench height and 5.0m bench width by deploying Jack Hammer Drilling & Slurry Explosive during blasting. Hydraulic Excavator and tippers are used for Loading and transportation. Rock Breakers are deployed to avoid secondary blasting.

The peak production of Rough stone is 6300m^3maximum in a year (21m^3 per day/ 2 Tippers per day considering 12m^3 per load). The depth of the mining is 20m bgl.

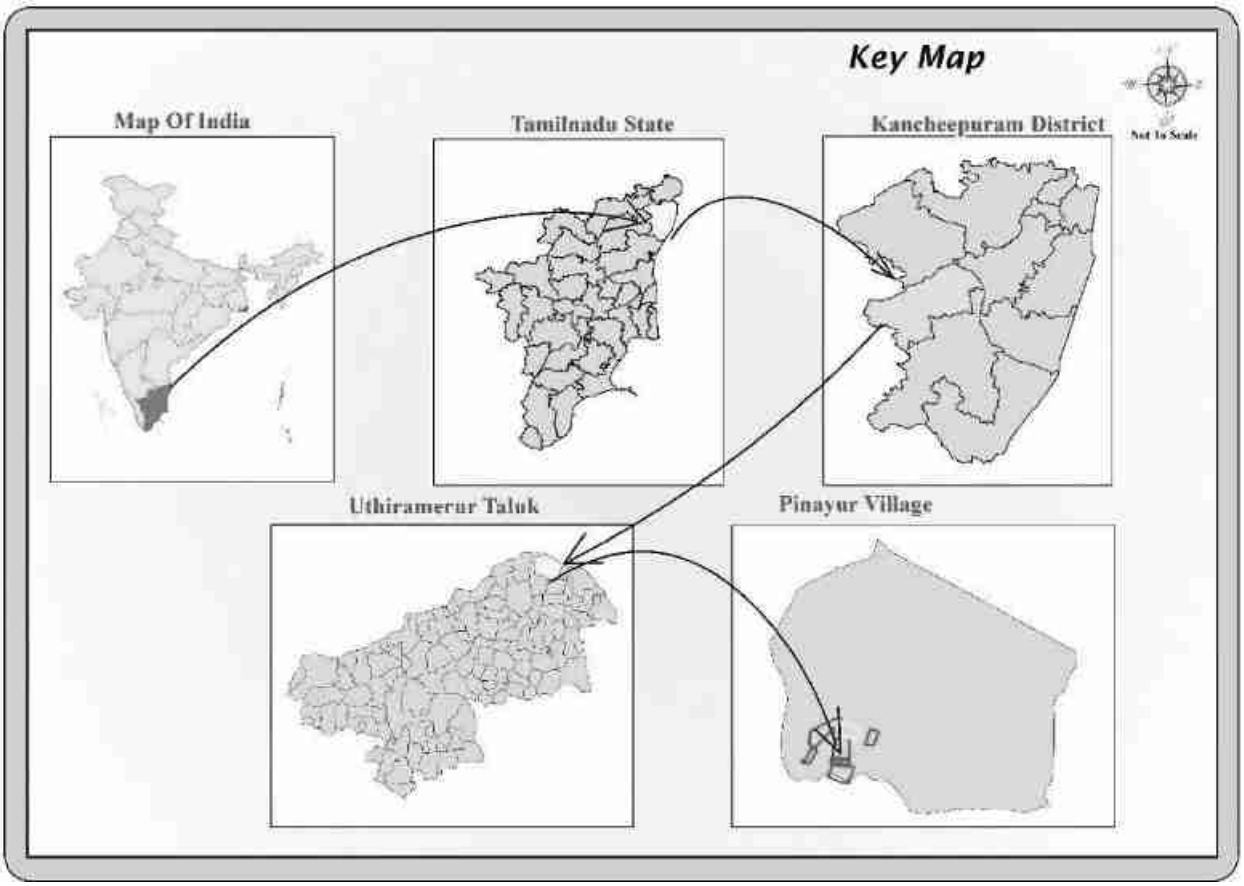
1.3.2 Location of the Project

- The project site is located in Pinayur Village, Uthiramerur Taluk and Kancheepuram District.
- 21km Southeast of Kancheepuram, 20km Northeast of Uthirramerur and 1km Northeast side of Pinayur Village.

Kancheepuram —25km→ Uthiramerur —20km→ Pinayur —1km→ Lease applied area

Southeast Northeast Northeast

FIGURE 1.2 LOCATION MAP OF THE PROJECT SITE



Source: Survey of India Toposheet 58-A/15 & 16

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

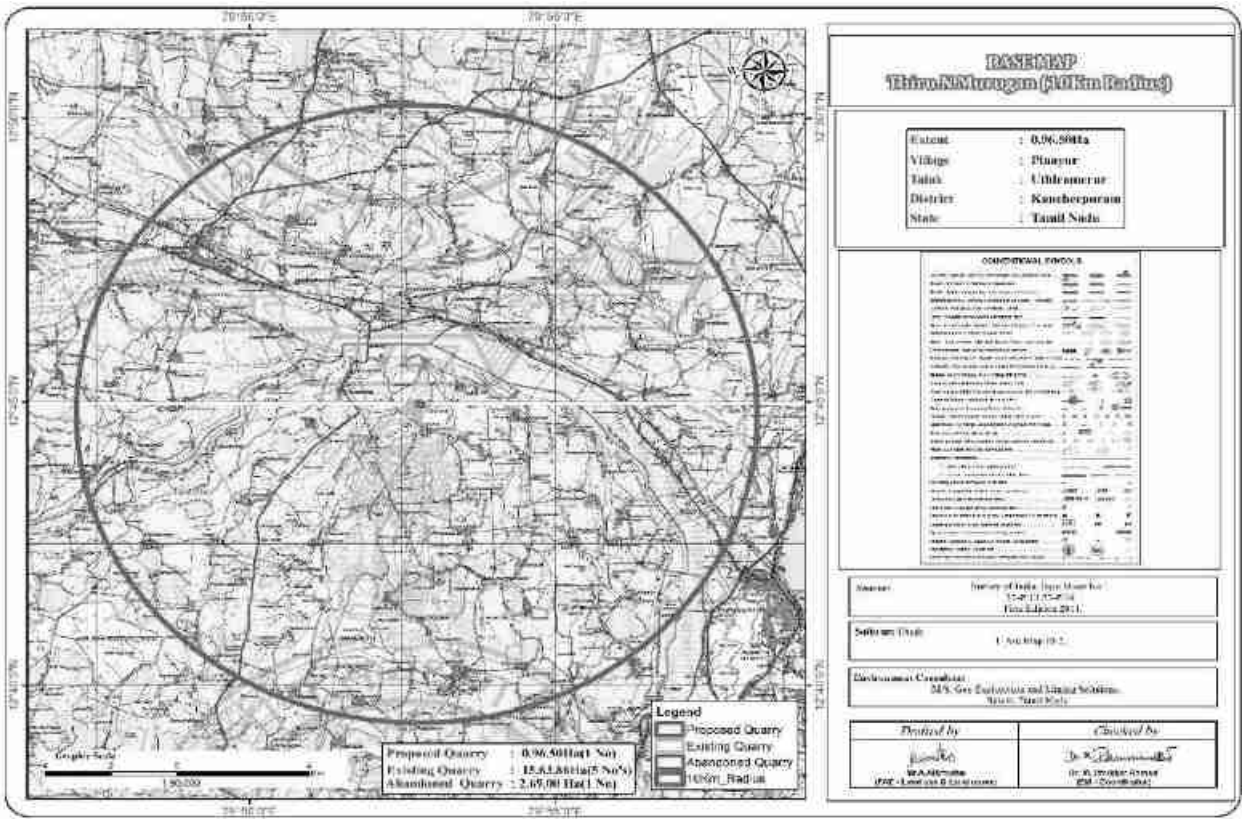
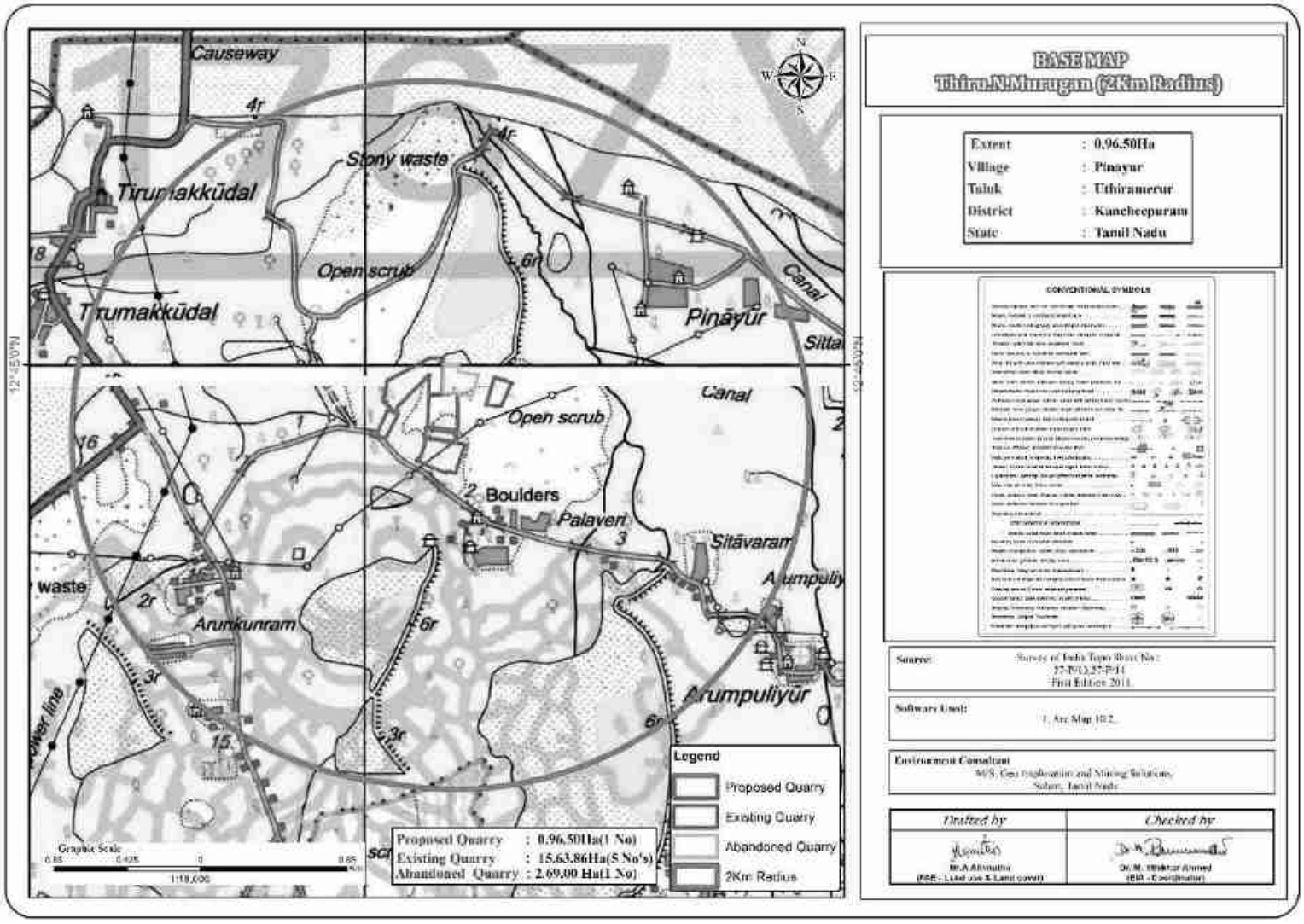


FIGURE 1.4: TOPOSHEET MAP OF THE STUDY AREA 2KM RADIUS



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 –

- Proponent applied for Rough stone and Gravel quarry lease on 29.05.2017
- Precise area communication letter was issued by the District Collector vide RC.No. 618/Q3/2017 Dated 02.02.2021
- The Mining plan has been prepared by the Qualified person and got approval vide Letter RC.No. 618/Q3/2017 Dated 27.07.2021
- The proposed project falls under "B1" Category as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018
- Proponent applied for ToR for Environmental Clearance vide online Proposal No. SIA/TN/MIN/67203/2021. dated: 02.09.2021.

SCOPING:

- The proposal was placed in 245th SEAC meeting held on 11.02.2022 and the committee recommended for issue of ToR.
- The proposal was considered in 488th SEIAA meeting held on 28.02.2022 and issued ToR vide Lr No. SEIAA-TN/F. No8782/ToR-1069/2022 Dated: 01.03.2022

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.

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.

1.5 TERMS OF REFERENCE (ToR)

The ToR was issued by the SEIAA vide Lr No. SEIAA-TN/F.No.8782/ToR-1069/2022 Dated: 01.03.2023. The Details of the ToR Compliance is given in the Page No.

1.6 POST ENVIRONMENT CLEARANCE MONITORING

The proponent 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. 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 winter season (Dec 2023 to Feb 2024) for various environmental components so as to assess the anticipated impacts of the cluster quarry projects on the environment and suggest suitable mitigation measures for likely adverse impacts due to the proposed project.

TABLE 1.3: 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 7 locations (1 Core & 6 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 – 2 Surface water and 4 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)	7 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 for all Proposed Quarries

- Application for Quarrying Lease as per Tamil Nadu Minor Mineral Concession Rules, 1959.
- Obtained Precise Area Communication Letter as per Tamil Nadu Minor Mineral Concession Rules, 1959 for Preparation of Mining Plan and obtaining Environmental Clearance.
- The Mining Plan has been approved under Rule 41 & 42 as amended of Tamil Nadu Minor Mineral Concession Rules, 1959.
- ToR vide Lr No. SEIAA-TN/F.No.8782/ToR-1069/2022 Dated: 01.03.2022

****

2. PROJECT DESCRIPTION

2.0 GENERAL

The Proposed Rough Stone Quarries requires Environmental Clearance. There are 1 proposed, and 5 existing quarries forming a cluster; calculated as per MoEF & CC Notification S.O. 2269(E) Dated 1st July 2016 and the total extent of cluster is 16.60.36 ha.

As the extent of cluster are more than 5 ha, the proposal falls under B1 Category as per the Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018, and requirement for EIA, EMP and Public Consultation for obtaining Environmental Clearance.

2.1 DESCRIPTION OF THE PROJECT

The proposed project is site specific and there is no additional area required for this project. There is no effluent generation/discharge from this project. Method of mining is opencast mechanized method involving splitting of rock mass of considerable volume from the parent rock mass by jackhammer drilling and blasting, hydraulic excavators are used for loading the Rough Stone from pithead to the needy crushers and rock breakers to avoid secondary blasting.

2.2 LOCATION OF THE PROJECT

- 21km Southeast of Kancheepuram, 20km Northeast of Uthirramerur and 1km Northeast side of Pinayur Village.

Kancheepuram —25km (Southeast)→ Uthiramerur —20km (Northeast)→ Pinayur —1km (Northeast)→ Lease applied area

TABLE 2.1: SITE CONNECTIVITY

Nearest Roadway	NH45- Chennai – Dindigul is 11km -SE SH58- Kancheepuram – Chengalpattu is 3km -NE
Nearest Village	Pinayur – 1km- NE
Nearest Town	Walajabad -8.0km – NW
Nearest Railway Station	Palayaseevaram Railway station - 3.0km – North
Nearest Airport	Chennai Airport – 59km –NE
Seaport	Chennai – 70 km – NE

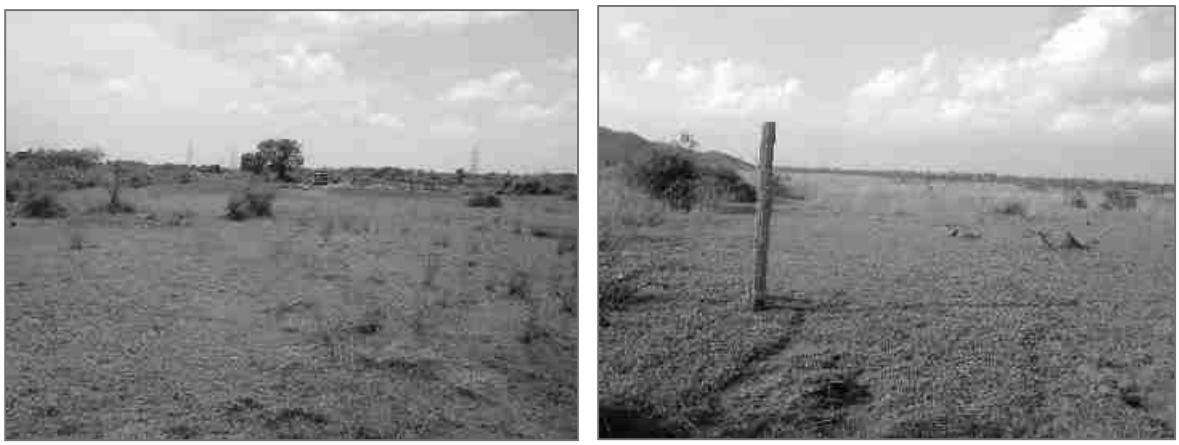
Source: Survey of India Toposheet

TABLE 2.2: CO-ORDINATES – PROJECT BOUNDARY

Corner Nos.	Latitude	Longitude
1	$12^0$44’46.29” N	$79^0$52’41.25” E
2	$12^0$44’48.14” N	$79^0$52’41.40” E
3	$12^0$44’47.25” N	$79^0$52’47.03” E
4	$12^0$44’45.44” N	$79^0$52’46.97” E
Datum: UTM-WGS84,		

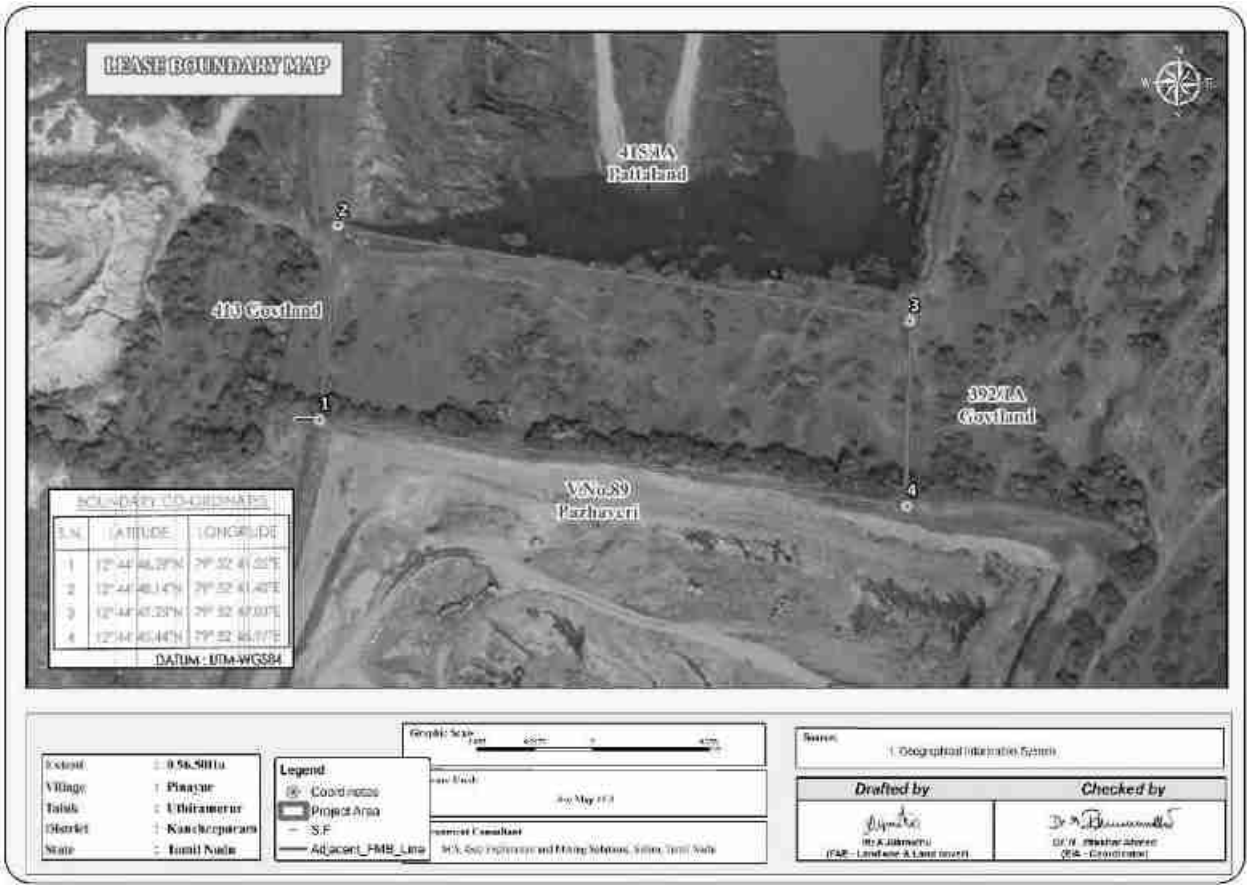
Source: Approved Mining Plan

FIGURE 2.1: TOPOGRAPHICAL VIEW OF PROJECT AREA



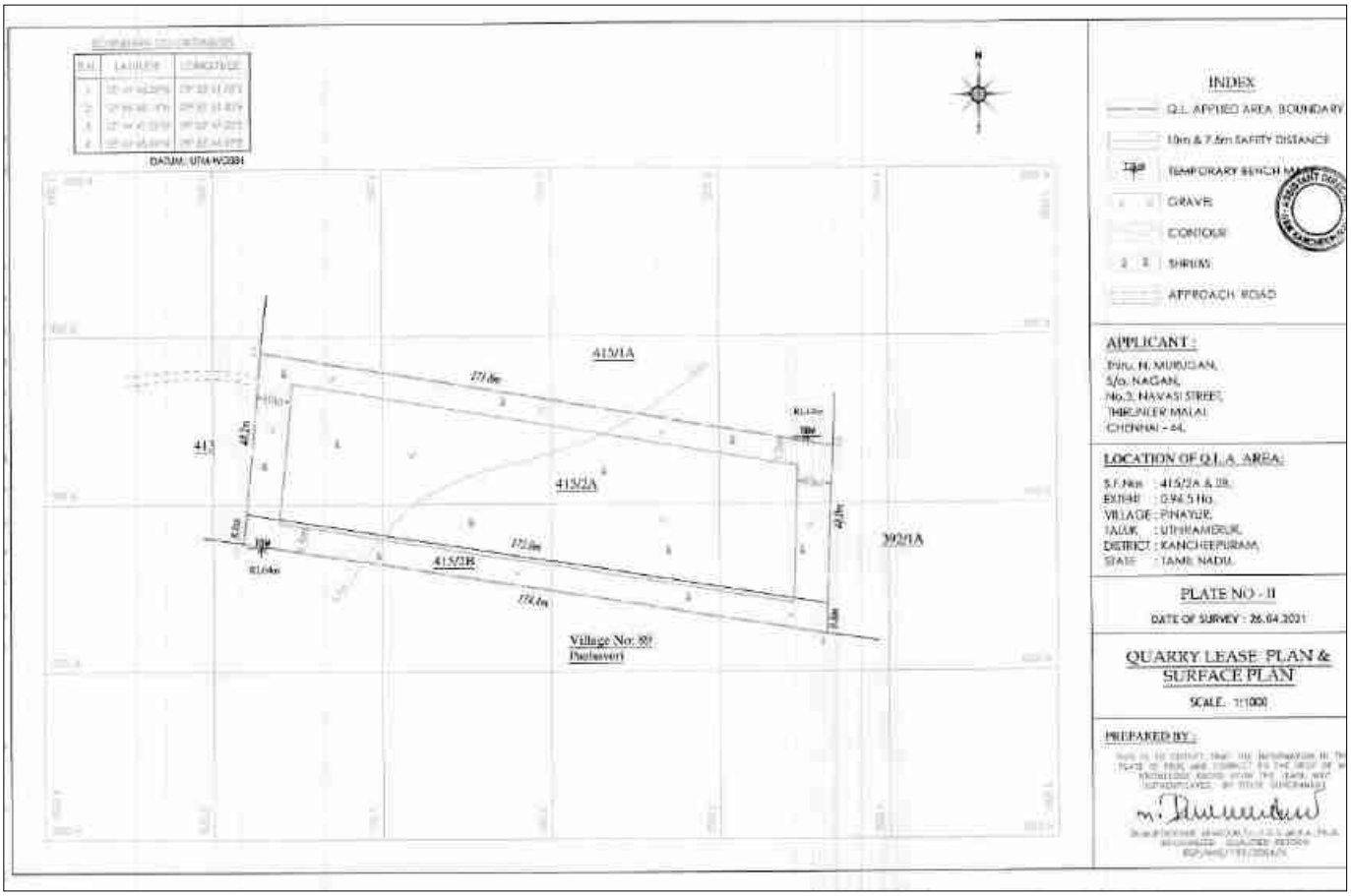
PROJECT SITE PHOTOGRAPHS

FIGURE 2.2: GOOGLE IMAGE OF THE PROJECT AREA



Source: Google Earth Imagery

FIGURE 2.3: QUARRY LEASE PLAN / SURFACE PLAN



Source: Approved Mining Plan

FIGURE 2.4: VILLAGE MAP SUPERIMPOSED ON GOOGLE EARTH IMAGE

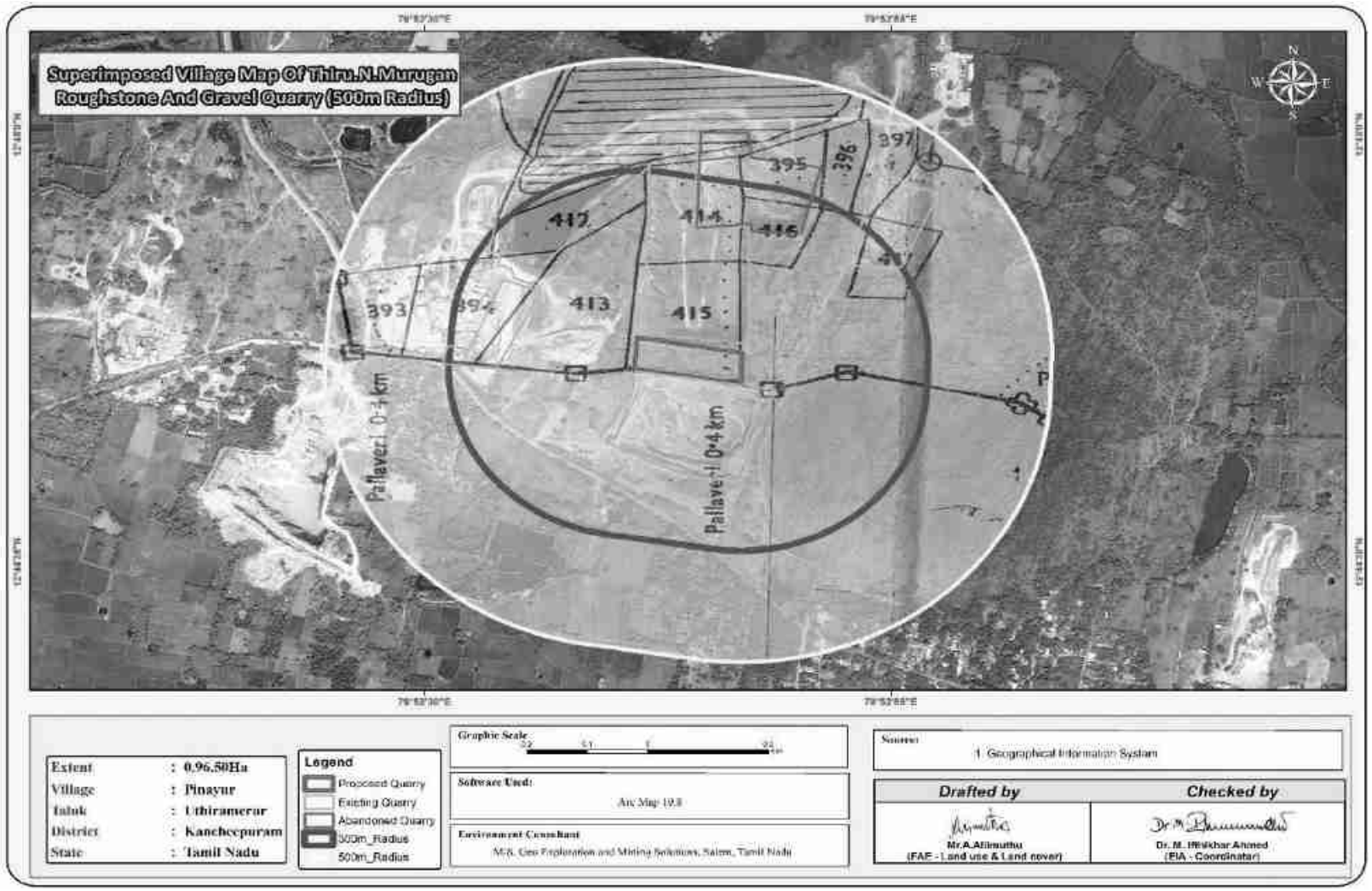


FIGURE 2.5: IMAGE SHOWING SURFACE FEATURES AROUND 10 KM RADIUS

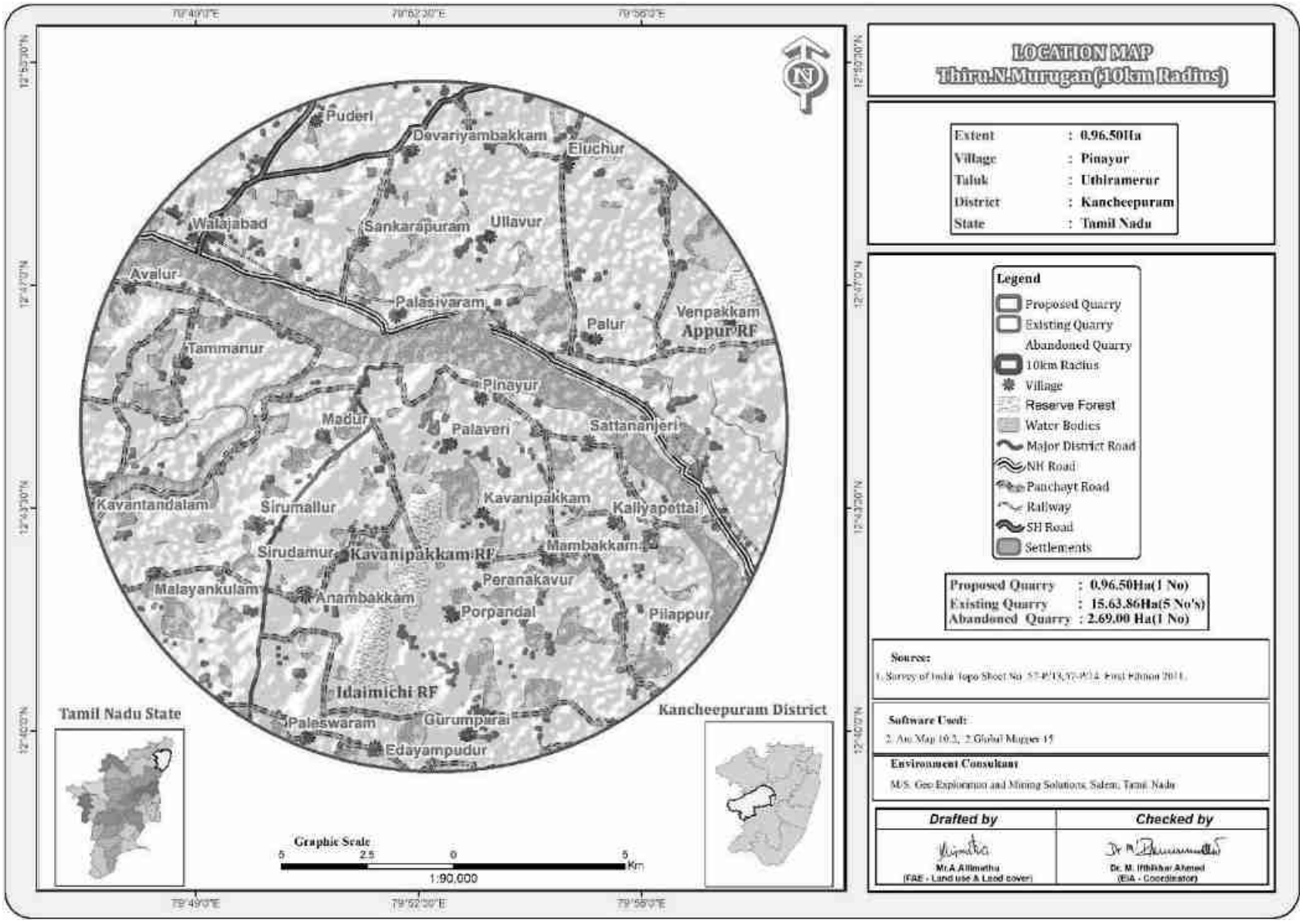
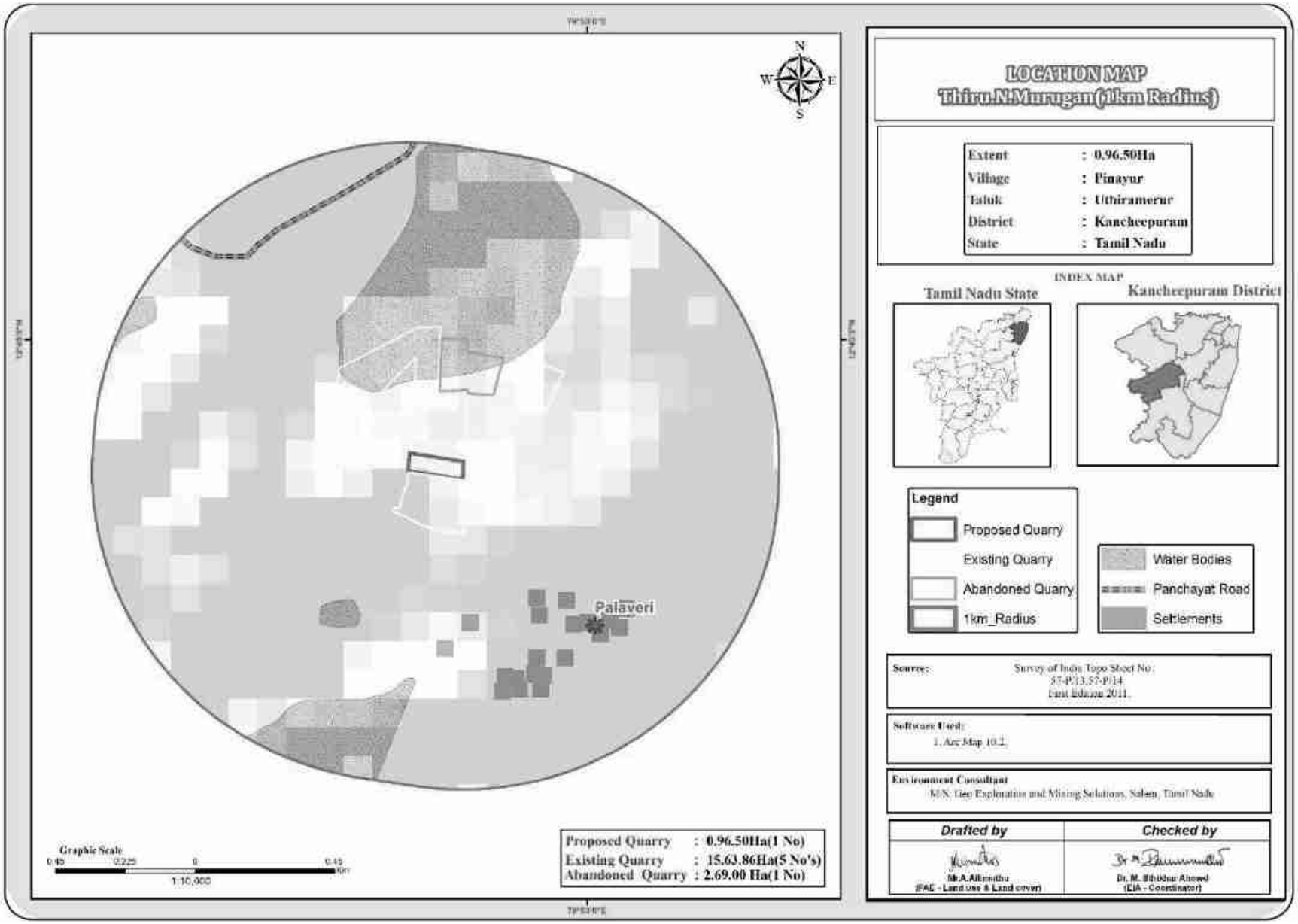


FIGURE 2.6: IMAGE SHOWING SURFACE FEATURES AROUND 1 KM RADIUS



2.2.1 Project Area

- The project is site specific & no beneficiation or processing in the project site.
- There is no forest land involved in the proposed projects and is devoid of major vegetation and trees.

TABLE 2.3: LAND USE PATTERN

Description	Present area (Ha)	Area at the end of this quarrying period (Ha)
Area under quarrying	Nil	0.62.0
Infrastructure	Nil	0.01.0
Roads	Nil	0.02.0
Green Belt	Nil	0.20.0
Unutilized Area	0.96.50	0.11.5
Grand Total	**0.96.50**	**0.96.50**

Source: Approved Mining

2.2.2 Size or Magnitude of Operation

TABLE 2.4: RESOURCES AND RESERVES

PARTICULARS	DETAILS		
	Rough Stone	Weathered Rock m^3	Gravel in m^3
Geological Resources	1,42,725	28,545	19,030
Mineable Reserves	42,895	18,819	12,546
Production for first five years plan period	13,915	18,819	12,546
Production for second years plan period	28,980	-	-
Peak Production	6,300	6,519	4,264
Mining Plan Period / Lease Applied Period	10 Years		
Number of Working Days	300 Days		
Production per day	14	21	14
No of Lorry loads ($6m^3$ per load)	2	3	2
Total Depth of Mining	20m (2m Gravel + 3m Weathered Gravel + 15m Rough stone) below ground level.		

Source: Approved mining plan.

2.3 GEOLOGY

2.3.1 Regional Geology

Peninsular gneiss forms the oldest rock formations, in which the massive formation of Charnockite lies over with rich accumulation of recent quaternary formation. On regional scale of the Charnockite body is N45°E – S45°W with dipping towards SE70º.

The general geological sequences of the rocks in this area are given below:

AGE		FORMATION
Recent	-	Quaternary
		Formation (Gravel + Weathered Rock)
----------Unconformity----------		
Archaean	-	Charnockite
		Peninsular Gneiss complex

The Kanchipuram area is endowed with a complex geological set up with crystalline rocks occurring in the southern part of the area and the northern part of the area the crystalline rocks occur at depths covered by sedimentary formations ranging from Gondwana to Recent. The depth at which the crystalline rocks occur progressively increase towards north. The sedimentary cover sequence is named as Palar basin and the thickness of the sediments is as high as 300 m in the northern part. The eastern part comprises unconsolidated sediments of fluvio-marine and marine origin.

Source: District Survey Report for Minor Minerals Kancheepuram District – March 2019

https://kancheepuram.nic.in/document/kancheepuram-district-mineral-survey-report/

2.3.2 Local Geology: -

The area exposes crystalline rocks of Archaean age and sedimentary rocks of Gondwana Supergroup and the Cuddalore Formation belonging to Mio-Pliocene age. A gravel and shingle bed locally known as Kanchipuram Gravels belong to the Pliocene to lower Pleistocene age. The laterite and alluvium are related to Quatemary age. The Archaean rocks are represented by Khondalite Group, Charnockite Group and Migmatite complex. Garnet Sillimanite Gneiss is well exposed in the Northeastern part of the district in Pachchamalai hill at Chrompet, Parangimalai and Southeast of Pallavaram. Charnockite in the predominant country rock and the type area for Charnockite is St. Thomas Mount at Pallavaram Taluk. The lower Gondwana sediments (Talchirs) overlie the Archaean rocks unconformably and are seen to the northeast and south of Palar river preserved in the trough faults and comprise boulder beds, dirty white to light green, greyish yellow fine sandstone, siltstone with clasts of rock fragments and khaki green to greenish grey shales. Source: https://tnmines.tn.gov.in/pdf/dsr/15.pdf

2.3.3 Hydrogeology

The Kancheepuram district is principally made up of hardrocks and sedimentary formations. These are overlained by laterites and alluvium. The study area is underlain by formations of Quarternary, Tertiary and Mesozoic ages followed by the basement complex of crystalline rocks of Archaean age. The general trend of the gneiss is NE-SW direction and the regional trend observed is NNE-SSW to NW-SE direction. The deposition of Gondwana raocks, the sedimentary rocks, in faulted troughs and in the rugges topography of crystalline rocks took place during Jurasic period. The insitu soils laterites and alluvial deposits were deposited along the Palar and Cheyyar rivers during the quarternary period.

Aquifer Systems:

Occurrence and storage of groundwater depend upon three factors viz., Geology, Topography and rainfall in the form of precipitation. Apart from Geology, wide variation in topographic profile and intensity of rainfall constitutes the prime factors of groundwater recharge. Aquifers are part of the more complex hydro geological system and the behaviour of the entire system cannot be interpreted easily. In hard rock terrain the occurrence of Ground Water is limited to top weathered, fissured and fractured zone which extends to maximum 30 m on an average it is about 10-15 m in Chengalpattu District.

In Sedimentary formations, the presence of primary inter granular porosity enhances the transmitting capacity of groundwater where the yield will be appreciable. The sedimentary area which occupies the eastern part of the district along the coastal tract is more favourable for groundwater recharge. Ground Water occurs both in semi confined and confined conditions. A brief description of occurrence of groundwater in each formation is furnished below.

Alluvial Formations

In the river alluvium groundwater occurs under water table condition. The maximum thickness is 37 m and the average thickness of the aquifer is approximately 12m. These formations are porous and permeable which have good water bearing zones.

Charnockite

Groundwater occurs under water table conditions but the intensity of weathering, joint, fracture and its development is much less when compared to gneissic formations. The groundwater potential is low, when compared with the gneissic formations.

Aquifer Parameters

The Transmissivity values in weathered, partly weathered and jointed rocks vary from 10.- 125 m^2 /day and specific yield in these formations is 1.5%. The specific yield of the porus formation varied from 1.4 – 10.6%. The transmissivity in the semi-consolidated and unconsolidated are varies from 23 to 52 m^2 /day and 200 – 300 m^2 /day respectively.

TABLE 2.5: RANGE OF AQUIFER PARAMETERS

Parameters	Range
Specific yield in %	1.4-10.6%
Transmissivity (T) m^2 /day	10-125 m^2 /day
semi-consolidated and unconsolidated	23-52 m^2/day and 200 – 300 m^2 /day

Source: http://cgwb.gov.in/district_profile/tamilnadu/kancheepuram.pdf

TABLE 2.6: GROUND WATER LEVEL VARIATION OF KANCHEEPURAM DISTRICT

Jan 2017	May 2017	Jan 2018	May 2018	Jan 2019	May 2019	Jan 2020	May 2020	Jan 2021	May 2021	5 Years PreMonsoon Average	5Years Post Monsoon Average
10.7	8.4	6.2	9.7	7.5	13.1	4.6	16.9	7.1	14.9	10.8	5.6

Source: https://www.twadboard.tn.gov.in/content/kanchipuram-district

FIGURE 2.7: REGIONAL GEOLOGY MAP

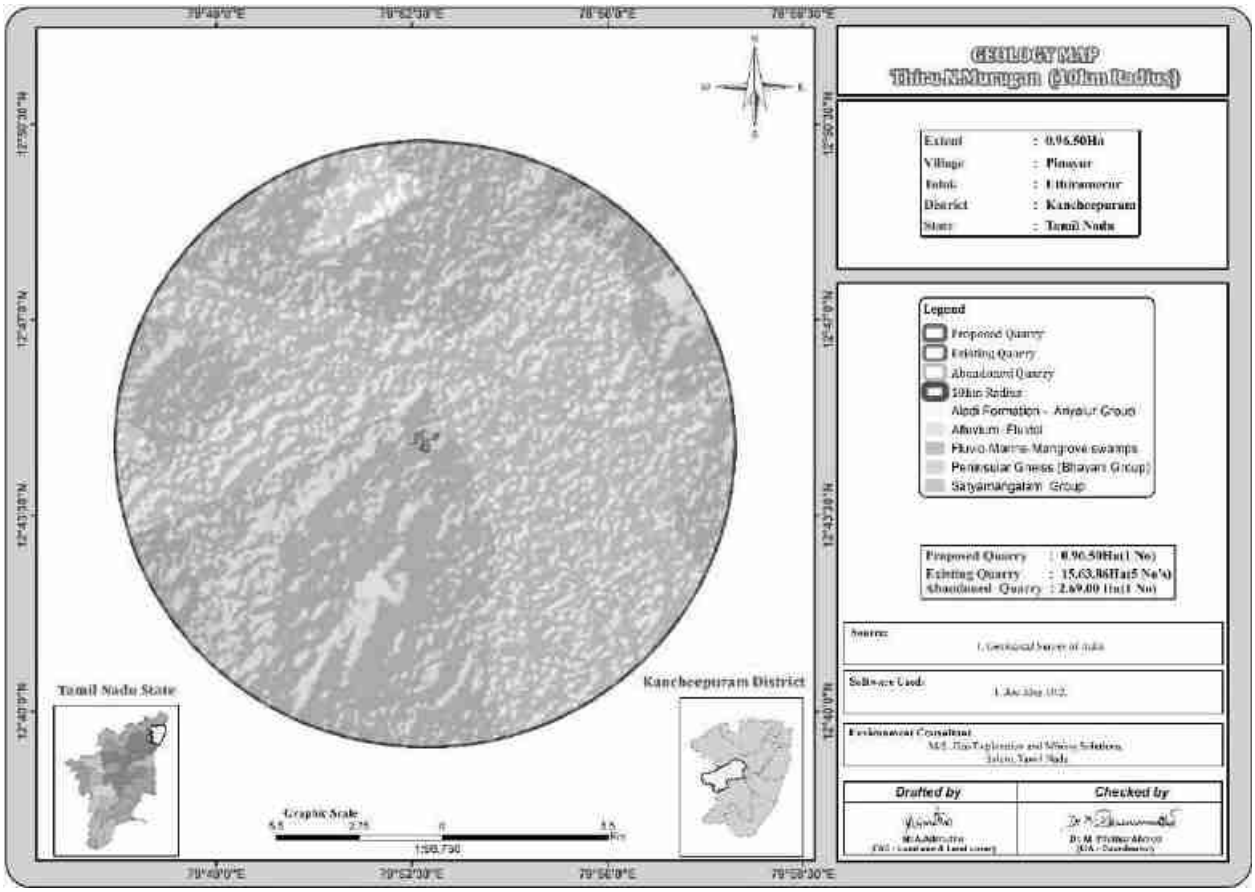
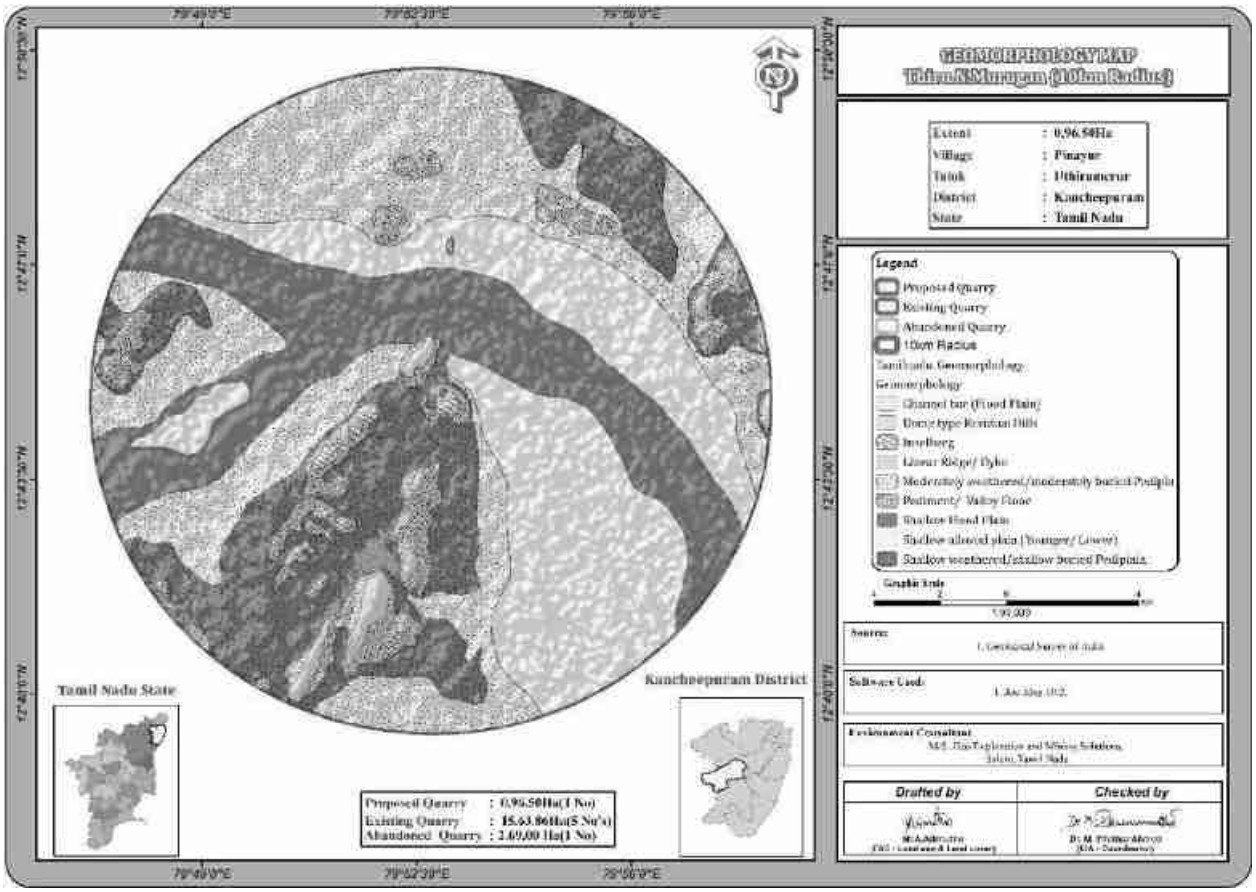


FIGURE 2.8: GEOMORPHOLOGY MAP



2.4 RESOURCES AND RESERVES

The Resources and Reserves of Rough Stone and Gravel were calculated based on Cross-Section Method by plotting sections to cover the maximum lease area. 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 applied 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 / side burden (100% Recovery Anticipated).

TABLE 2.5: RESOURCES AND RESERVES

Description	Rough Stone m^3	Weathered Rock m^3	Gravel m^3
Geological Resource in m^3	1,42,725	28,545	19,030
Mineable Resource in m^3	42,895	18,819	12,546
Year wise production for first five-year plan period	13,915	18,819	12,546
Year wise production for second five-year plan period	28,980	-	-

Source: Approved Mining Plan

TABLE 2.6: YEAR-WISE PRODUCTION PLAN FIRST FIVE-YEAR PLAN PERIOD

YEAR	ROUGH STONE (m^3)	WEATHERED ROCK m^3	GRAVEL (m^3)
I	775	6,150	4,264
II	775	6,150	4,100
III	775	6,519	4,182
IV	5,920	-	-
V	5,670	-	-
TOTAL	**13,915**	**18,819**	**12,546**

TABLE 2.6: YEAR-WISE PRODUCTION PLAN SECOND FIVE-YEAR PLAN PERIOD

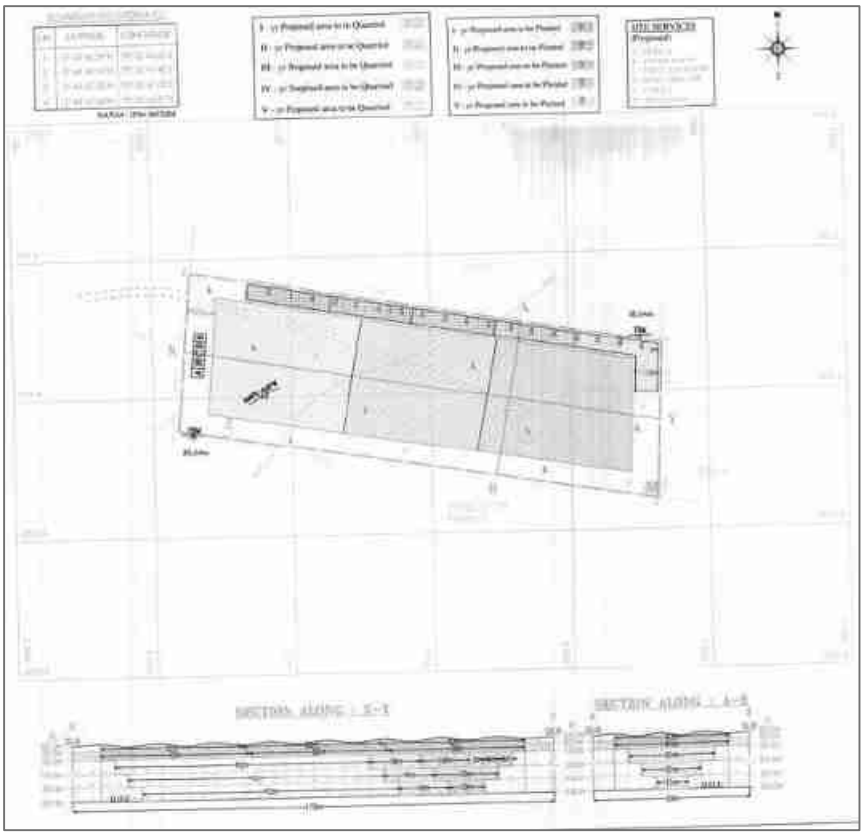
YEAR	ROUGH STONE (m^3)	WEATHERED ROCK m^3	GRAVEL (m^3)
I	6,300	-	-
II	6,300	-	-
III	6,300	-	-
IV	5,355	-	-
V	4,725	-	-
TOTAL	**28,980**	-	-

Source: Approved Mining Plan

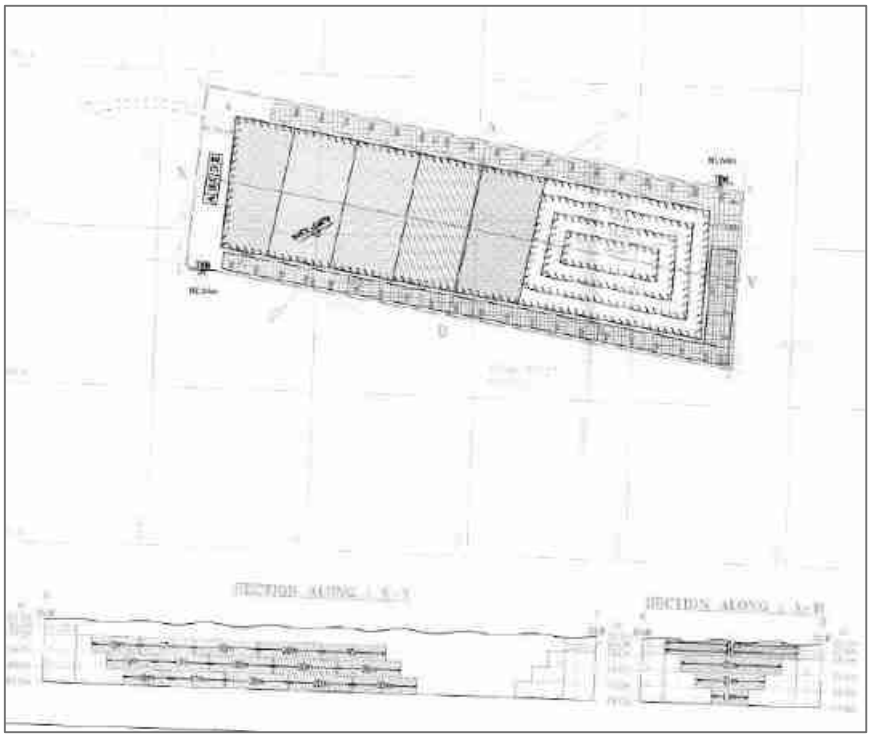
Disposal of Waste

The overburden in the form of Gravel formation is about 12,546m^3 up to depth 2m and Weathered formation is about 18,819m^3 up to depth 3m for during this period. the Gravel and Weathered Rock will be directly loaded into tippers for the filling and levelling of low-lying areas, this will be done only after obtaining permission and paying necessary seigniorage fees to the Government.

FIGURE 2.9: TOPOGRAPHY, GEOLOGICAL, YEAR-WISE DEVELOPMENT PRODUCTION PLAN AND SECTIONS



Source: Approved Mining Plan



Source: Approved Mining Plan

Conceptual Mining Plan/ Final Mine Closure Plan

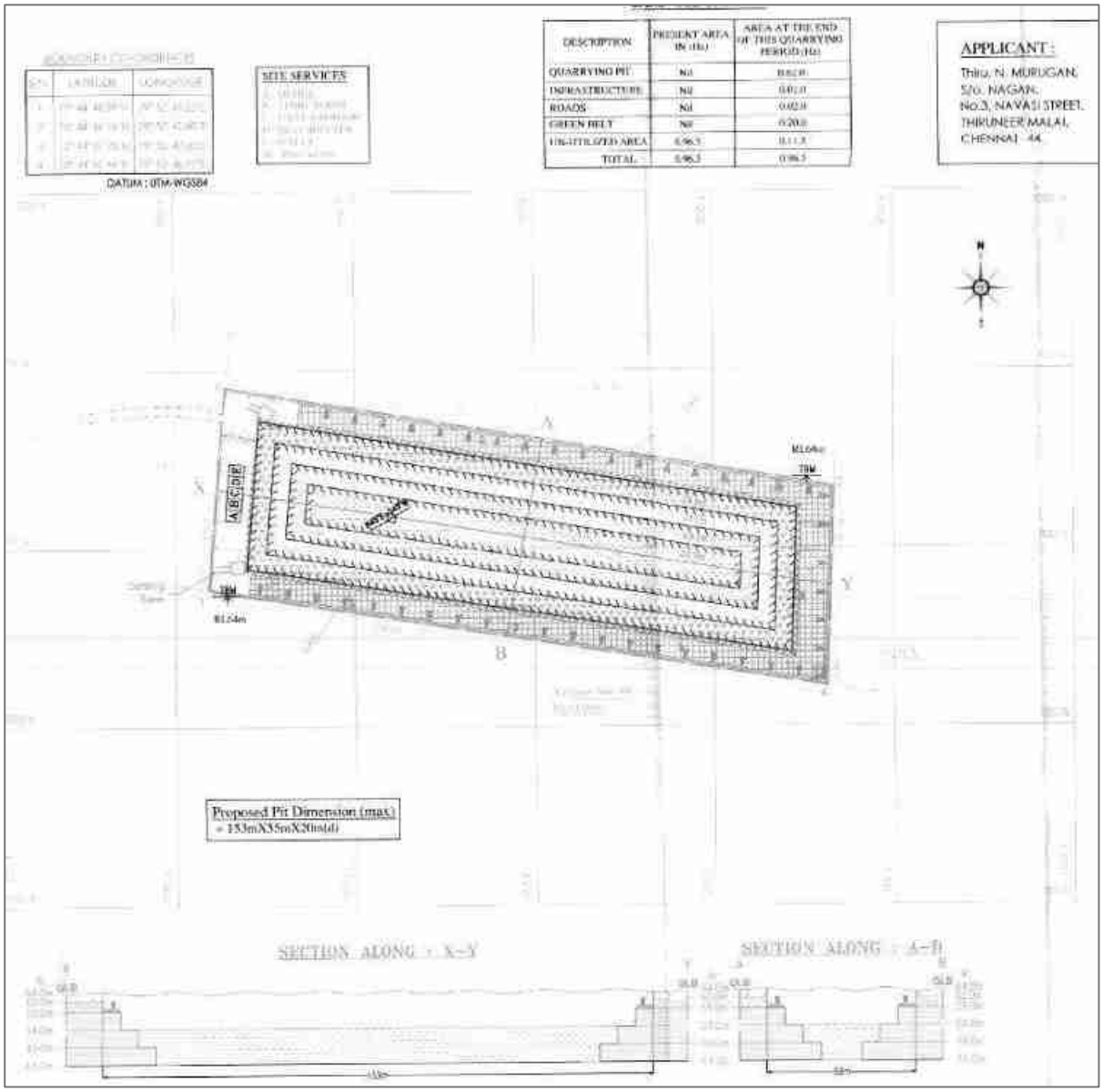
The ultimate pit size is designed based on certain practical parameters such as economical depth of mining, safety zones, permissible area, etc.

TABLE 2.7: ULTIMATE PIT DIMENSION

Pit	Length (Max) (m)	Width (Max) (m)	Depth (Max)
I	153	55	20m bgl

Source: Approved Mining Plan

FIGURE 2.10: CLOSURE PLAN AND SECTIONS

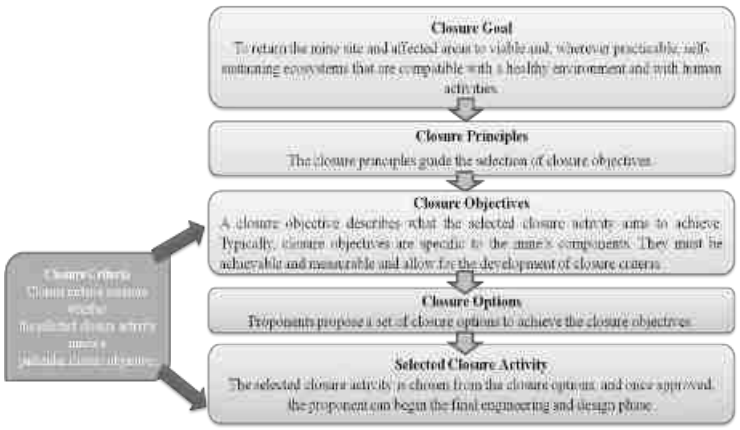


Source: Approved Mining Plan

- At the end of life of mine, the excavated mine pit / void will act as artificial reservoir for collecting rain water and helps to meet out the demand or crises during drought season.

- 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, geo-technically stable, geo-chemically non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.

Closure Objectives –



- Access to be limited, for the safety of humans and wildlife.
- The open pit mine workings and pit boundary are physically and geo-technically stable.
- Water quality in flooded pits is safe for humans, aquatic life, and wildlife.
- Discharge of contaminated drainage has been minimized and controlled.
- Original or desired new surface drainage patterns have been established.
- For flooded pits, in-pit aquatic habitat has been established where practical and feasible.
- Emergency access and escape routes from flooded pits for humans and wildlife are in place.
- Dust levels are safe for people, vegetation, aquatic life, and wildlife.

Closure Planning & Options Considerations in Mine Design –

- The closure of mine is well planned at the initial stage of planning & design consideration by the internal and external stake holders
- Construction of 2m height bund all along the mine pit boundary and ensure its stability all time & construction of garland drain along the natural slope to avoid sliding and collection of soil to the pit & surface runoff during rainfall
- After complete exploitation of mineral, the lowest bench foot wall side will be maintained as plain surface without any sump pits to avoid any accidents
- All the sharp edges will be dressed to smoother face before the closure of mine and ensure no loose debris on hanging wall side
- The project proponent as a part of social responsibilities assures to supply the stored mine pit water to the nearby villages after effective treatment process as per the standards of TNPCB & TWAD
- Native species will be planted in 3 row patterns on the boundary barriers and 1st bench, a full-time sentry will be appointed at the gate to prevent inherent entry of public & cattle.
- The access road to the quarry will be cut-off immediately after the closure

- The layout design shall be prepared and get approved from Department of Geology and Mining.
- The proponent is instructed to construct as per the layout approved
- Physical and chemical stability of structures left in place at the site, the natural rehabilitation of a biologically diverse, stable environment, the ultimate land use is optimized and is compatible with the surrounding area and the requirements of the local community, and taking the needs of the local community into account and minimizing the socio-economic impact of closure
- There will be a positive change in the environmental and ecology due to the mine closure

2.5 METHOD OF MINING

Opencast Mechanized Mining Method is proposed by formation of 5.0-meter height bench with a bench width not less than the bench height. Bench slope will be maintained as 60^0.

The Rough Stone is a batholith formation and the splitting of rock mass of considerable volume from the parent rock mass will be carried out by deploying jackhammer drilling and Slurry Explosives will be used for blasting. Hydraulic Excavator attached with rock breaker/ bucket with tipper combination will be involved for the excavation/breaking of Rough stone after blasting. Hydraulic excavators attached with bucket unit will be deployed for loading the Rough Stone into the tippers and then the stone is transported from pithead to the nearby crushers.

It is recommended to obtain necessary statutory permission from the Department of Geology and Mining for Using Heavy Earth Moving Machineries, Blasting and appointment of Mines Manager etc.,

2.5.1 Drilling & Blasting Parameters

Drilling will be carried out using Jack hammer and compressor, the depth of the hole will be maximum 1.5m Drilling & Blasting will be carried out as per parameters given below: -

Spacing	–	1.2m
Burden	–	1.0 m
Depth of hole	–	1.5 m
Charge per hole	–	0.50 – 0.75kg
Powder factor	–	6.0 tonnes/kg
Diameter of hole	–	32 mm
Peak production Capacity	=	21m^3 of Rough stone per day
Spacing X Burden X Depth	=	1.2m X 1.0m X 1.5m = 1.8m^3
	=	1.8m^3 X 2.6 (Bulk Density) = 4.68Ts per hole

Type of Explosives to be used –

Slurry explosives (An explosive material containing substantial portions of a liquid, oxidizers, and fuel, plus a thickener), NONEL / Electric Detonator &Detonating Fuse.

Storage of Explosives –

No proposal for storage of explosives within the project area, the project proponent will made agreement with authorized explosives agencies for carrying out blasting activities and competent person as per DGMS guidelines will be employed for safety and supervision of overall quarrying activities.

The explosives will be sourced from the blasting agency on daily basis and the blasting will be carried out under the supervision of competent qualified Blaster and it will be ensured that there shall be no balance of explosive stock; any balance stock will be taken back by the supplier.

2.5.2 Extent of Mechanization

TABLE 2.8 PROPOSED MACHINERY DEPLOYMENT

S.NO.	TYPE	NOS	SIZE/CAPACITY	MOTIVE POWER
1	Jack hammers	2	1.2m to 2.0m	Compressed air
2	Compressor	1	400psi	Diesel Drive
3	Excavator with Bucket and Rock Breaker	1	300 HP	Diesel Drive
4	Tippers	1	20 Tonnes	Diesel Drive

Source: Approved Mining Plan

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 quarry lease in all the proposed quarries.

2.6.2 Drainage Pattern

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 Rough Stone is proposed to be transported mainly through

Traffic density measurements were performed at two locations

1. Village Road- Thirumukkudal to Seethapuram Road ,
2. Major District Road- Thirumukkudal to Uthiramerur Road

Traffic density measurement was 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.2.9: TRAFFIC SURVEY LOCATIONS

Station Code	Road Name	Distance and Direction	Type of Road
TS1	Village Road Thirumukkudal to Seethapuram Road	SE_430m	Village Road
TS2	Major District Road Thirumukkudal to Uthiramerur Road	NW_2km	Major District Road

Source: On-site monitoring by GEMS FAE & TM

TABLE 2.10: EXISTING TRAFFIC VOLUME

Station code	HMV		LMV		2/3 Wheelers		Total PCU
	No	PCU	No	PCU	No	PCU	
TS1	150	450	50	50	100	50	550
TS2	250	750	150	150	100	100	1000

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 2.11: ROUGH STONE & GRAVEL HOURLY TRANSPORTATION REQUIREMENT

Transportation of Rough Stone & Gravel per day		
Capacity of trucks	No. of Trips per day	Volume in PCU
20 tonnes	2	6

FIGURE.2.11: MINERAL TRANSPORTATION ROUTE MAP

Proposed Transportation Route :

1. The Rough stone will be transported to the Crusher which is located 300m West side of the project site.
2. approach road is located on the south side this road connecting in the Arumpuliyur – Pazhaveri road (Total Stretch of the approach road = 260m)
3. Thirumukkudal– Uthiramerur road connecting in the Major District road (789) at a distance of 2km the total Stretch of the Transportation route is about 2.0km from the project site
4. No Major Habitation, Schools in the proposed transportation route.

TABLE 2.12: 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 – 1960guidelines
Village Road Thirumukkudal to Seethapuram Road	550	6	556	1500
Major District Road Thirumukkudal to Uthiramerur Road	1000	6	1006	1200

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 2.13: WATER REQUIREMENT FOR THE PROJECT

Purpose	Quantity calculation	Source
Domestic & Drinking purpose	0.5KLD	From Existing, bore wells and drinking water will be sourced from Approved Water vendors.
Dust Suppression	1.0KLD	From Existing bore wells from nearby area/ Rain water harvesting pits
Green Belt	0.5KLD	From Existing bore wells from nearby area / Rain water harvesting pits
Total	**2.0KLD**	

Source: Prefeasibility report

2.7.2 Power and Other Infrastructure Requirement

Power is not required for the mining operation, the mining operation will be carried out using Diesel Generator and Earth moving machineries using diesel. The quarrying 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 by project proponent.

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

1. For Gravel:

Per hour Excavator will consume = 10 liters / hour
Per hour Excavator will excavate = 60$m^3$of Gravel
For = 12,546/60
= 209 hours
Diesel consume working hours = 209 hours x 10 liters
Total diesel consumption = 2090 Liters of HSD will be utilized for Gravel.

2. For Weathered rock:

Per hour Excavator will consume = 10 liters / hour
Per hour Excavator will excavate = 60$m^3$of Weathered rock
For = 18,819/60
= 314 hours
Diesel consume working hours = 314 hours x 10 liters
Total diesel consumption = 3140 Liters of HSD will be utilized for Weathered rock.

3. For Rough stone:

Per hour Excavator will consume = 16 liters / hour
Per hour Excavator will excavate = 20$m^3$of Rough stone

For = 13,915/20
= 696hours
Diesel consume working hours = 696hours x 16 liters
Total diesel consumption = 11,136 Liters of HSD will be utilized for Rough stone
Total diesel consumption is around = **16,366**Liters of HSD during this plan period.

2.7.4 Project Cost

The Environmental Management plan has been prepared considering the mode of working, Safety of the employees and Monitoring periods the total Cost is 29.68Lakhs.

Description	**Cost Rs**
Operational cost	22,08,000/-
EMP cost (Ten years period)	7,60,000/-
Total Project cost	**29,68,000/-**

Source: Approved Mining Plan

2.8 EMPLOYMENT REQUIREMENT:

The following manpower's are proposed in the mining plan to carry out the day-to-day quarrying 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 2.14: PROPOSED MANPOWER DEPLOYMENT

Designation	**No of persons**
Mines Manager/Mines Foreman	1
Mate/Blaster	1
Jack hammer operator	4
Excavator Operator	1
Tippers driver	1
Helper	2
Cleaner & Co-operator	2
Security	1
Total	**13**

Source: Approved Mining Plan

2.9 PROJECT IMPLEMENTATION SCHEDULE

The mining operation will commence after the grant of Environmental Clearance, Consent to operate (CTO), Execution of Lease Deed and Obtaining permission from the DGMS (Notice of Opening).

TABLE 2.15: EXPECTED TIME SCHEDULE

Sl.No.	**Particulars**	**Time Schedule (In Month)**					**Remarks if any**
		1st	**2nd**	**3rd**	**4th**	**5th**	
1	Environmental Clearance						
2	Consent to Operate						
3	Execution of Lease deed						
4	Permission from DGMS						
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

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 Dec 2023 to Feb 2024 with CPCB guidelines for the following attributes –

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

Environmental data has been collected with reference to cluster quarries by EHS 360 Lab Private Limited, – An accredited by ISO/IEC 17025:2017 (NABL).

Study Area

An area of 10 km radius (aerial distance) from the periphery of the cluster is considered for EIA study. The study area has been divided into two zones viz **core zone** and **buffer zone**.

- Core zone is considered as cluster area
- 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 Winter season i.e., Dec 2023 to Feb 2024.

Study Methodology

- The project area was surveyed in detail with the help of Total Station Survey instruments and pillars were marked. 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 in order to assess the impact due to mining activities and to recommend saplings for Greenbelt development.
- Ground water samples were collected from the existing bore wells, Surface water was collected from water bodies in the buffer zone and analysed as per CPCB Guidelines.
- An onsite meteorological station was setup in cluster area, to collect data about wind speed, wind direction, temperature, relative humidity, rainfall and general weather conditions were recorded throughout the study period.
- Air quality Data's were collected by installation of Respiratory Dust Samplers (RDS) for Fugitive dust, PM_{10} and SO_2, 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	6 (1 core & 5 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	6 (2 surface water & 4 ground water)	IS 10500& CPCB Standards
Meteorology	Wind Speed Wind Direction Temperature Cloud cover Dry bulb temperature Rainfall	1 Hourly Continuous Mechanical/Automatic Weather Station	1	Site specific primary data& Secondary Data from IMD Station
*Ambient Air Quality	PM10 PM2.5 SO2 NOX Fugitive Dust	24 hourly twice a week (December 2023 – February 2024)	7 (1 core & 6 buffer)	IS 5182 Part 1-23 National Ambient Air Quality Standards, CPCB
*Noise Levels	Ambient Noise	Hourly observation for 24 Hours per location	7 (1 core & 6 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 EHS 360 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

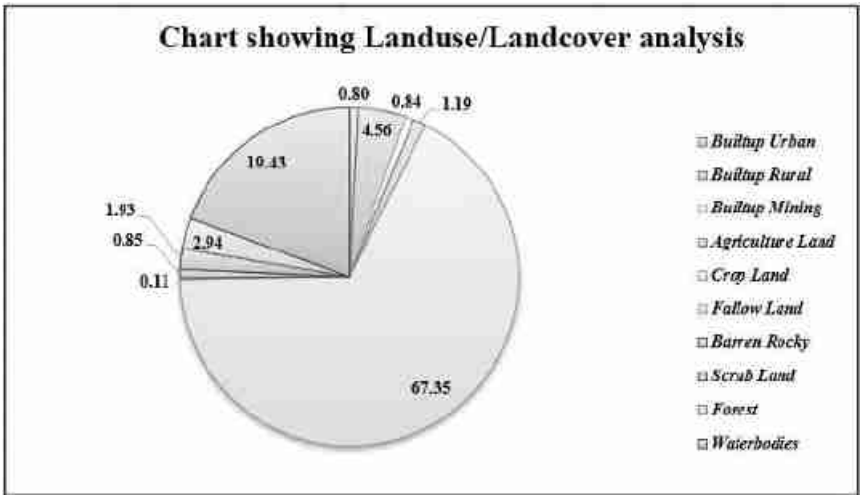
A visual interpretation technique has been adopted for land use classification based on the keys suggested in the chapter – V of the guidelines issued by NNRMS Bangalore & Level III classification with 1:50,000 scale for the preparation of land use mapping. Land use pattern of the area was studied through 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	Builtup Urban	256.24	0.80
2	Builtup Rural	1452.09	4.56
3	Builtup Mining	266.68	0.84
AGRICULTURAL LAND			
4	Agriculture Land	378.74	1.19
5	Crop Land	21458.79	67.35
6	Fallow Land	33.48	0.11
BARREN/WASTE LANDS			
7	Barren Rocky	271.43	0.85
8	Scrub Land	616.23	1.93
FOREST			
9	Forest	936.61	2.94
WETLANDS/ WATER BODIES			
10	Waterbodies	6189.10	19.43
TOTAL		31859.39	100.00

Source: Survey of India Toposheet and Landsat Satellite Imagery

FIGURE 3.1: PIE DIAGRAM OF LAND USE AND LAND COVER



Interpretation:

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) 68.65% followed by Built-up Lands – 5.36%, Scrub land – 1.93%, and Water bodies 19.43%.

The total mining area within the study area is 266.68 ha i.e., 0.84%. The cluster area of 16.60.36 ha contributes about 0.06% of the total mining area within the study area. This small percentage of Mining Activities shall not have any significant impact on the environment.

FIGURE 3.2: PHYSIOGRAPHIC MAP 10KM RADIUS

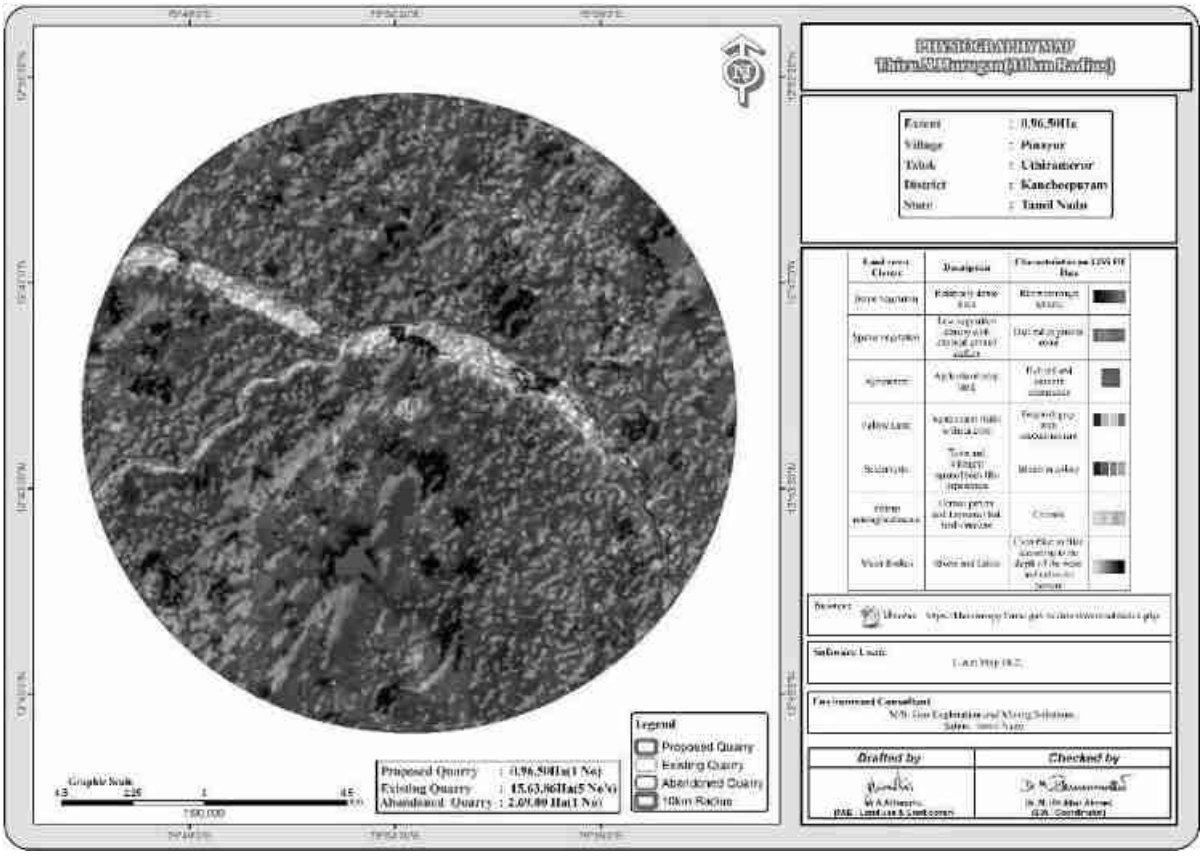


FIGURE 3.3: LAND USE LAND COVER MAP 10KM RADIUS

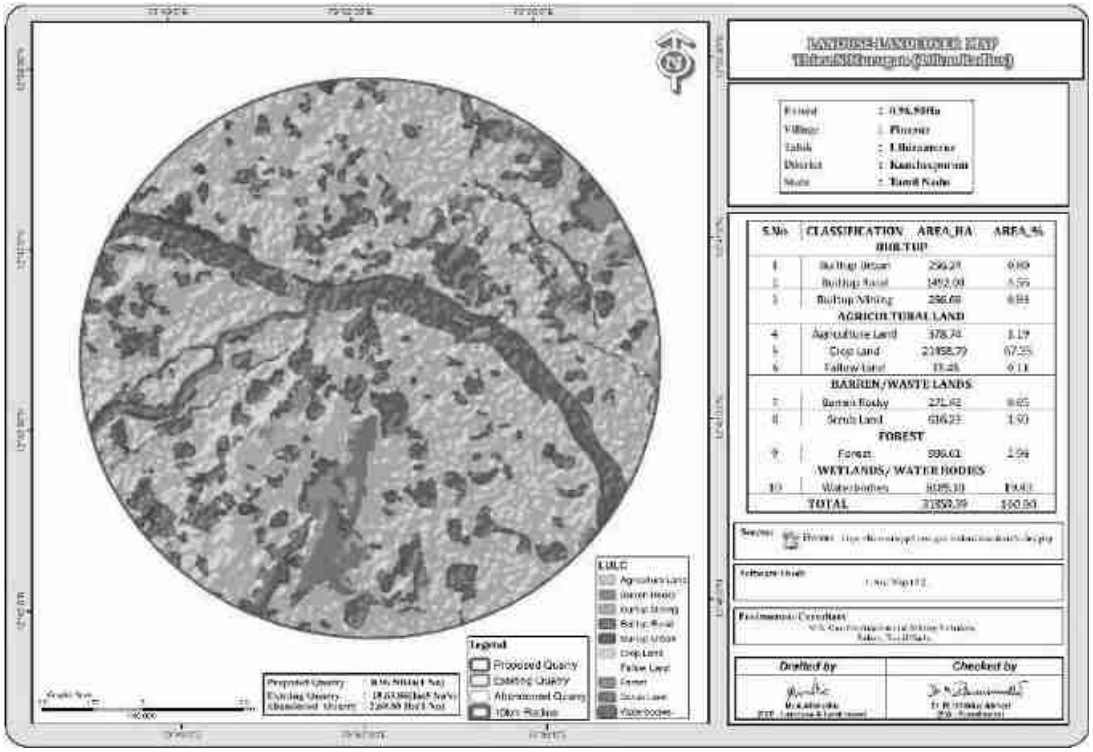


FIGURE 3.4: LAND USE LAND COVER MAP 500m RADIUS

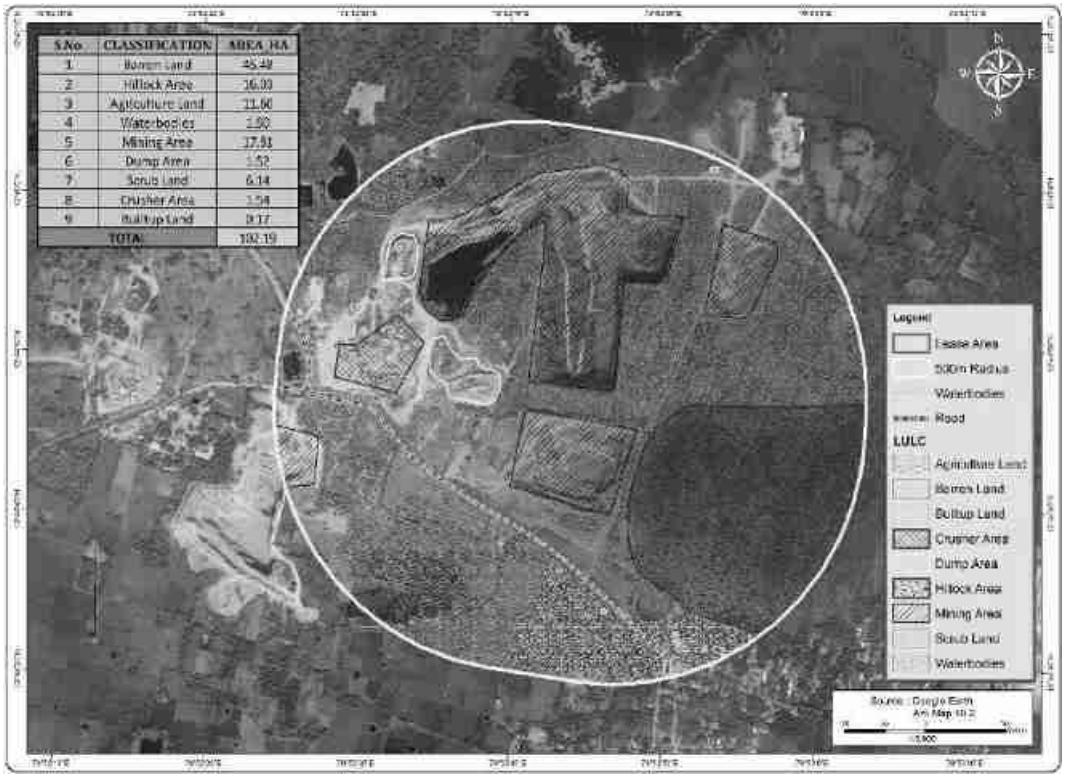


TABLE 3.3: LAND USE LAND COVER MAP 500m RADIUS

S.No	CLASSIFICATION	AREA_HA
1	Barren Land	45.48
2	Hillock Area	16.03
3	Agriculture Land	11.60
4	Waterbodies	1.90
5	Mining Area	17.81
6	Dump Area	1.52
7	Scrub Land	6.14
8	Crusher Area	1.54
9	Builtup Land	0.17
TOTAL		102.19

Land use Landcover of the area within 500m radius were studied in detailed that the majority of the land within 500m is Barren land (45.48ha) followed by agriculture land and Mining areas are contributing majority of the land use.

3.1.2 Topography

The project area is almost plain terrain having gentle slope towards South side, the south side of the area is existing Rough stone quarry. The North side of the area is side casted upto the maximum 0.5m to utilize temporary storage of Crushed materials.

3.1.3 Drainage Pattern of the Area

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

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.

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 3.4.

TABLE 3.4: 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	Karkili Birds sanctuary-	16km-SW 22km-S

		Vedanthangal Birds sanctuary-	
2	Reserve Forest	Kaveripakkam R.F Idaimichi R.F Appur R.F	2.0km- South side 5.40 km- SW side 8.0 km- NE side
3	Tiger Reserve/ Elephant Reserve/ Biosphere Reserve	None	Nil within 10Km Radius
4	Critically Polluted Areas	Coimbatore - SIDCO Industrial Estate	Around 10.5 km- North West
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 3.5: NEARBY WATER BODIES FROM THE PROPOSED PROJECT SITE

Sl.No	NAME	DISTANCE & DIRECTION
1	Tank	420m_NW
2	Tank	430m_SW
3	Vaikkaal	410m_NW
4	Kavanipakkam Lake	1.5Km_SE
5	Palar River	2Km_N
6	Cheyyar River	2.7km_NW
7	Palur Lake	3.5Km_NE
8	Salavakkam Lake	6.2km_SE

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 3.8 and Figure 3.5.

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 3.6: SOIL SAMPLING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	S-1	Core Zone	Project Area	12°44'46.66"N 79°52'44.14"E
2	S-2	Palaveri	520m SE	12°44'30.23"N 79°52'51.19"E
3	S-3	Sankarapuram	5.5km NW	12°47'40.66"N 79°51'41.19"E
4	S-4	Mambakkam	4.8km SE	12°42'46.66"N 79°54'38.49"E
5	S-5	Nerkundarm	4.2km SW	12°42'52.46"N 79°51'25.67"E
6	S-6	Kamarajapuram	6.8km West	12°45'28.59"N 79°48'38.82"E

Source: On-site monitoring/sampling by EHS 360 lab 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. Six (6) 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 3.7.

TABLE 3.7: 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 EHS360 Labs Private Limited 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 are presented below in Figure 3.4 and the physico-chemical characteristics of the soil & Test Results in Table 3.7.

FIGURE 3.5: SOIL SAMPLING LOCATIONS AROUND 10 KM RADIUS

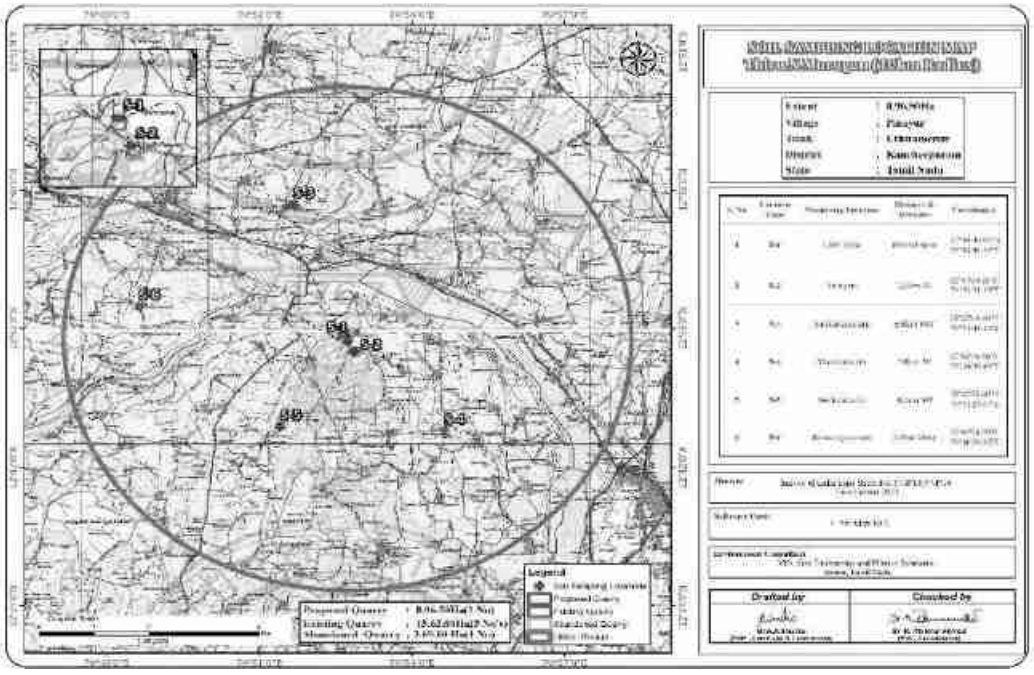


FIGURE 3.6: SOIL MAP

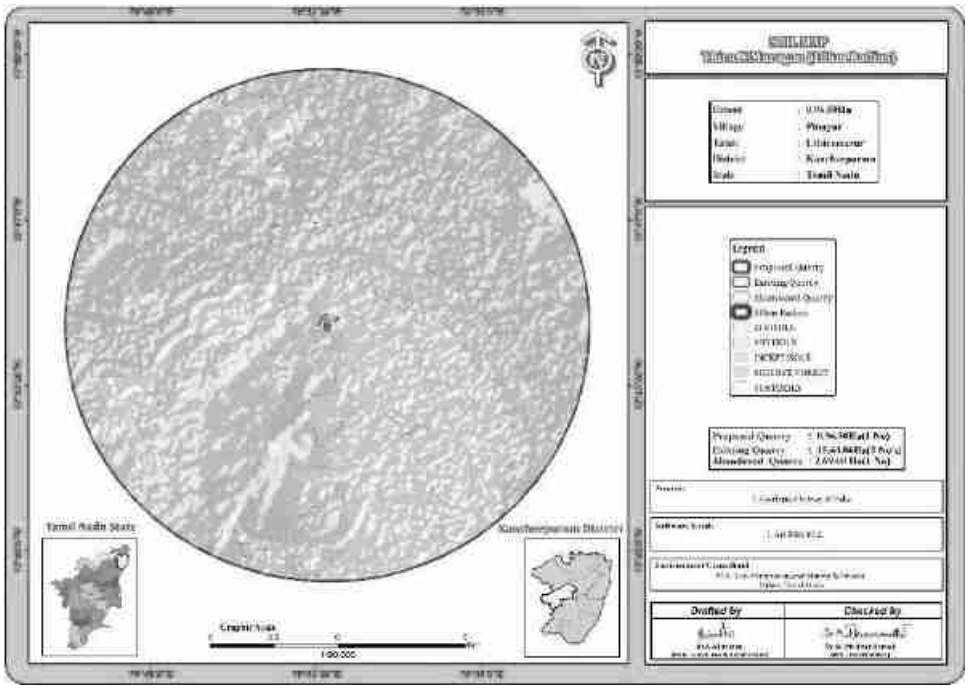


TABLE 3.8: SOIL QUALITY OF THE STUDY AREA

S.No	Test Parameters	Protocols	S-1 Core Zone	S-2 Palaveri	S-3 Sankarapuram	S-4 Mambakkam	S-5 Nerkundarm	S-6 Kamarajapuram
01	pH @ 25°C	IS 2720 Part 26 - 1987 (Reaff:2016)	8.61	8.22	8.24	8.60	8.54	8.09
02	Conductivity @ 25°C	IS 14767 - 2000 (Reaff : 2016)	410 µmhos/cm	473.1 µmhos/cm	530 µmhos/cm	377 µmhos/cm	460 µmhos/cm	457 µmhos/cm
03	Water Holding Capacity	By Gravimetric Method	46.2 %	47.6 %	46.8 %	45.7. %	46.4 %	46.0 %
04	Bulk Density	By Cylindrical Method	1.02 g/cm^3	1.06 g/cm3	0.96 g/cm3	1.40 g/cm3	1.16 g/cm3	1.16 g/cm3
05	Porosity	By Gravimetric Method	47.7 %	46.8 %	48.2 %	46.6 %	46.5 %	46.23 %
06	Calcium as Ca	Food and Agriculture organization of the united Nation Rome 2007 : 2018	47.6 mg/kg	27.5 mg/kg	55.2 mg/kg	60.1 mg/kg	42.6 mg/kg	58.7 mg/kg
07	Magnesium as Mg		31 mg/kg	23.5 mg/kg	30 mg/kg	54 mg/kg	32 mg/kg	21.5 mg/kg
08	Chloride as Cl	APHA 23rd Edn 2019 4500 Cl B	52.2 mg/kg	28.0 mg/kg	25.1 mg/kg	37.8 mg/kg	30 mg/kg	35 mg/kg
09	Soluble Sulphate as SO_4	IS 2720 Part 27 : 1977 (Reaff:2015)	0.0013 %	0.0011 %	0.0014 %	0.0034 %	0.0014 %	0.0019 %
10	Total Phosphorus as P	IS 10158 : 1982 (Reaff: 2019)	6.67 mg/kg	1.02. mg/kg	1.22 mg/kg	5.16 mg/kg	2.61 mg/kg	6.88 mg/kg
11	Total Nitrogen as N	IS 14684 : 1999 (Reaff:2019)	380.6 mg/kg	5.1 mg/kg	371 mg/kg	480.3 mg/kg	384.3 mg/kg	440.2 mg/kg
12	Organic Matter	IS : 2720 Part 22: 1972 (Reaff: 2015)	1.57 %	1.86 %	2.31 %	1.29 %	2.63 %	1.64 %
13	Organic Carbon	IS : 2720 Part 22: 1972 (Reaff: 2015)	0.91 %	1.08 %	1.34 %	0.75 %	1.53 %	0.95 %
14	Texture :							
	Clay	Gravimetric Method	32.6 %	35.0 %	28.1 %	30.0 %	32.9 %	32.8 %
	Sand		31.3 %	21.6 %	33.8 %	32.5 %	32.9 %	32.9 %
	Silt		36.1%	33.4 %	38.1 %	37.5 %	34.2 %	34.3 %
15	Manganese as Mn	USEPA 3050 B – 1996 & USEPA 6010 C - 2000	12.6 mg/kg	18.4 mg/kg	5 41 mg/kg	7.05 mg/kg	13.5 mg/kg	23 mg/kg
16	Zinc as Zn		4.01 mg/kg	8.52 mg/kg	2.06 mg/kg	5.86 mg/kg	4.22 mg/kg	5.64 mg/kg
17	Boron as B		3.72 mg/kg	4.4 mg/kg	7.3 mg/kg	3.05 mg/kg	3.6 mg/kg	1.88 mg/kg
18	Potassium as K		10.9 mg/kg	25.1 mg/kg	5.01 mg/kg	28.8 mg/kg	16.7 mg/kg	13.3 mg/kg
19	Cadmium as Cd		BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
20	Total Chromium as Cr		1.12	BDL (DL : 1.0 mg/kg)	2.10	15.0	5.1	9.8
21	Copper as Cu		BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)	BDL (DL : 1.0 mg/kg)
22	Lead as Pb		0.69 mg/kg	1.51 mg/kg	1.17 mg/kg	2.1 mg/kg	1.2 mg/kg	1.79 mg/kg
23	Iron as Fe		5.51 mg/kg	4.37 mg/kg	0.68 mg/kg	4.4 mg/kg	5.4 mg/kg	4.5 mg/kg
24	Cation Exchange Capacity	USEPA 9080 – 1986	41.8 meq/100g of soil	45.2 meq/100g of soil	45 meq/100g of soil	36.7 meq/100g of soil	44.56 meq/100g of soil	35.1 meq/100g of soil

Source: Sampling Results by EHS 360 Lab Private Limited.

FIGURE 3.7: SOIL SAMPLE COLLECTION

Interpretation & Conclusion

Physical Characteristics –

The physical properties of the soil samples were examined for texture, bulk density, porosity and water holding capacity. The soil texture found in the study area is Clay (28.1 % 35.0 %) to Sandy Loam Soil and Bulk Density of Soils in the study area varied between 0.96– 1.40 g/cc. The Water Holding Capacity and Porosity of the soil samples is found to be medium i.e., ranging from 45.7 – 47.6 %. and 46.23-48.2 %.

Chemical Characteristics –

- The nature of soil is slightly alkaline to strongly alkaline with pH range 8.09 to 8.61
- The available Nitrogen content range between 5.1 to 480.3mg/kg
- The available Phosphorus content range between 1.02 to 6.88 mg/kg
- The available Potassium range between 5.01 mg/kg to 28.8 mg/kg

Observation:

The pH of the Soil indicates that the soil is Neutral and arid region and ideal for plant growth.

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.

FIGURE 3.8: WATER SAMPLE COLLECTION




3.2.1 Surface Water Resources:

Cheyyar 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., The weathering is controlled by the intensity of weathering and fracturing. Dug wells as wells 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 remains 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

Two (2) surface water and Four (4) 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 3.9 and shown as Figure 3.5.

TABLE 3.9: WATER SAMPLING LOCATIONS

S.NO	CODE	LOCATIONS	DISTANCE & DIRECTION	CO-ORDINATES
SURFACE WATER				
1	SW-1	Palar River Palayaseevaram	2km NW	12°45'47.19"N 79°52'18.60"E
2	SW-2	Eri Near Nerkundram	4.5km South	12°42'25.52"N 79°51'37.49"E
GROUND WATER				
3	WW-1	Near Project Area	480m SW	12°44'30.95"N 79°52'37.44"E
4	WW-2	Sankarapuram	5.8km NW	12°47'37.25"N 79°51'23.36"E
5	BW-1	Near Project Area	410m West	12°44'51.42"N 79°52'28.16"E
6	BW-2	Mambakkam	4.8km SE	12°42'47.49"N 79°54'37.70"E

Source: On-site monitoring/sampling by EHS 360 Lab Private Limited in association with GEMS

FIGURE 3.9: WATER SAMPLING LOCATIONS AROUND 10 KM RADIUS

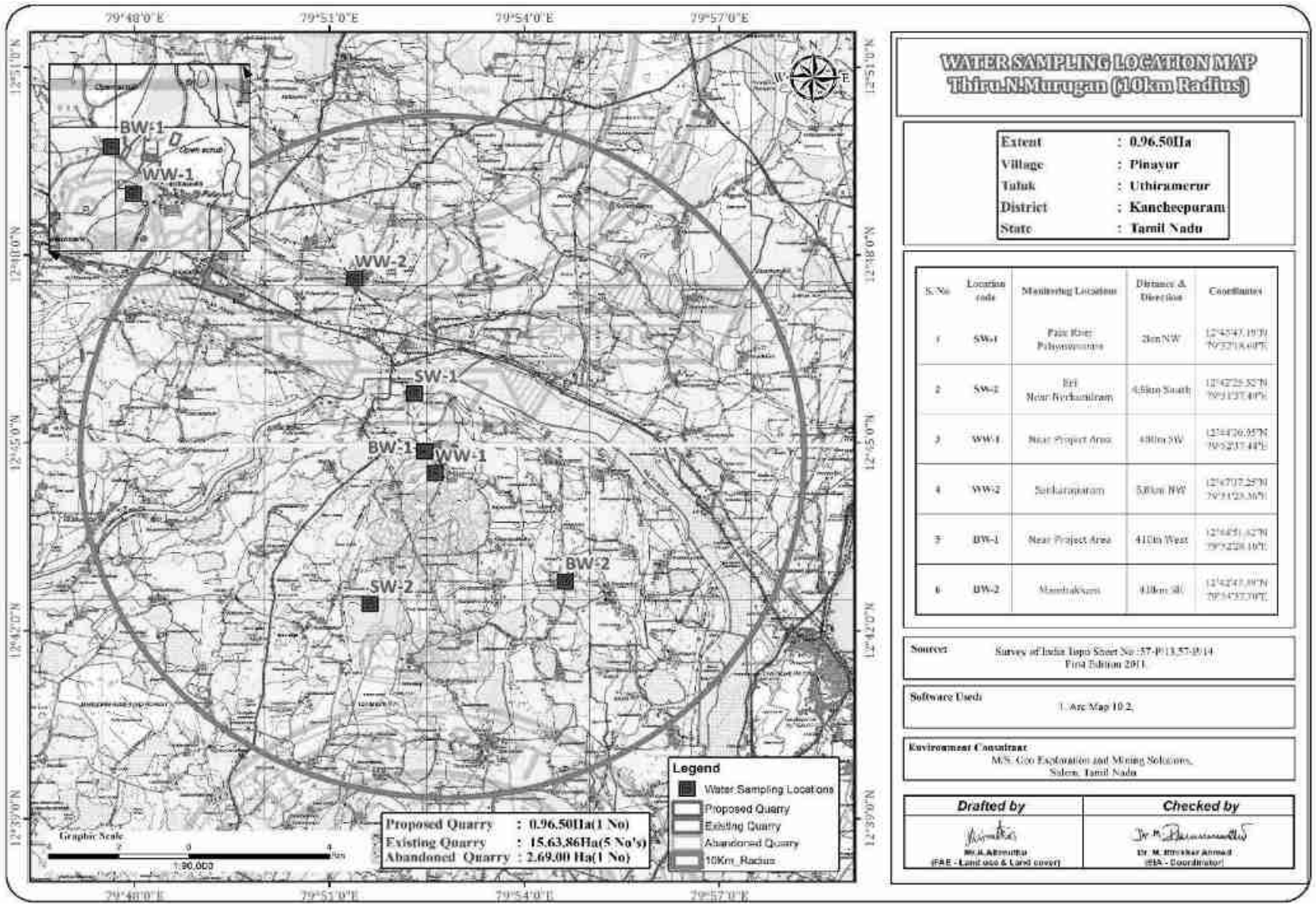


TABLE 3.10: GROUND WATER SAMPLING RESULTS

S.NO	Parameter	BW-1 Near Project Area	BW-2 Mambakkam	WW-1 Near Project Area	WW-2 Sankarapuram
1	Color	5	5	5	5
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	pH@ 25°C	7.06	7.81	7.11	6.88
4	Electrical Conductivity @ 25°C	1017 µmhos/cm	985 µmhos/cm	952 µmhos/cm	1038 µmhos/cm
5	Turbidity	1.0 NTU	1.0 NTU	1.2 NTU	1.1 NTU
6	Total Dissolved Solids	600 mg/l	581 mg/l	561 mg/l	612 mg/l
7	Total Hardness as $CaCO_3$	228.25 mg/l	210.95 mg/l	224.08 mg/l	222.04 mg/l
8	Calcium as Ca	37.1 mg/l	36.1 mg/l	37.9 mg/l	38.4 mg/l
9	Magnesium as Mg	33.0 mg/l	29.4 mg/l	31.5 mg/l	30.7 mg/l
10	Total Alkalinity	175 mg/l	205 mg/l	206.4 mg/l	210 mg/l
11	Chloride as Cl^-	130 mg/l	101 mg/l	122 mg/l	115 mg/l
12	Sulphate as SO_4^-	55.5 mg/l	70.3 mg/l	45.5 mg/l	55.6 mg/l
13	Iron as Fe	0.21 mg/l	0.23 mg/l	0.26 mg/l	0.23 mg/l
14	Free Residual Chlorine	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)
15	Fluoride as F	0.29 mg/l	0.14 mg/l	0.18 mg/l	0.19 mg/l
16	Nitrates as NO_3	3.06 mg/l	6.5 mg/l	2.68 mg/l	5.12 mg/l
17	Copper as Cu	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
18	Manganese as Mn	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
19	Mercury as Hg	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
20	Cadmium as Cd	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)
21	Selenium as Se	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
22	Aluminium as Al	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
23	Lead as Pb	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
24	Zinc as Zn	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
25	Total Chromium	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)
26	Boron as B	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)
27	Mineral Oil	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)
28	Phenolic Compunds as C_6H_5OH	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)
29	Anionic Detergents as	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
30	Cynaide as CN	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
31	Total Coliform	140 MPN/100ml	195 MPN/100ml	155 MPN/100ml	210 MPN/100ml
32	E-Coli	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml	< 1.8 MPN/100ml
33	Barium as Ba	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)	BDL(DL:0.05 mg/l)
34	Ammonia (as Total	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
35	Sulphide as H_2S	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)
36	Molybdenum as Mo	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)
37	Total Arsenic as As	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)
38	Total Suspended Solids	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)	BDL (DL:1.0 mg/l)

* 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

TABLE 3.11: SURFACE WATER SAMPLING RESULTS

Sl. No.	Parameter	Unit	RESULT		CPCB Designated Best Use
			SW1- Palar River	SW2- Eri Near Nerkundram	
1	Colour	Hazen	10 Hazen	5 Hazen	300
2	Odour	-	Agreeable	Agreeable	Not specified
3	pH@ 25ºC	-	7.71	7.45	6.5 – 8.5
4	Electrical Conductivity @ 25°C	µs/cm	927 µmhos/cm	920 µmhos/cm	
5	Turbidity	NTU	5.8 NTU	4.4 NTU	Not specified
6	Total Dissolved Solids	mg /l	547 mg/l	543 mg/l	1500
7	Total Hardness as $CaCO_3$	mg/l	190.96 mg/l	199.67 mg/l	Not specified
8	Calcium as Ca	mg/l	32.7 mg/l	32.9 mg/l	Not specified
9	Magnesium as Mg	mg/l	26.6 mg/l	28.6 mg/l	Not specified
10	Total Alkalinity as $CaCO_3$	mg/l	181.4 mg/l	186.4 mg/l	Not specified
11	Chloride as Cl^-	mg/l	110 mg/l	125 mg/l	600
12	Sulphate as SO_4^-	mg/l	43.7 mg/l	31.2 mg/l	400
13	Iron as Fe	mg/l	0.31 mg/l	0.19 mg/l	50
14	Free Residual Chlorine	mg/l	BDL (DL:0.1 mg/l)	BDL (DL:0.1 mg/l)	400
15	Fluoride as F	mg/l	0.26 mg/l	0.33 mg/l	1.5
16	Nitrates as NO_3	mg/l	6.41 mg/l	7.86 mg/l	50
17	Copper as Cu	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	1.5
18	Manganese as Mn	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	Not specified
19	Mercury as Hg	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	Not specified
20	Cadmium as Cd	mg/l	BDL (DL:0.001 mg/l)	BDL (DL:0.001 mg/l)	0.01
21	Selenium as Se	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	Not specified
22	Aluminium as Al	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	Not specified
23	Lead as Pb	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	0.1
24	Zinc as Zn	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	15
25	Total Chromium	mg/l	BDL(DL : 0.02 mg/l)	BDL(DL : 0.02 mg/l)	0.05
26	Boron as B	mg/l	BDL(DL : 0.05 mg/l)	BDL(DL : 0.05 mg/l)	Not specified
27	Mineral Oil	mg/l	BDL(DL : 0.01 mg/l)	BDL(DL : 0.01 mg/l)	Not specified
28	Phenolic Compounds as C_6H_5OH	mg/l	BDL (DL:0.0005 mg/l)	BDL (DL:0.0005 mg/l)	0.005
29	Anionic Detergents as MBAS	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	Not specified
30	Cyanide as CN	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	0.05
31	Biological Oxygen Demand, 3 days @ 27°C		14.8 mg/l	12.8 mg/l	3
32	Chemical Oxygen Demand		50 mg/l	40 mg/l	Not specified
33	Dissolved Oxygen		5.5 mg/l	5.4 mg/l	4
34	Total Coliform	MPN/ 100ml	510 MPN/100ml	740 MPN/100ml	5000
35	E-Coli		130 MPN/100ml	200 MPN/100ml	Not specified
36	Barium as Ba	mg/l	BDL (DL:0.5)	BDL (DL:0.5)	300
37	Ammonia (as Total Ammonia-N)	mg/l	1.61 mg/l	1.57 mg/l	Not specified
38	Sulphide as H_2S	mg/l	BDL (DL:0.01 mg/l)	BDL (DL:0.01 mg/l)	Not specified
39	Molybdenum as Mo	mg/l	BDL (DL:0.02 mg/l)	BDL (DL:0.02 mg/l)	Not specified
40	Total Arsenic as As	mg/l	BDL (DL:0.005 mg/l)	BDL (DL:0.005 mg/l)	0.2
41	Total Suspended Solids	mg/l	18.6 mg/l	21.5 mg/l	-

Note : APHA – American Public Health Association, BDL – Below Detection Limit, DL – Detection Limit, MPN – Most Probable Number.

3.2.4 Interpretation& Conclusion

Surface Water

The pH varied from 7.45 to 7.71 while turbidity found within the standards (Optimal pH range for sustainable aquatic life is 6.5 to 8.5 pH).

Total Dissolved Solids:

Total Dissolved Solids varied from 543 to 547mg/l, the TDS mainly composed of carbonates, bicarbonates, Chlorides, phosphates and nitrates of calcium, magnesium, sodium and other organic matter.

Other parameters:

Chloride content is 110 – 125mg/l. Nitrates varied from 6.41to 7.86 mg/l, while sulphates varied from 31.2 to 43.7mg/l.

Ground Water

The pH of the water samples collected ranged from 6.88 to 7.81 and within the acceptable limit of 6.5 to 8.5. pH, Sulphates and Chlorides of water samples from all the sources are within the limits as per the Standard. On Turbidity, the water samples meet the requirement. Total Dissolved Solids were found in the range of 561– 612mg/l in all samples. Total hardness varied between 210.95– 228.25 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-ATS Instrument by qualified Geo physicist with the help of IGIS software and it was inferred that the low resistance encountered at the depth between 45-50m. The maximum depth proposed out of proposed projects is 20m bgl (2m Gravel + 3m Weathered Gravel + 15m Rough stone) below ground level.

Ground water levels and Flow Direction based on the Bore well and open well Data's

In general, the ground water movement is based on the gradient ie., water moves from the highest static ground water elevation to lowest static ground water elevation point. The ground water movement is important aspect to locating the recharge and discharge areas. Therefore, the data has been collected in the study area. Water level measured in the Six open well and 6 borewells.

The average water level in the open well is varies from = 68 to 71.6m bgl

The water level in the bore well is varies from = 56.3 to 56.9m bgl

Based on the water level contour map of the open well and bore well the water flow direction in the particular region is towards North side.

The water level in the area is above 45-50m 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.

TABLE 3.12: WINTER SEASON WATER LEVEL OF OPEN WELLS 1 KM RADIUS

S.NO	LABEL	LATITUDE	LONGITUDE	Dec-23	Jan-24	Feb-24
1	OW-1	12° 45' 01.50"N	79° 52' 32.63"E	11	11.6	12.2
2	OW-2	12° 44' 59.32"N	79° 53' 10.41"E	11.3	11.9	12.5
3	OW-3	12° 44' 45.35"N	79° 53' 16.14"E	11.5	12.1	12.7
4	OW-4	12° 44' 14.40"N	79° 52' 47.79"E	11.4	12	12.6
5	OW-5	12° 44' 27.38"N	79° 52' 21.67"E	11.2	11.8	12.4
6	OW-6	12° 44' 45.95"N	79° 52' 10.68"E	11.6	12.2	12.8

Source: Onsite monitoring data

FIGURE 3.10: OPEN WELL CONTOUR MAP (DEC 2023- FEB 2024)

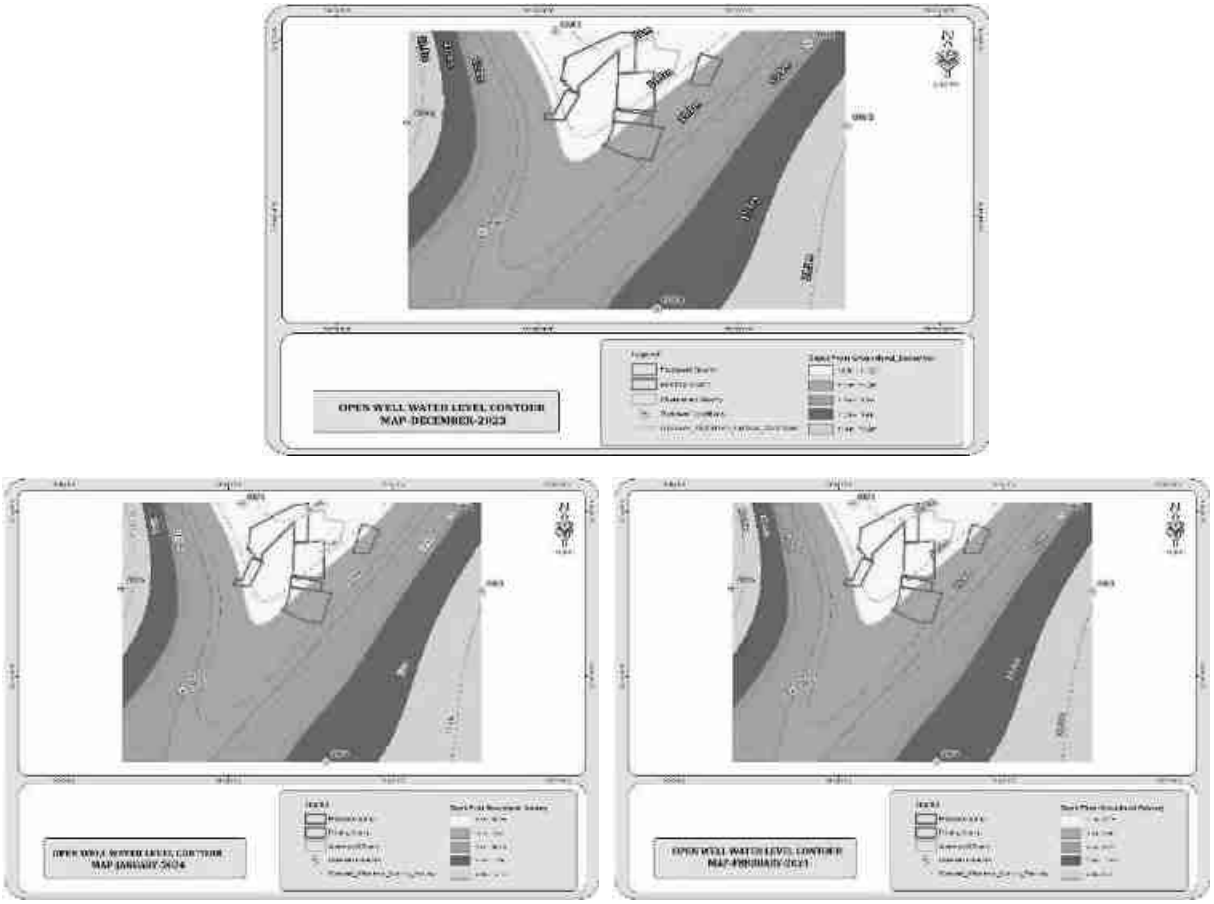
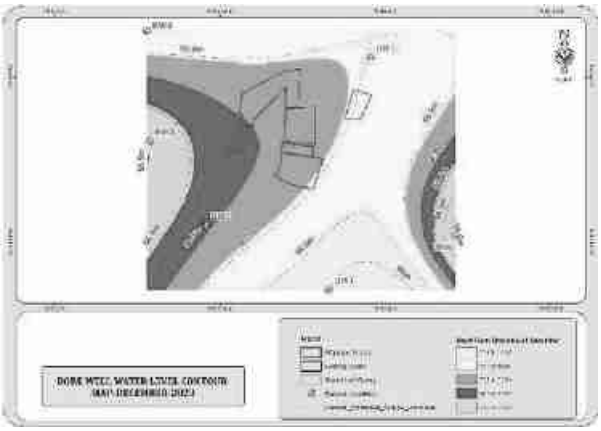


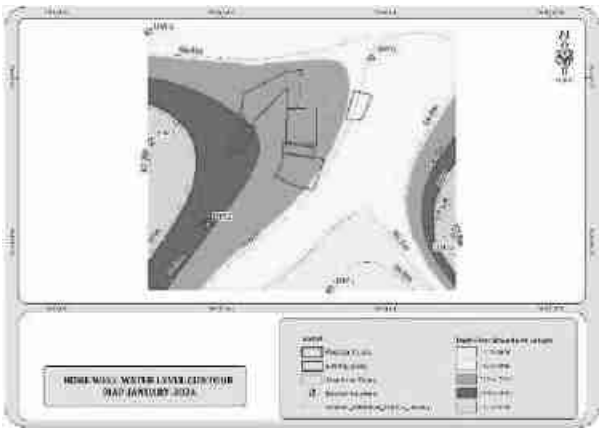
TABLE 3.13: WINTER SEASON WATER LEVEL OF BOREWELLS 1 KM RADIUS

S.NO	LABEL	LATITUDE	LONGITUDE	Dec-23	Jan-24	Feb-24
1	BW-1	12° 44' 21.44"N	79° 52' 49.88"E	56	56.6	57.2
2	BW-2	12° 44' 33.13"N	79° 52' 27.45"E	56.3	56.9	57.5
3	BW-3	12° 44' 48.32"N	79° 52' 17.20"E	56.5	57.1	57.7
4	BW-4	12° 45' 08.33"N	79° 52' 16.78"E	56.1	56.7	57.3
5	BW-5	12° 45' 03.59"N	79° 52' 57.39"E	56.2	56.8	57.4
6	BW-6	12° 44' 31.34"N	79° 53' 12.68"E	56.7	57.3	57.9

Source: Onsite monitoring data

FIGURE 3.11: BOREWELL CONTOUR MAP – (DEC 2023- FEB 2024)





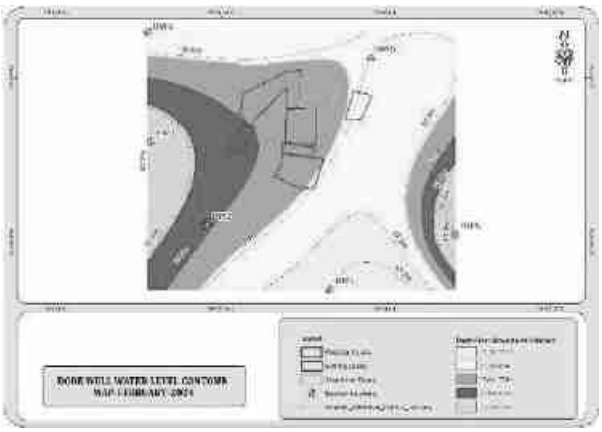
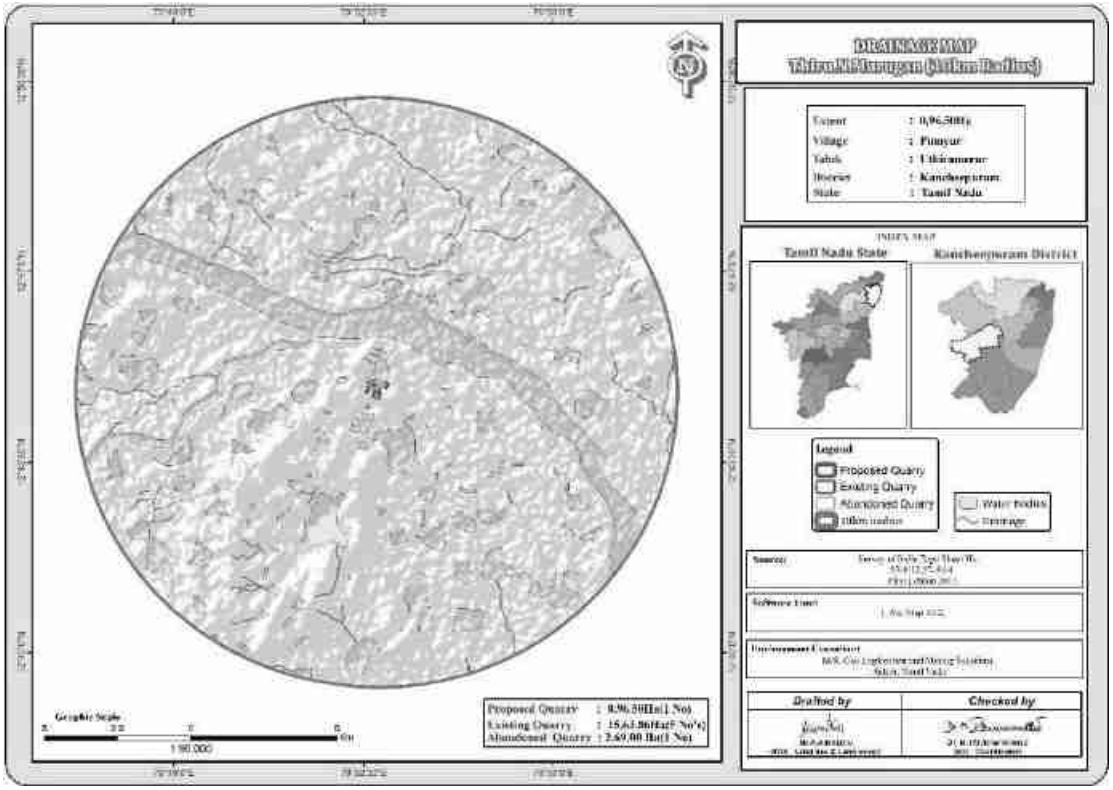
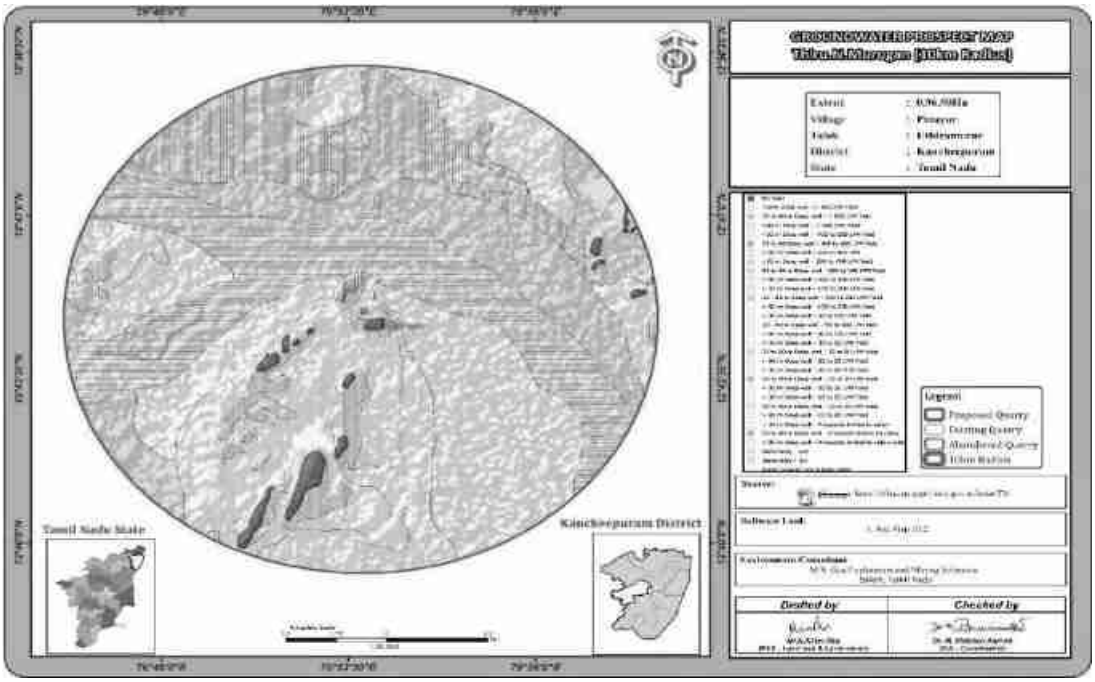


FIGURE 3.12: DRAINAGE MAP AROUND 10 KM RADIUS FROM PROJECT SITE



Remarks : it is inferred that the area is dendritic to sub dendritic pattern

FIGURE 3.13: GROUND WATER PROSPECT MAP



Remarks : Water table in the area is 45-50m as per the Bhuvan Data

Geophysical Resistivity Survey

3.2.5.1 Methodology and Data Acquisition

The Geophysical Electrical Resistivity survey conducted in the area Schlumberger configuration, Vertical Electrical Sounding (VES) method. 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 farm 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,

$$\rho_r = F\rho_w = a\,\emptyset^m\rho_w$$

ρr = Resistivity of Rocks

ρw = Resistivity of water in pores of rock

F = Formation Factor

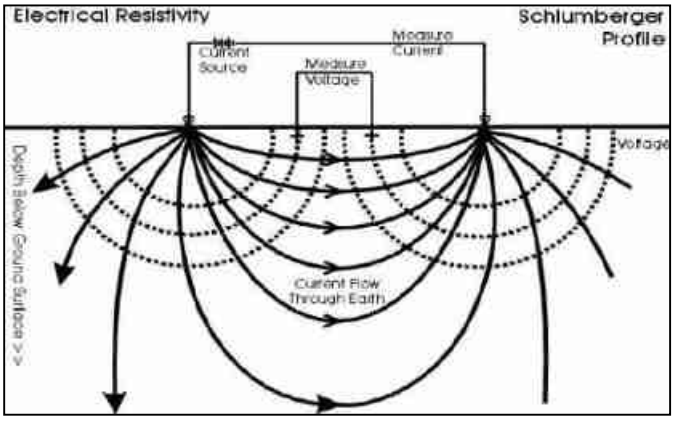
$\emptyset$ = Fractional pore volume

A = Constants with values ranging from 0.5 to 2.5

3.2.5.2 Survey Layout

The field equipment deployed for the study is in a deep resistivity meter with a model of SSRMP – ATS. 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 nose 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 (C_1& C_2) and measuring the resulting potential by two other electrodes called potential electrode (P_1& P_2). 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 45-50m. The maximum depth proposed out of proposed projects 20m 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 quarrying operation will not have any significant impact on the natural water bodies.

It is inferred that the proposed quarry in the surrounding area reaches maximum of 45-50m and the water table is not intersected, only the seepage water during rainy season encountered from the upper layer and it will be used for the Greenbelt development, Dust suppression and quarrying operation.

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 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.

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 proposed quarry. The station was installed at a height of 3m 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

Kancheepuram is 985m above sea level. climate is classified as tropical. The summers here have a good deal of rainfall, while the winters have very little rain. This location is classified as Aw by Köppen and Geiger. In Kancheepuram –

- ✓ This city has a tropical climate. In Kancheepuram, the level of precipitation during summers surpasses that of winters. The climate here is classified as Aw by the Köppen-Geiger. The mean yearly temperature recorded in Kancheepuram is 27.7 °C | 81.9 °F, as per the available data. About 967 mm | 38.1 inch of precipitation falls annually.
- ✓ The Kancheepuram is situated close to the equator, making summers difficult to define. It is highly recommended to plan your visit during the months of January, February, March, December for an optimal experience.
- ✓ The least amount of rainfall occurs in February. The average in this month is 10 mm | 0.4 inch. The highest amount of precipitation occurs during the month of October, with an average quantity reaching up to 195 mm | 7.7 inch.
- ✓ The temperatures are highest on average in May, at around 31.8 °C | 89.3 °F. The month of January registers the most frigid temperatures throughout the year, with an average low temperature of 23.6 °C | 74.5 °F. https://en.climate-data.org/asia/india/tamil-nadu/kancheepuram-26316/

Rainfall

TABLE 3.14: RAINFALL DATA

Actual Rainfall in mm					Normal Rainfall in mm
2017	2018	2019	2020	2021	
1191.7	833.0	1131.4	1258.4	1698.1	985

Source: https://www.twadboard.tn.gov.in/content/kanchipuram-district

TABLE 3.15: METEOROLOGICAL DATA RECORDED AT SITE

S. No	Parameters		Dec-2023	Jan-2024	Feb 2024
1	Temperature (^{0}C)	Max	27.31	25.83	28.85
		Min	24.33	24.27	26.23
		Avg.	25.82	25.05	27.54
2	Relative Humidity (%)	Avg.	83.37	81.31	73.97
3	Wind Speed (m/s)	Max	11.13	7.18	5.55

		Min	2.48	2.37	2.65
		Avg.	6.80	4.77	4.1
4	Cloud Cover (OKTAS)		0-8	0-8	0-8
5	Wind direction		NE, NNE	NE, ENE	ENE, NE

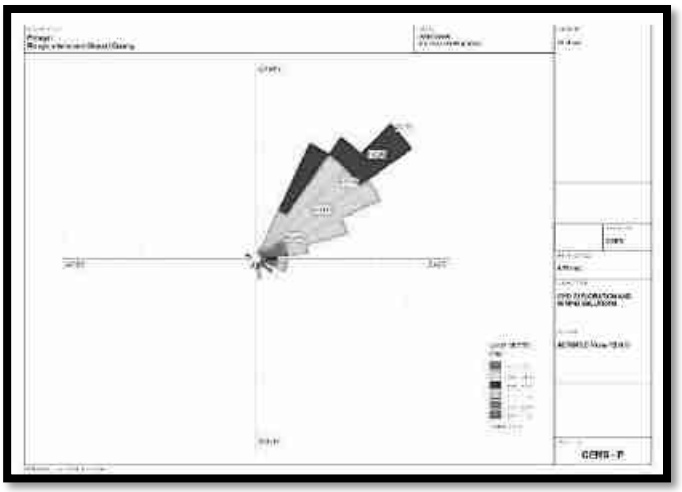
Source: On-site monitoring/sampling by EHS 360 lab Private Limited in association with GEMS

Correlation between Secondary and Primary Data

The average rain falls over the period of five years Ist is 1191.7mm. The meteorological data collected at the site is almost similar to that of secondary data collected from IMD Kancheepuram_Agro. A comparison of site data generated during the three months with that of IMD, Kancheepuram_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 East.

FIGURE 3.14: WINDROSE DIAGRAM



In the abstract of collected data wind rose were drawn on presented in figure No.3.14 during the monitoring period in the study area

1. Predominant winds were from ENE, E,
2. Wind velocity readings were recorded between 2.10 to 8.80m/s
3. Calm conditions prevail of about 0 % of the monitoring period
4. Temperature readings ranging from 24.23 to 28.85 °C
5. Relative humidity ranging from 73.97 to 83.37 %
6. The monitoring was carried out continuously for three months.

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.,

3.3.3 Sampling and Analytical Techniques

TABLE 3.16: METHODOLOGY AND INSTRUMENT USED FOR AAQ ANALYSIS

Parameter	Method	Instrument
PM2.5	Gravimetric Method Beta attenuation Method	Fine Particulate Sampler Make – Thermo Environmental Instruments – TEI 121
PM10	Gravimetric Method Beta attenuation Method	Respirable Dust Sampler Make –Thermo Environmental Instruments – TEI 108
SO2	IS-5182 Part II (Improved West & Gaeke method)	Respirable Dust Sampler with gaseous attachment
NOx	IS-5182 Part II (Jacob & Hochheiser modified method)	Respirable Dust Sampler with gaseous attachment
Free Silica	NIOSH – 7601	Visible Spectrophotometry

Source: Sampling Methodology followed by EHS 360 lab Private Limited & CPCB Notification.

TABLE 3.17: 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 (µg/m3)	Annual Avg.* 24 hours**	50.0 80.0	20.0 80.0
2	Nitrogen Dioxide (µg/m3)	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 seven (7) locations, adopting a continuous 24 hourly (3 shift of 8-hour) schedule for the period Dec 2023 – Feb 2024. The baseline data of ambient air has been generated for PM_{10}, $PM_{2.5}$, Sulphur Dioxide (SO_2) & Nitrogen Dioxide (NO_2) Monitoring has been carried out as per the CPCB, MoEF guidelines and notifications.

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

Seven (7) 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 3.18: AMBIENT AIR QUALITY (AAQ) MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	**AAQ-1**	Core Zone	Project Area	12°44'47.04"N 79°52'46.82"E
2	**AAQ-2**	Palaveri	520m SE	12°44'29.28"N 79°52'52.16"E
3	**AAQ-3**	Sankarapuram	5.5km NW	12°47'35.55"N 79°51'30.20"E
4	**AAQ-4**	Mambakkam	4.8km SE	12°42'45.69"N 79°54'36.75"E
5	**AAQ-5**	Nerkundarm	4.2km SW	12°42'48.48"N 79°51'23.04"E
6	**AAQ-6**	Ulavar	5.2km NE	12°47'29.69"N 79°53'26.67"E
7	**AAQ-7**	Kamarajapuram	6.8km West	12°44'57.73"N 79°48'52.95"E

Source: On-site monitoring/sampling by EHS 360 lab Private Limited in association with GEMS.

FIGURE 3.15: AIR QUALITY MONITORING PHOTOGRAPHS

FIGURE 3.16: AMBIENT AIR QUALITY LOCATIONS AROUND 10 KM RADIUS

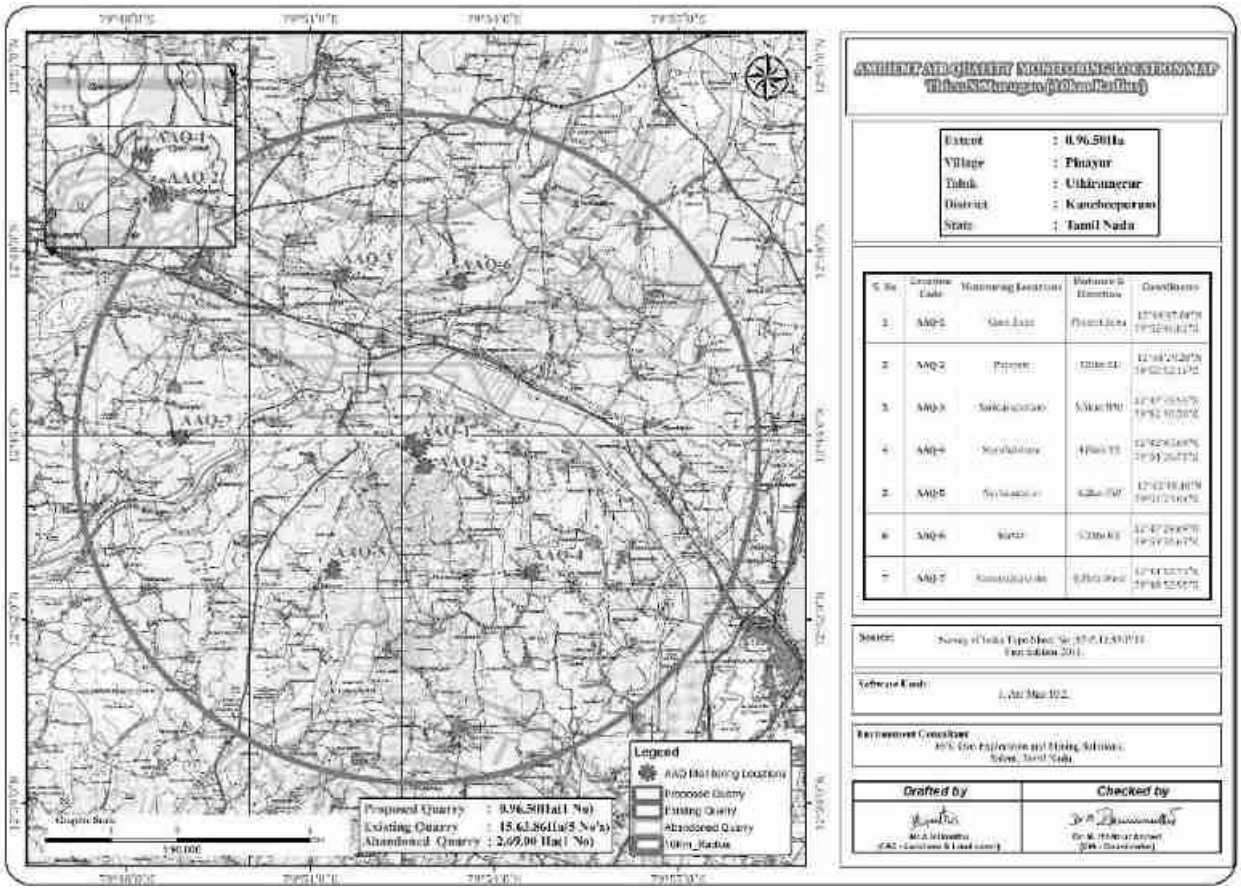


TABLE 3.19: SUMMARY OF AAQ 1 to AAQ 7

PM10	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	43.9	45.5	46.8	42.5	46.8	46.8	43.2
Minimum	42.5	42.3	44.9	41.2	44.9	41.4	42.1
Maximum	44.9	46.7	48.6	44.4	48.6	45.5	44.9
NAAQ Norms	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PM2.5	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	21.2	21.4	25.1	22.6	46.8	43.0	21.8
Minimum	20.3	20.3	22.7	21.2	20.5	20.2	20.4
Maximum	23.5	22.9	26.4	23.9	23.9	23.8	23.6
NAAQ Norms	60.0	60.0	60.0	60.0	60.0	60.0	60.0
SO2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	6.8	6.5	6.7	6.3	6.7	6.9	6.4
Minimum	5.2	5.1	5.3	5.1	5.3	5.2	5.6
Maximum	8.8	7.9	7.8	7.9	7.8	8.9	7.4
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0
NO2	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Arithmetic Mean	24.1	23.6	23.3	24.1	24.8	23.1	23.9
Minimum	22.4	22.4	20.7	22.5	23.3	21.4	21.6
Maximum	25.9	24.9	25.7	25.7	26.3	25.9	25.6
NAAQ Norms	80.0	80.0	80.0	80.0	80.0	80.0	80.0

TABLE 3.20: ABSTRACT OF AMBIENT AIR QUALITY DATA

1	Parameter	PM10	PM2.5	SO_2	NO_2
2	No. of Observations	260	260	260	260
3	98^{th} Percentile Value	48.3	26.3	8.8	25.8
4	Arithmetic Mean	45.1	22.9	6.9	24.2
5	Geometric Mean	45.1	22.8	6.8	24.2
6	Standard Deviation	2.2	2.0	0.9	1.1
7	Minimum	42.1	20.6	5.6	22.4
8	Maximum	48.3	26.3	8.8	25.8
9	**NAAQ Norms***	**100.0**	**60.0**	**80.0**	**80.0**
	% Values exceeding Norms*	0.0	0.0	0.0	0.0

FIGURE 3.17: BAR DIAGRAM OF SUMMARY OF AAQ 1 – AAQ7

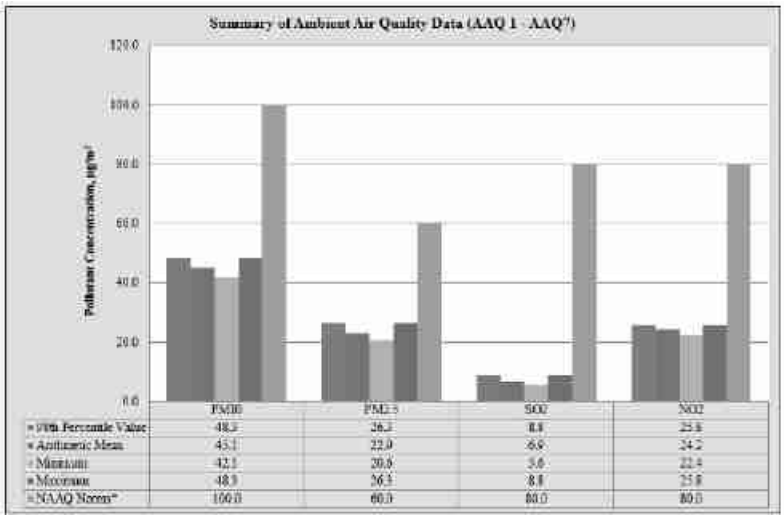


FIGURE 3.18: BAR DIAGRAM OF PARTICULATE MATTER $PM_{2.5}$

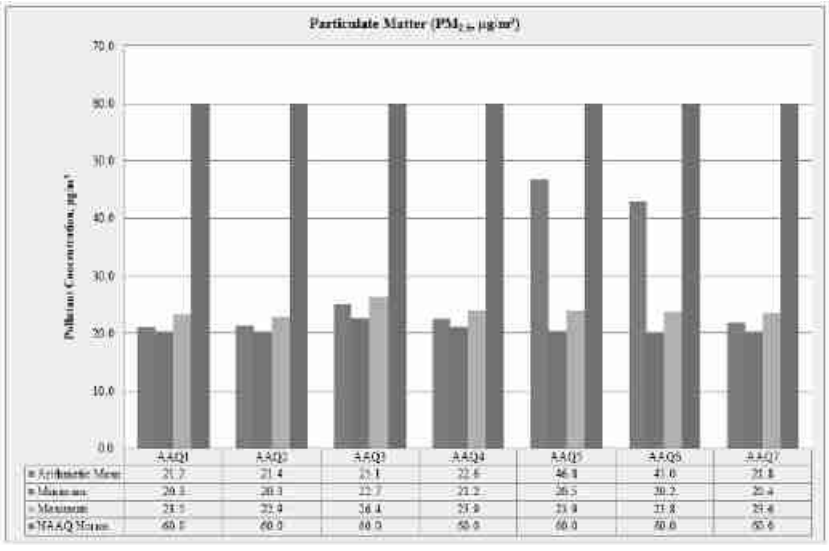


FIGURE 3.19: BAR DIAGRAM OF PARTICULATE MATTER PM_{10}

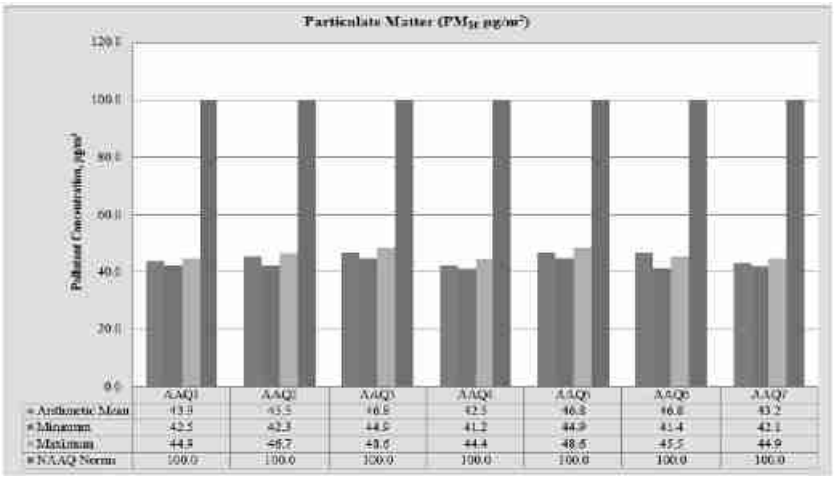


FIGURE 3.20: BAR DIAGRAM OF GASEOUS POLLUTANT SO_2

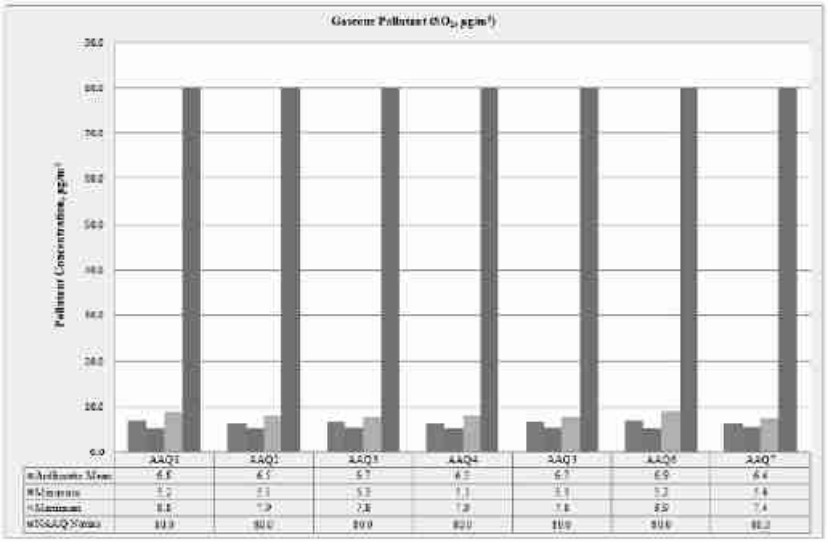
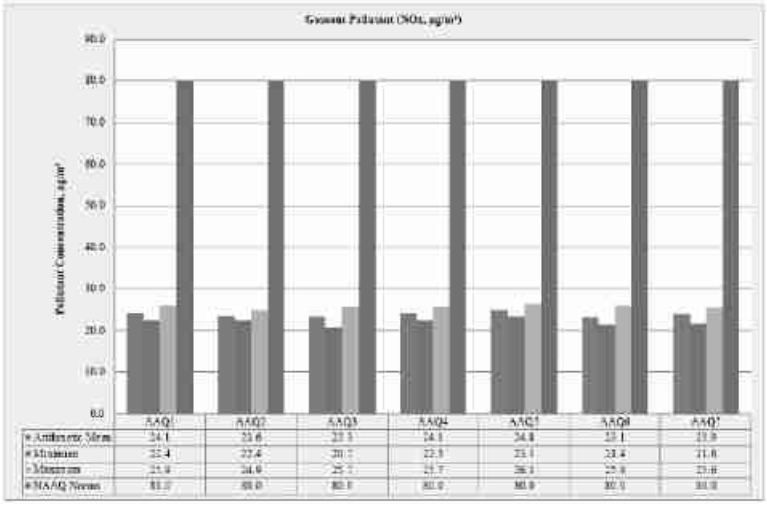


FIGURE 3.21: BAR DIAGRAM OF GASEOUS POLLUTANT NO_x



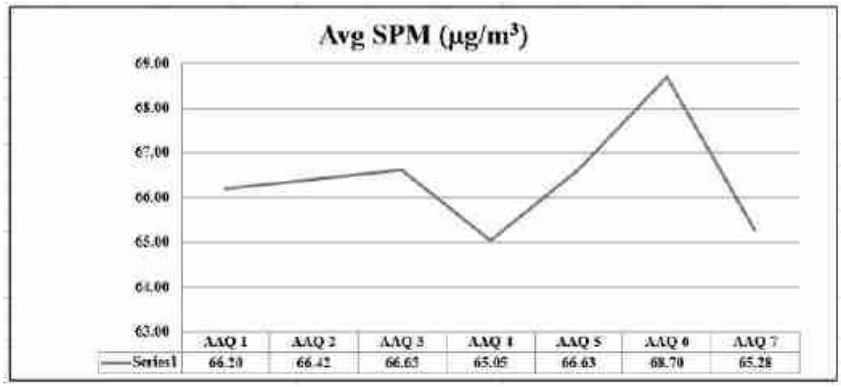
3.3.7 FUGITIVE DUST EMISSION –

Fugitive dust was recorded at 7AAQ monitoring stations for 30 days average during the study period.

TABLE 3.21: FUGITIVE DUST SAMPLE VALUES IN µg/m³

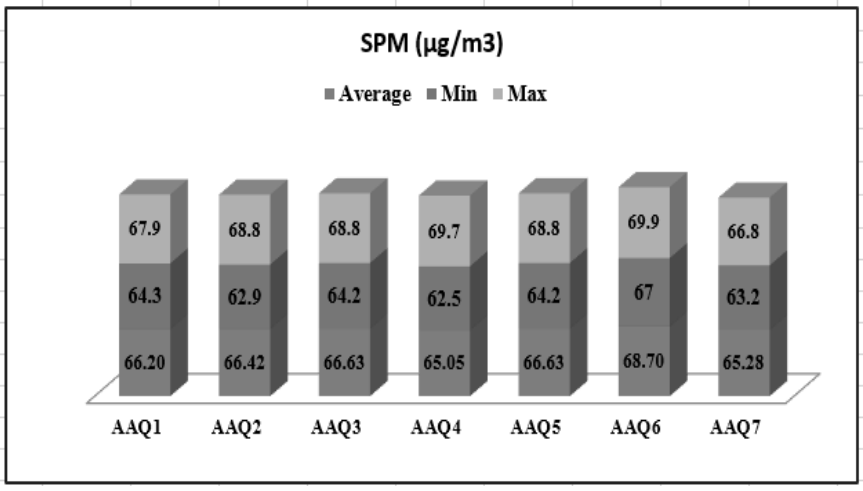
SPM (µg/m³)	AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7
Average	66.20	66.42	66.63	65.05	66.63	68.70	65.28
Min	64.3	62.9	64.2	62.5	64.2	67	63.2
Max	67.9	68.8	68.8	69.7	68.8	69.9	66.8

FIGURE 3.22: LINE DIAGRAM OF AVERAGE SPM VALUES



Source: Calculations from Lab Analysis Reports

FIGURE 3.23: BAR DIAGRAM OF SPM VALUES



3.3.6 Interpretations & Conclusion

As per monitoring data, PM_{10} ranges from 41.2 µg/m³ to 48.6 µg/m³, $PM_{2.5}$ data ranges from 20.2 µg/m³ to 26.4 µg/m³, SO_2 ranges from 5.1µg/m³ to 8.9 µg/m³ and NO_2 data ranges from 20.7 µg/m³ to 26.3 µg/m³. The concentration levels of the above criteria pollutants were observed to be well within the limits of NAAQS prescribed by CPCB.

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 (7) locations. The noise level measurement was carried out at each ambient air quality station. The main aim of the noise level monitoring is

- To assess the ambient Noise level in the study area
- Type of noise pollution generated in the core zone
- To predict the temporal changes in the ambient noise level in the area

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 3.22: DETAILS OF SURFACE NOISE MONITORING LOCATIONS

S. No	Location Code	Monitoring Locations	Distance & Direction	Coordinates
1	N1	Core Zone	Project Area	12°44'47.64"N 79°52'41.74"E
2	N2	Palaveri	520m SE	12°44'29.71"N 79°52'50.95"E
3	N3	Sankarapuram	5.5km NW	12°47'34.49"N 79°51'30.95"E
4	N4	Mambakkam	4.8km SE	12°42'47.39"N 79°54'36.96"E
5	N5	Nerkundarm	4.2km SW	12°42'48.32"N 79°51'23.32"E
6	N6	ulavar	5.2km NE	12°47'29.32"N 79°53'26.66"E
7	N7	Kamarajapuram	6.8km West	12°44'57.25"N 79°48'49.20"E

Source: On-site monitoring/sampling by EHS360 lab Private Limited 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,

$Leq = 10 \text{ Log } L / T\sum (10Ln/10)$

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

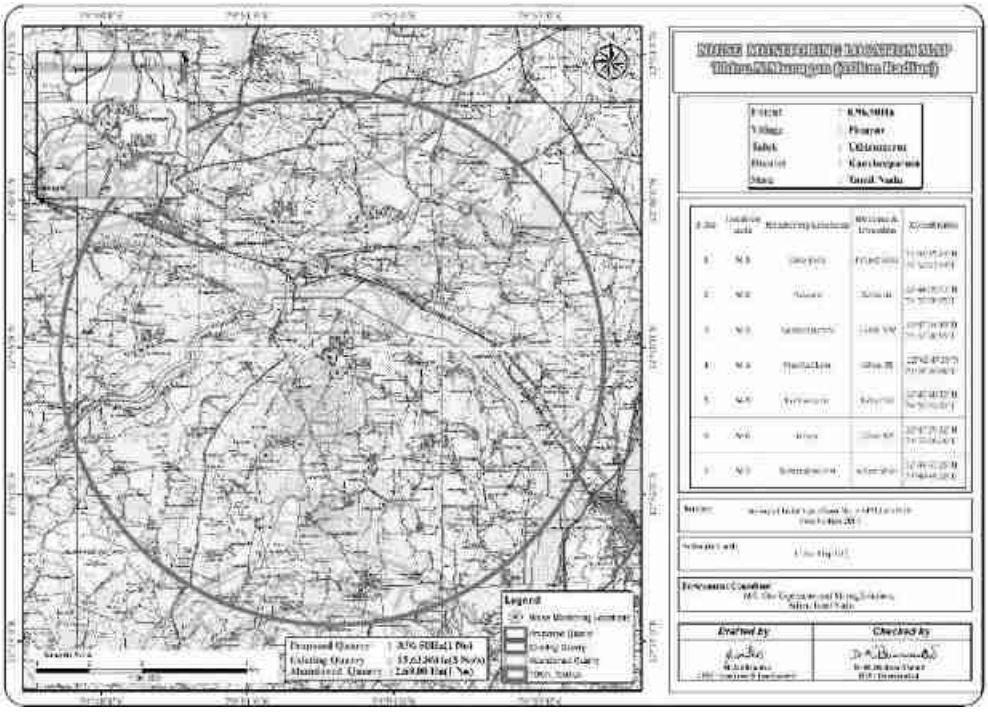
T = Time interval of observation

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 60minutes are computed for equivalent noise levels. Equivalent noise level is a single number descriptor for describing time varying noise levels.

FIGURE 3.24: NOISE SAMPLE MONITORING PHOTOGRAPHS




FIGURE 3.25: 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 3.23.

Day time: 6:00 hours to 22.00 hours.

Night time: 22:00 hours to 6.00 hours.

TABLE 3.23: AMBIENT NOISE QUALITY RESULT

S. No	Locations	Noise level (dB (A) Leq)		Ambient Noise Standards
		Day Time	Night Time	
1	Core Zone	42.3	35.0	**Industrial Day Time- 75 dB (A) Night Time- 70 dB (A)**
2	Palaveri	41.4	36.8	
3	Sankarapuram	38.5	35.2	
4	Mambakkam	40.0	36.8	
5	Nerkundarm	41.8	37.1	**Residential Day Time– 55 dB (A) Night Time- 45 dB (A)**
6	ulavar	39.2	37.9	
7	Kamarajapuram	39.2	37.9	

Source: On-site monitoring/sampling by EHS 360 lab Private Limited in association with GEMS

FIGURE 3.26: DAY TIME NOISE LEVELS IN CORE AND BUFFER ZONE

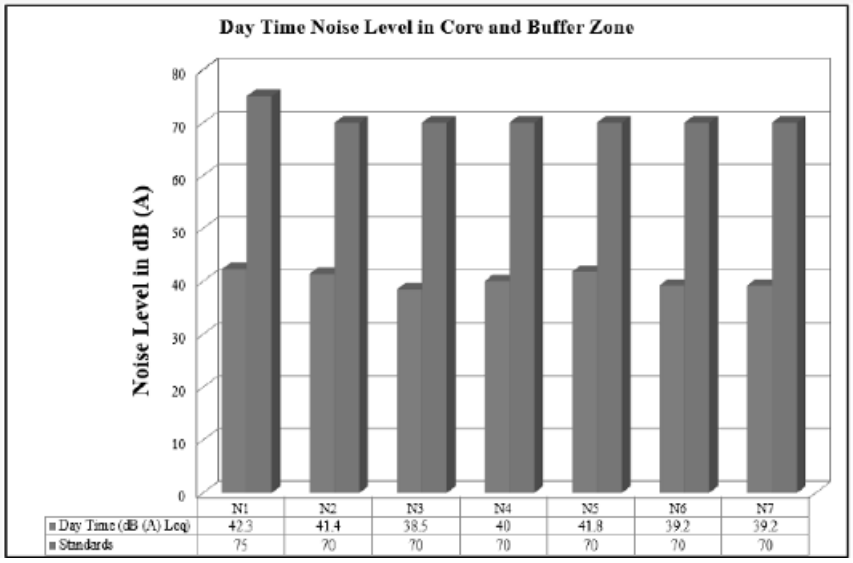
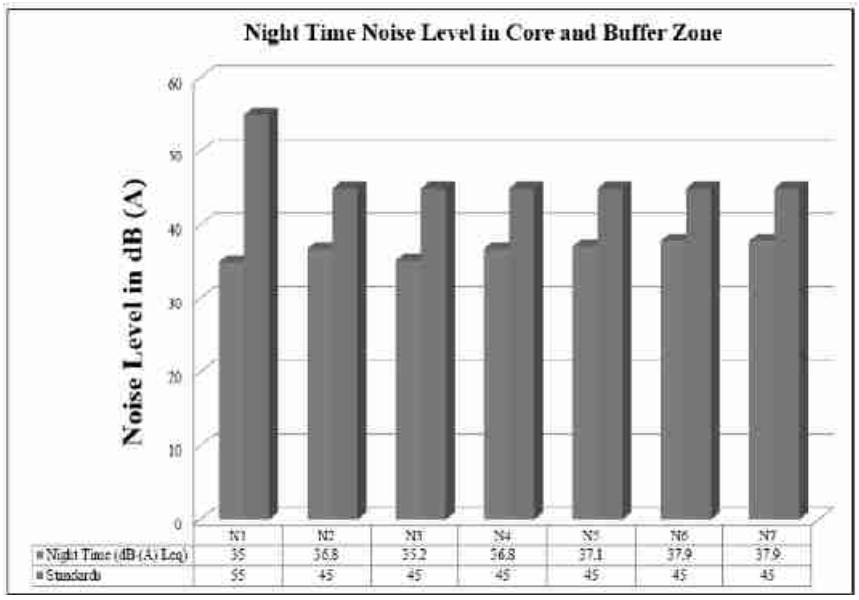


FIGURE 3.27: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE



3.4.4 Interpretation & Conclusion:

Ambient noise levels were measured at 7 (Seven) locations around the proposed project area. Noise levels recorded in core zone during day time were from 42.3 dB (A) Leq and during night time were from 35 dB (A) Leq. Noise levels recorded in buffer zone during day time were from 38.5 to 41.8 dB (A) Leq and during night time were from 35.2 to 37.9 dB (A) Leq. Thus, the noise level for Industrial and Residential area meets the requirements of CPCB.

3.5 BIOLOGICAL ENVIRONMENT

3.5.1 .Study area Ecology

The core area extent of 0.96.50 Ha of Rough Stone and Gravel quarry has an impact on the diversity of flora and fauna of the surrounding area. But present work was carried out the on detailed study of the impacts of Rough stone and Gravel quarry on the ecology and biodiversity of the core lease area with the proper mitigation and sustainable management plan. The Core mining area is situated with exhibits plain topography. whereas in the buffer zone some places agricultural land is dominated. The following methods were applied during the baseline study of flora, fauna, and diversity assessment.

3.5.2. Objectives of Biological Studies

a) Undertake an intensive field survey to assess the status of floral & faunal component in different habitats in the core and buffer areas of the project site.
b) Identification and listing of flora and fauna which are important as per the Wildlife (Protection) Act 1972.
c) Suggest Wildlife conservation (species specific/habitat specific) and management plan for the threatened (critically endangered & endangered species - schedule I) faunal species if any reported within the study area.
d) To identify the impacts of mining on agricultural lands and how it affects.
e) Proper collection of information about wildlife Sanctuaries/ national parks/ biosphere reserves of the project area.
f) Devise management & conservation measures for biodiversity.

3.5.2.1. Field surveys

The field visit was carried out to understand and assess the impacts of mining activities on flora & and fauna and natural habitats and prediction after the enhancement of the production capacity of the mine. We evaluated the distribution and abundance of flora and fauna in the study area through primary and secondary data sources.

3.5.3. Methodology of Sampling

Primary survey was conducted with established and accepted ecological methods in different habitats of study area. The field data collection mainly included biodiversity status assessment of different life forms habit of flora elements such as Trees, Shrubs, Climbers Herbs and Grass. Faunal diversity was assessed by inventorying the taxonomical groups like Mammals, Herpetofauna, birds and butterflies.

Nocturnal faunal species were searched by locating their calls during night time and by searching along the forest shrubs areas, dense dry bushes, below the stones, water bodies. During the study, to know more about the seasonal presence of flora and faunal species, information was obtained from local people and forest department.

Identification of vegetation in relation to the natural flora and crops was conducted through reconnaissance field surveys and onsite observations in core and buffer zone. The plant species identification was done based on the reference materials and also by examining the morphological characteristics and reproductive materials i.e. flowers, fruits and seeds. Land use pattern in relation to agriculture crop varieties were identified through physical verification of land and interaction with local villagers.

Plot method is used in the floral documentation in the core and buffer zone. For trees (10x10-m), shrubs (5x5-m) and herbs (1x1-m) plots were taken. Birds and butterflies were mainly focused during faunal assessment, transect method was employed for birds and butterflies. Transect is a path along which one counts and records the occurrence of an individual for study. A straight-line walk covering desired distance, within a time span of one hour to 30 minutes was carried out in the proposed region. Bird species were recorded during the hours of peak activity. 0700 to 1100 Hrs and 1430 to 1730 Hrs (Bibby et al. 2000).

Direct observations and bird calls were used for bird documentation. Same transects were used for counting butterflies. Opportunistic observations were made for Amphibians, reptiles and ordinates. Presence of mammals was recorded by direct and indirect signs. All possible transects were taken for birds and butterflies. Birds and butterflies were classified into species level. Recorded bird species were identified to species level using standard books (Ali & Ripley 1987, Grimmett et al., 2016).

The secondary baseline data of flora and fauna has been complied through the following data sources:

1. Forest working plan

2. Schedule I to V: Indian Wildlife (Protection) Act, 1972
3. Vivek Menon, Indian Mammals: A Field Guide. Hachette Book publishing India Pvt.Ltd., India.
4. Daniel J.C. The Book of Indian Reptiles and Amphibians, Bombay Natural History Society., India.
5. Ali, S and Ripley. handbook of the Birds of India and Pakistan together with those of Nepal, Sikkim and Bhutan, Oxford University Press, Bombay.
6. ENVIS Centre on Wildlife and Protected Area.
7. Birds Life Data Zone
8. Ebird.org
9. Global Biodiversity Information Facility

3.5.3.1. Sampling

A stratified simple random sampling procedure was employed to obtain a sample from study area. The study area was further stratified in different land use/ecosystems.

3.5.3.2. Sampling Size

Keeping in mind both random sampling technique and covering all land use patterns for the study following sampling locations were chosen depending up on the area of the proposed site.

3.5.3.3. Timing of Study

The study was carried out during morning and evening hours, to cover the different activity phases for important species such as time resting, feeding, hunting, and daily movements.

3.5.3.4. Observations from Sampling

The various observations relating to flora and fauna species are discussed in detail below, in separate sections.

3.5.3.5. Field Equipment's/ References

Following tools/equipment were used for conducting phytosociological study.

- Ballpoint pen, Field bags, Field notebooks, field shoes, gloves, GPS, Measuring tapes and scales, Plant cutters, packet lens, ropes etc.
- Canon Mark III Camera with 50-500mm lens– Snap shots taken
- Leica Binoculars (8x 20) to spot/identify species
- IUCN Red Data Book – https://www.iucnredlist.org/species

Ornithological/Entomological/Herpetological/Mammalian catalogues and pictorial descriptions from various authors and websites are followed for species identification.

3.5.4. Part I Field Sampling Techniques (Fauna Sampling)

3.5.4.1. Transect walk – Birds

Eight no transect lines with varying length (100m-300m) and fixed width (2m) were laid which cuts through the core and buffer areas of proposed site. The transect surveys were conducted from 0700 to 1100Hrs and 1430 to 1730Hrs (Bibby et al. 2000). All avifauna found along these transects were recorded for analysing the data. Counts were conducted while there is no heavy rain, mist or strong wind.

3.5.4.2. Modified Pollard Walk – for Butterflies

The Modified Pollard Walk (Pollard 1977, 1993, Walpole 1999) using fixed width transect walk method were employed to investigate butterfly spatial distribution, diversity and abundance at the different survey sites.

3.5.4.3. Visual Encounter Survey (VES) - reptiles and Amphibians

VES is a time-constrained sampling technique (Campbell and Christman, 1982; Corn and Bury, 1990). It needs a systematic search through an area or habitat for a prescribed time period (Campbell and Christman, 1982). The result of VES is measured against the time spent on search. VES technique is one of the simplest methods, and an appropriate technique for both inventory and monitoring Herpetofauna (Heyer et al. 1994).

3.5.4.4. Observational methods- Mammals

For the purpose of recording mammals, we used two different observational techniques: (1) direct observations, and (2) recording of occurrences like holes, markings, scats, hairs, and spines (Menon 2003). For identification confirmations, photographs with a scale reference were used, and locations were recorded using a portable GPS device. Indigenous knowledge particularly that of the locals, was occasionally employed to compile a preliminary list of species and/or aid in the recognition of indicators.

3.5. Flora

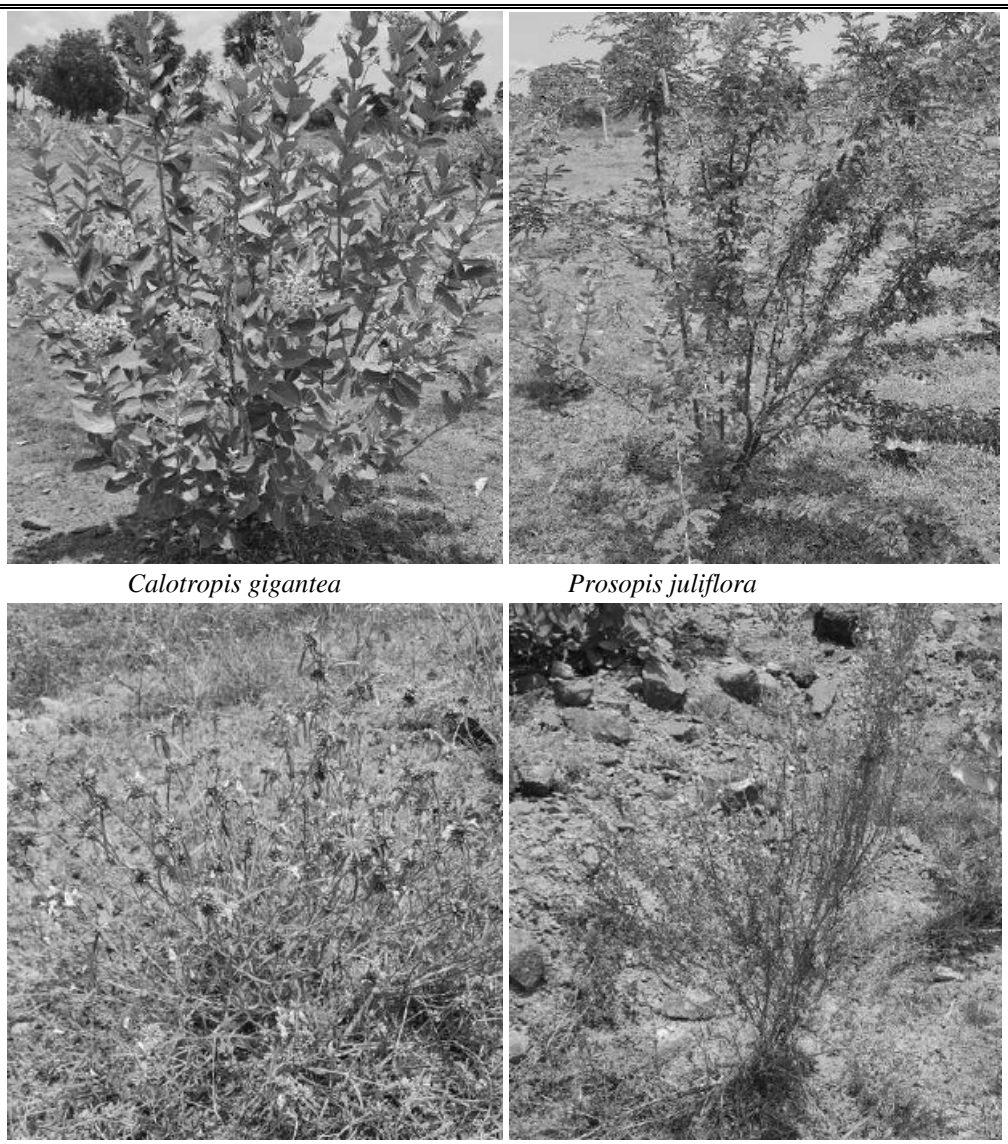
The quadrat sampling technique was used for sampling vegetation. Sampling quadrats of regular shape of dimensions 10 × 10 m, 5 × 5 m and 1 × 1 m, were nested within each other and were defined as the units for sampling the area and measuring the diversity of trees, Shrubs and herbs respectively.

Table No: 3.24. Flora in the Core zone of the lease area (Primary data)

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Neem	Vembu	*Azadirachta indica*	Meliaceae
2.	Velvet mesquite	Mullu maram	*Prosopis juliflora*	Fabaceae
3.	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
Shrubs				
4.	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
5.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
Herbs				
6.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae
7.	Devil‘s thorn	Nerunji	*Tribulus terrestris*	Zygophyllales
8.	Cleome viscosa	Nai kadugu	*Celome viscosa*	Capparidaceae
9.	Fish poison	Kolinchi	*Tephrosia purpurea*	Fabaceae
10.	Coat buttons	Thatha poo	*Tridax procumbens*	Asteraceae
11.	Indian Catmint	Pei viratti	*Anisomeles malabarica*	Lamiaceae
12.	Goatweed	Kallurukki	*Scoparia dulcis*	Plantaginaceae
Climber				
13.	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
14.	Stinking passionflower	Poonai puduku chedi	*Passiflora foetida L*	Passifloraceae
Grasses				
15.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
16.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
17.	Great brome	Thodappam	*Bromus diandrus*	Poaceae

3.5.1. Flora’s Composition of the Core Zone

Core zone flora sampling was conducted between 8.00 am to 10.00 am in three locations. The lease area is exhibiting plain terrain. we used with quadrat sampling methods. Taxonomically a total of 17 species belonging to 12 families have been recorded from the core mining lease area. Based on the habitat classification of the enumerated plants the majority of species were Herbs 7 followed by Trees 3, Grasses 3, Climbers 2 and Shrubs 2. Details of flora with the scientific name were mentioned in Table No. 3.24. The result of the core zone of flora studies shows that Fabaceae and Poaceae are the main dominating species in the study area mentioned in Table No.3.24. No species found as threatened category.



Calotropis gigantea *Prosopis juliflora*

Leucas aspera *Scoparia dulcis*

Fig No: 3.28. Flora species observation in the core zone area

Fig No. 3.29: Graph Showing % Distribution Of Floral Life Forms - Core Zone

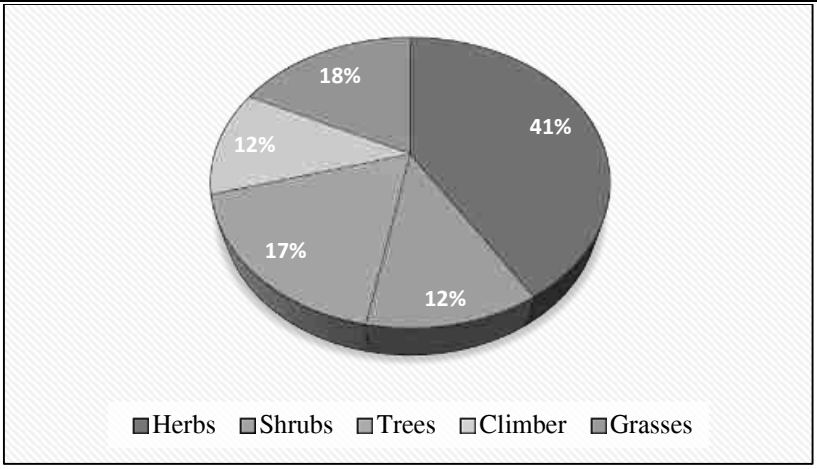


Table No: 3.25. Flora in Buffer Zone of Thiru.Murugan Rough stone and Gravel Quarry

SI.No	English Name	Vernacular Name	Scientific Name	Family Name
Trees				
1.	Coconut	Thennai maram	*Cocos nucifera*	Arecaceae
2.	Neem or Indian lilac	Vembu	*Azadirachta indica*	Meliaceae
3.	Frywood	Vaagai	*Albizia lebbeck*	Mimosaceae
4.	Indian plum	Elanthai maram	*Ziziphus mauritiana*	Rhamnaceae
5.	Pongamia pinnata	Pongam	*Millettia pinnata*	Fabaceae
6.	Oil cake tree	Wunja	*Albizia amara*	Fabaceae
7.	Eucalyptus	Thailam maram	*Eucalyptus tereticornis*	Myrtaceae
8.	Velvet mesquite	Velikatthaan	*Prosopis juliflora*	Fabaceae
9.	River tamarind	Savunda	*Leucaenaleucocephala*	Fabaceae
10.	Indian rosewood	Shisham	*Dalbergia sissoo*	Fabaceae
11.	Madras thorn	Kudukapuli	*Pithecellobium dulce*	Fabaceae
12.	Portia tree	Poovarasan	*Thespesia Populnea*	Malvaceae
13.	Lemon	Ezhumuchaipalam	*Citrus lemon*	Rutaceae
14.	Jamun Fruit Plant	Naval maram	*Syzygium cumini*	Myrtaceae
15.	Gum arabic tree	Karuvelam	*Vachellia nilotica*	Fabaceae
16.	Kassod Tree	ManjalKonrai	*Cassia siamea*	Fabaceae
17.	Butterfly Tree	Mandarai	*Bauhinia purpurea*	Fabaceae
18.	Chinaberry	Malaivembu	*Meliaazedarach*	Meliaceae
19.	Monkey pod tree	Kondraimaram	*Samaneasaman*	Fabaceae
20.	Senna siamea	Manjal Konnai	*Sennasiamea*	Fabaceae
21.	Indian cork tree	Maramalli	*Millingtoniahortensis*	Bignoniaceae
22.	Asian Palmyra palm	Panai maram	*Borassus flabellifer*	Arecaceae
23.	Bamboo	Moongil	*Bambusoideae*	Poaceae
24.	Indian-almond	Vadamaram	*Terminaliacatappa*	Fabaceae
25.	Spanish cherry	Mahizhamaram	*Mimusopselengi*	Sapotaceae
26.	Teak	Thekku	*Tectona grandis*	Verbenaceae
27.	Indian mulberry	Nuna maram	*Morinda tinctoria*	Rubiaceae
28.	Banyan	Alai	*Ficus benghalensis*	Moraceae
29.	Kapok tree	Ilavamaram	*Ceibapentandra*	Malvaceae
30.	Common fig	Athi Maram	*Ficus Carica*	Anacardiaceae
31.	Horsetail She-oak	Savukku maram	*Casuarina equisetifolia*	Casuarinaceae

32.	Tamarind	Puliyamaram	*Tamarindus indica*	Legumes
33.	Creamy peacock flower	Perungondrai	*Delonix elata*	Fabaceae
34.	Sapodilla	Sappotta	*Manilkarazapota*	Sapotaceae
35.	Indian bael	Vilvam	*Aegle marmelos*	Rutaceae
36.	Indian gooseberry	Nelli	*Phyllanthus emblica*	Phyllanthaceae
37.	Guava	Koyya	*Psidium guajava*	Myrtaceae
38.	Mango	Manga	*Mangifera indica*	Anacardiaceae
39.	Papaya	Pappali maram	*Carica papaya L*	Caricaceae
40.	Banana tree	Vazhaimaram	*Musa acuminata*	Musaceae
41.	Jack fruit	Palamaram	*Artocarpus heterophyllus*	Moraceae
Shrubs				
1.	Bush Morning Glory	Neiveli Kattamani	*Ipomoea carnea*	Convolvulaceae
2.	Chinese chastetree	Nochi	*Vitex negundo*	Lamiaceae
3.	Triangular spruge	Chaturakalli	*Euphorbia antiquorum*	Euphorbiaceae
4.	Malabar nut	Adhatoda	*Justicia adhatoda*	Acanthaceae
5.	Milk Weed	Erukku	*Calotropis gigantea*	Apocynaceae
6.	Solanum pubescens	Malaisundai	*Solanum pubescens Willd*	Solanaceae
7.	Plumeria alba	Malaiarali	*Plumeria alba*	Appocynaceae
8.	Night shade plan	Sundaika	*Solanum torvum*	Solanaceae
9.	Stachytarpheta urticifolia	Rat tai	*Stachytarpheaurticifolia*	Verbenaceae
10.	Devil's trumpet	Umathai	*Datura metel*	Solanaceae
11.	Castor bean	Amanakku	*Ricinus communis*	Euphorbiaceae
12.	Shoe flower	Chemparuthi	*Hibiscu rosa-sinensis*	Malvaceae
13.	Bellyache bush	Kaatamanaku	*Jatropagossypifolia*	Euphorbiaceae
14.	Touch-me-not	Thottalchinungi	*Mimosa pudica*	Mimosaceae
15.	Indian mallow	Maanikham	*Abutilon indicum*	Meliaceae
16.	Avaram	Avarai	*Senna auriculata*	Fabaceae
17.	Indian Oleander	Arali	*Nerium indicum*	Apocynaceae
18.	West Indian Lantana	Unni chedi	*Lantana camara*	Verbenaceae
Herbs				
1.	Mexican prickly poppy	Kudiyotti	*Argemone mexicana*	Papaveraceae
2.	Purple pitcher plant	Kavali	*Tephrosia purpurea*	Fabaceae
3.	Septicweed	Kattuttakarai	*Senna occidentalis*	Fabaceae
4.	Rough cocklebur	Marul-umattai	*Xanthium strumarium*	Asteraceae
5.	Billygoat weed	Aappakkoti	*Ageratum conyzoides*	Asteraceae
6.	Chamber bitter	Malai Kizhanelli	*Phyllanthus urinaria L.*	Euphorbiaceae
7.	Carrot grass	Vishapoondu	*Parthenium hysterophorus*	Asteraceae
8.	Billygoat weed	Pumpillu	*Ageratum conyzoides*	Asteraceae
9.	Aloe barbadensis	Katrazhai	*Aloe vera*	Asphodelaceae
10.	Indian Mercury	Kuppamani	*Acalypha indica*	Euphorbiaceae
11.	Indian nettle	Nayuruvi	*Achyranthes aspera*	Amaranthaceae
12.	Indian doab	Arugampul	*Cynodon dactylon*	Poaceae
13.	Rough cocklebur	Marul-umattai	*Xanthium strumarium*	Asteraceae
14.	Riceweeds	Seruppadai	*Coldenia procumbens*	Boraginaceae
15.	Goatweed	Kallurukki	*Scoparia dulcis*	Plantaginaceae
16.	Septicweed	Kattuttakarai	*Senna occidentalis*	Fabaceae
17.	Cleome viscosa	Nai kadugu	*Celome viscosa*	Capparidaceae
18.	Common leucas	Thumbai	*Leucas aspera*	Lamiaceae

19.	Asthma-plant	Amman pacharisi	*Euphorbia hirta*	Euphorbiaceae
20.	Poor land flatsedg	Kunnakora	*Cyperus compressus*	Cyperaceae
21.	Holy basil	Thulasi	*Ocimum tenuiflorum*	Lamiaceae
22.	Tridax daisy	Thatha poo	*Tridax procumbens*	Asteraceae
23.	Gale of the wind	Keelaneeli	*Phyllanthus niruri*	Phyllanthaceae
Climber/ Creepers				
1.	Balloon vine	Mudakathan	*Cardiospermum halicacabum*	Sapindaceae
2.	Ivy gourd	Kovai	*Coccinia grandis*	Cucurbitaceae
3.	Bitter apple	Peikkumatti	*Citrullus colocynthis*	Cucurbitaceae
4.	Wild water lemon	Poonai puduku chedi	*Passiflora foetida*	Passifloraceae
5.	Stemmed vine	Perandai	*Cissus quadrangularis*	Vitaceae
6.	Butterfly pea	Sangu poo	*Clitoria ternatea*	Fabaceae
7.	Bitter melon	Paagarkaai	*Momordica charantia*	Cucurbitaceae
8.	Rosary pea	Kundumani	*Abrus precatorius*	Fabaceae
9.	Madras Pea Pumpkin	Musumuskkai	*Mukia mederaspatna*	Cucurbitaceae
10.	Bottle gourd	Churakka	*Lagenaria siceraria*	Cucurbitaceae
Grass				
1.	Great brome	Thodappam	*Bromus diandrus*	Poaceae
2.	Windmill grass	Chevvarakupul	*Chloris barbata*	Amaranthaceae
3.	Eragrostis	Pullu	*Eragrostis ferruginea*	Poaceae
4.	Narrowleaf cattail	Sambu	*Typha angustifolia*	Typhaceae

Reference: http://www.ethnobiomed.com/content/2/1/43 **and Prmary survey data.**

A list of floral species has been prepared based on 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 No. 3.25 and their % distribution is shown in Figure No 3.30.

Table No: 3.26: Number of floral life forms in the Study Area

S. No	Plant Life Form	Number of Species
1	Trees	41
2	Shrubs	18
3	Herbs	23
4	Climber/ Creepers	10
5	Grassess	4
Total No. of Species		**96**
Total No. of Family		**41**

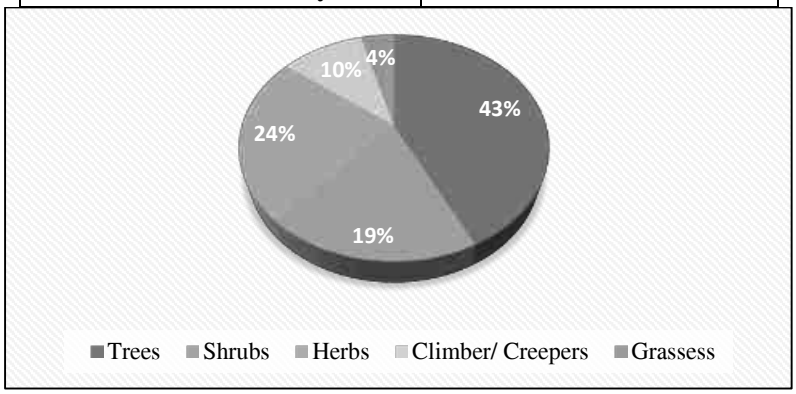


Fig No. 3.30: Graph Showing % Distribution Of Floral Life Forms (Buffer Zone)

3.6. Flora Composition in the Buffer Zone (Primary & Secondary data)

Buffer zone flora sampling was conducted between 10.00 am to 4.00 pm in eight different locations in 10 km radius as per the ToR. The most important and widely used methods for a general assessment is belt transect/quadrate methods. The study area was divided according to habitat types followed the random sampling methods in the selected area. For plant biodiversity study in the ecosystems, the quadrate methods were followed. The proposed applied area is exhibiting plain topography. Similar habitats may be found in the buffer area as well, although there is a wider variety of plants there than in the core zone area. The floral (96) varieties among them Trees 41, Herbs 23, Shrubs 18, Climbers/Creepers 10, and Grasses 4 were identified. The result of the buffer zone of flora studies shows that Fabaceae and Cucurbitaceous, Euphorbiaceae is the main dominating species in the study area mentioned in Table No.3.56. There are no impacts due to this mining activity. There are no Rare, Endangered, and Threatened Flora species in the mining area and their surrounding study area. 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. A list of floral species has been prepared based on 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 No. 3.57 and their % distribution is shown in Figure No. 3.35.

a.Calotropis gigantea

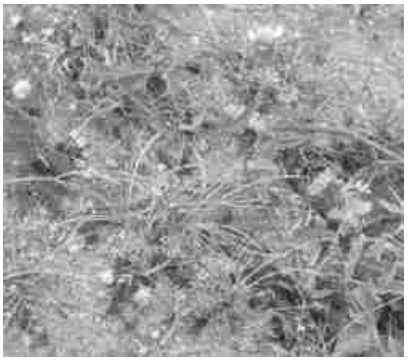
b.Azadirachta indica

c. Lantana camara

d. Nerium indicum

e. Emblica officinalis

f.Annona reticulata



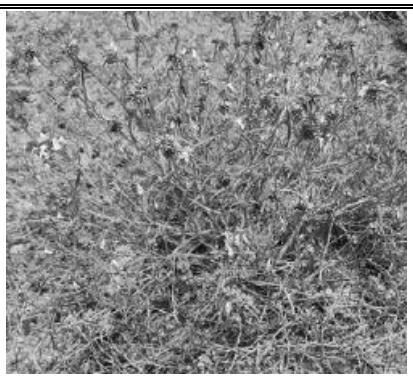
g.Tridax procumbens

h. Borassus flabellifer

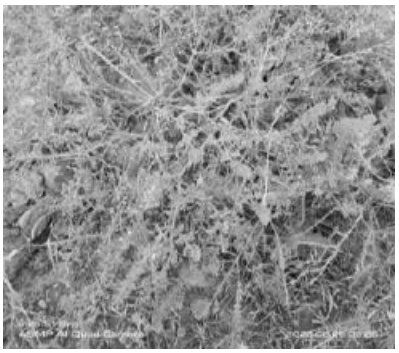
i. Tribulus terrestris

j. Tamarindus indica

k.Jatropha curcas



l. Leucas aspera



m. Ocimum tenuiflorum

n. Euphorbia hirta

o. Croton bonplandianus

P. Cocos nucifera

q.Thespesia populnea

r.Euphorbia antiquorum

s.Solanumnigrum

t. Mangifera indica

u. Prosopis juliflora


V.Solanum torvum


w. Abutilon indicum


x. Morinda tinctoria

Fig No: 3.31. Flora species observation in the Buffer zone area

3.5.5. 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 few reserve forest located way from the proposed project site. Kaveripakkam R.F. is located about 2.0 km on the South side and Appur R.F.is located about 8.0 Km- NE side. Idaimichi R.F. is located about 5.40Km- SW side. There is no Eco Sensitive zone/ critically polluted area/ HACA/CRZ located within 10 km radius of the 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. It is away from the proposed project site.

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.

3.6. Fauna

3.6.1. Fauna Composition in the Core Zone

Core zone fauna samplings were conducted between 6.00 am to 8.00 am in three locations. A total of 21 varieties of species were observed in the Core zone of Pinayur Village, Rough stone and gravel quarry (Table No.3.27) among them numbers of Insects 8, Reptiles 4, Mammals 3, and Avian 6. 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 6 species of bird were sighted in the mining lease area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table No: 3.27. Fauna in the Core zone of lase area (Primary data)

SI.No	Scientific Name	FamilyName	WPA Schedule	IUCN List
Insects				
1.	Danaus plexippus	Nymphalidae	Schedule IV	LC
2.	Catopsilia pyranthe	Peridae	NL	LC
3.	Hieroglyphus sp	Acrididae	NL	LC
4.	Hamitermes silvestri	Blattodea	NL	LC
5.	Mantis religiosa	Mantidae	NL	NL

6.	Crausius morosus	Lonchodidae	NL	LC
7.	Acraea violae	Nymphalidae	NL	LC
8.	Danaus genutia	Nymphalidae	NL	NL
Reptiles				
1.	Hemidactylus frenatus	Gekkonidae	NL	LC
2.	Eutropis carinata	Scincidae	NL	LC
3.	Calotes versicolor	Agamidae	NL	LC
4.	Sitanaponticeriana	Agamidae	NL	LC
Mammals				
1.	Rattus rattus	Muridae	Schedule IV	LC
2.	Mus booduga	Muridae	Schedule IV	NL
3.	Herpestes javanicus	Herpestidae	Schedule II	LC
Aves				
1.	Meropsorientalis	Meropidae	NL	LC
2.	Bubulcus ibis	Ardeidae	NL	LC
3.	Acridotheres tristis	Sturnidae	NL	LC
4.	Coturnix coturnix	Phasianidae	Schedule IV	LC
5.	Corvussplendens	Corvidae	NL	LC
6.	Dicrurus macrocercus	Dicruridae	Schedule IV	LC

***NL- Not listed, LC- Least Concern**

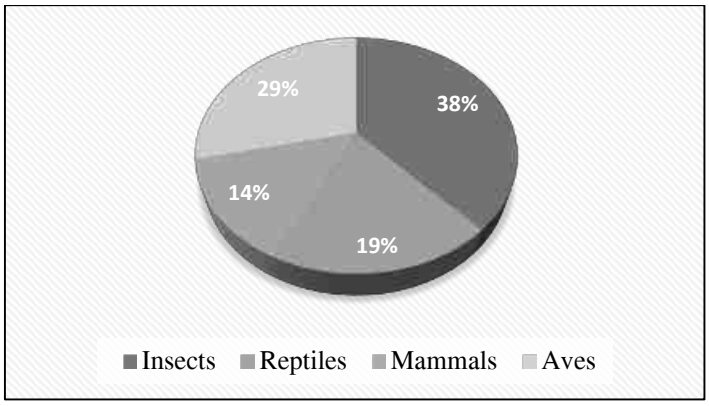


Fig No. 3.32. Graph Showing % Distribution of Fauna Life Forms (Core Zone)

3.6.2. Fauna Composition in the Buffer Zone

The Buffer zone fauna samplings were conducted between 3.00 pm to 6.00 pm in different locations. 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 forests 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 reserves or Elephant Corridor or other protected areas within 10 km radius of 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 Bee-eaters, Mynas, Reed Kites and Drongos etc.

The list of Mammals (*directly sighted animals & Secondary data) is given in table No.3.28. The list of bird species recorded during field survey and literature from the study area is given in Table No 3.29. The list of reptilian species recorded during field survey and literature from the study area are given in Table No 3.30. The list of insect species recorded during field survey and literature from the study area are given in Table No 3.31. The list of

Amphibian species recorded during the field survey and literature from the study area are given in Table No 3.32 and List of Butterflies identified from the project site and their conservation status is given in Table No.3.33. 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 62 species were identified from the project site. Based on habitat classification the majority of species were Insects 14, followed by birds 17, Reptiles 8, Mammals 5, amphibians 3, and Butterflies 15. A total of 17 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 insects, and three were observed during the extensive field visit Sphaerotheca breviceps, Euphlyctis hexadactylus, Bufomelanostictus, There is no schedule I Species in the study area. There are no critically endangered, endangered, vulnerable, and endemic species were observed.

Table No. 3.28. List of Fauna & Their Conservation Status (Mammals)

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	Funambulus palmarum	Indian palm squirrel	LC
2.	Mus booduga	Indian Field Mouse	LC
3.	Herpestes javanicus	Asian Small Mongoose	LC
4.	Lepus nigricollis	Indian hare	LC
5.	Rattus norwegicus	Brown rat	LC

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

Table No. 3.29. Listed birds (Primary data & Secondary data)

SI. No	Scientific Name	Family Name	WPA Schedule	IUCN List
1.	Eudynamys	Cucalidae	Schedule IV	LC
2.	Bubulcus ibis	Ardeidae	Schedule IV	LC
3.	Acridotheres tristis	Sturnidae	Schedule IV	LC
4.	Corvussplendens	Corvidae	Schedule V	LC
5.	Meropsorientalis	Meropidae	Schedule IV	LC
6.	Pycnonotuscafer	Pycnonotidae	Schedule IV	LC
7.	Psittacula krameri	Psittaculidae	Schedule IV	LC
8.	Accipiter badius	Accipitridae	Schedule IV	LC
9.	Coturnix coturnix	Phasianidae	Schedule IV	LC
10.	Dicrurus macrocercus	Dicruridae	Schedule IV	LC
11.	Alcedo atthis	Alcedinidae	Schedule IV	LC
12.	Coturnix coturnix	Phasianidae	Schedule IV	LC
13.	Amaurornis phoenicurus	Rallidae	Schedule IV	LC
14.	Fulica atra	Rallidae	Schedule IV	LC
15.	Cuculus canorus	Cuculidae	Schedule IV	LC
16.	Ardeola grayii	Ardeidae	Schedule IV	LC
17.	Milvus migrans	Accipitridae	Schedule IV	LC

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

Table No. 3.30. List of insects either spotted or reported from the study area

SI. No	Scientific Name	Family	IUCN Conservation Status	IUCN List
1.	Apis cerana	Apidae	Schedule IV	LC
2.	Danaus plexippus	Nymphalidae	Schedule IV	LC
3.	Danaus chrysippus	Nymphalidae	Schedule IV	LC

4.	Danaus genutia	Nymphalidae	Schedule IV	LC
5.	Eurythyrea austriaca	Buprestidae	Schedule IV	NA
6.	Sympetrum fonscolombii	Libellulidae	NL	LC
7.	Camponotus Vicinus	Formicidae	NL	NL
8.	Ceratogomphus pictus	Gomphidae	Schedule IV	-
9.	Danainae	Nymphalidae	NL	LC
10.	Euploea core	Nymphalidae	Schedule IV	LC
11.	Mantis religiosa	Mantidae	NL	NL
12.	Hieroglyphus sp	Acrididae	NL	LC
13.	Zizina Otis indica	Lycaenidae	Schedule IV	LC
14.	Tirumala limniace	Nymphalidae	Schedule IV	LC

Table No. 3.31. List of Reptiles either spotted or reported from the study area

SI. No	Scientific Name	Common Name	IUCN Red List data
1.	Calotes versicolor	Oriental garden lizard	LC
2.	Hemidactylus flaviviridis	House lizards	NL
3.	Naja naja	Indian cobra	LC
4.	Vipera russseli	Russell's viper	NL
5.	Ahaetulla nest	Green vine snake	LC
6.	Ptyas mucosa	Rat snake	NL
7.	Bungarus caeruleus	Common krait	LC
8.	Mabuya carinatus	Common skink	LC

Table No. 3.32. List of Butterflies identified from the project site and their conservation status

SI. No	Scientific Name	Common Name	IUCN Conservation Status
1.	Danaus genutia	Striped Tiger	LC
2.	Danaus chrysippuschrysippus	Plain Tiger	LC
3.	Acraea terpsicore	Tawny Coster	LC
4.	Papiliopolytespolytes	Common Mormon	LC
5.	Papiliopolytesromulus	Common Mormon	LC
6.	Papiliodemoleusdemoleus	Lime Butterfly	LC
7.	Junoniahierta	Yellow Pansy	LC
8.	Junonialemonias	Lemon Pansy	LC
9.	Phalantaphalantha	Common Leopard	LC
10.	Zizulahylax	Tiny Grass Blue	LC
11.	Euploea core	Common Crow	LC
12.	Melanitisledaleda	Common Evening Brown	LC
13.	Jamidescelenoceleno	Common Cerulean	LC
14.	Evereslacturnus	Indian Cupid	LC
15.	Pachlioptaaristolochiae	Common Rose	LC

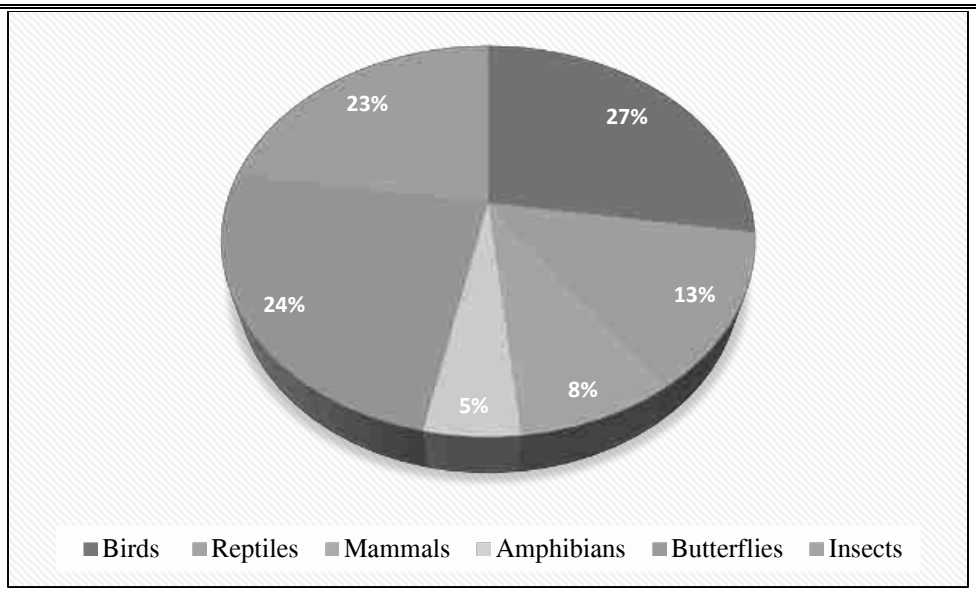


Fig No: 3.33. Distribution Of Faunal Communities (Buffer Zone)

Livestock like cattle, buffalo, goat, poultry, duck and pig are reared for dairy products, meat, and egg and for agriculture purpose. Majority of cattle and buffalo are of local variety. Backyard poultry farms are mostly common in this area; however, some commercial poultry farms are also recorded in the study area.

The study area is marked with moderate population of flora and fauna. With reference to the Wildlife Protection Act 1972 total number of wildlife tabulated in this study can be characterized as given in the Table No 3.33

Table No: 3.33 Characterization of Fauna in the Study Area (As Per W.P Act, 1972)

S.No	Schedule of Wildlife Protection Act 1972	No. of species	Remark
1.	Schedule I	0	-
2.	Schedule II	2	-
3.	Schedule III	0	-
4.	Schedule IV	32	-
5.	Schedule V	1	-
6.	Schedule VI	0	-

Fig No: 3.34. Schedule Of Wildlife Protection Act 1972

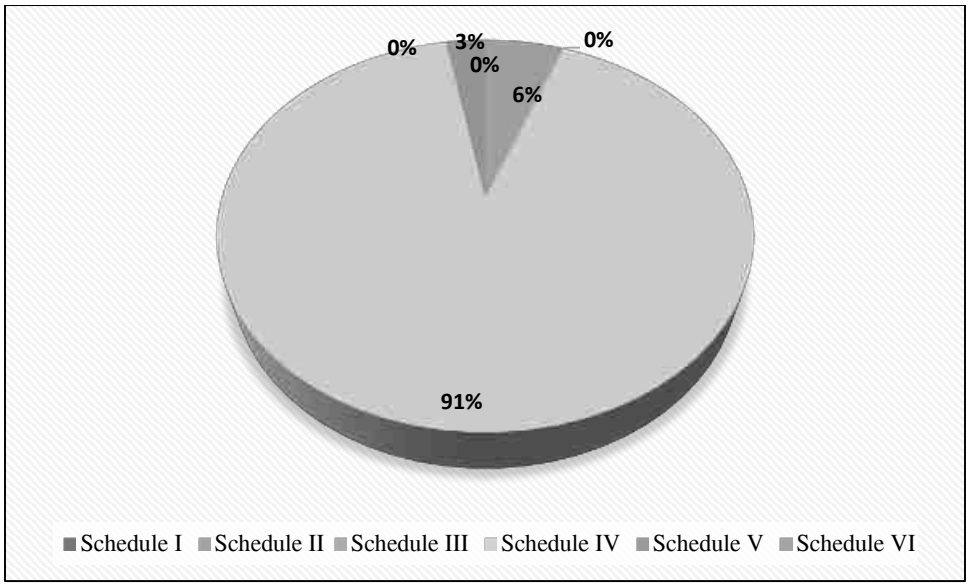


Table No: 3.34. Description of Flora & Fauna

S.No	Type of Species	Name	Local Name
Flora			
1.	Endangered species	None	None
2.	Threatened species	None	None
3.	Near Threatened species	None	None
4.	Vulnerable species	None	None
Fauna			
5.	Endangered species	None	None
6.	Threatened species	None	None
7.	Near Threatened species	None	None
8.	Vulnerable species	None	None
9.	Migratory Corridors & Flight Paths	No corridors & flight paths	-
10.	Breeding & Spawning grounds	None	-
11.	Invasive Alien species	None	None

A comprehensive Central Legislation Namely Wild Life (Protection) Act was enforced in 1972 to provide protection to wild animals. Schedule-I of this act contains the list of rare and endangered species, which are completely protected throughout the country. The list of wild animals and their conservation status as per Wild Life Act (1972) presented in Table 3.65 are the species recorded/reported from the study area, out of which 2 species belongs to schedule-II, 1 species belongs to Schedule-V and rest of the species belongs to schedule-IV of Wildlife Protection Act, 1972. And there is no Invasive alien species (IAP) in the study area.

3.7. Aquatic Ecology

Small seasonal waterbodies are located nearby the study area. There is no aquatic flora and, aquatic fauna. Aquatic weeds are found to be growing everywhere in 10 km radius area, in every water bog, pond, etc. 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.

3.7.1. 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.

3.7.2. Macrophytes

The macrophytes observed within the study area are Tabulated in Table No 3.35.

Table No.3.35. Description of Macrophytes

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

3.7.3. 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. 3.36. Amphibians Observed/Recorded from the Study Area

*Status assigned by the IUCN, where – CR – Critically Endangered; EN – Endangered; LC – Least Concern; NT –

SI. No	Scientific Name	Common Name	IUCN Red List data
1.	Sphaerotheca breviceps	Indian Burrowing frog	LC
2.	Euphlyctis hexadactylus	Green pond frog	LC
3.	Bufomelanostictus	Indian Toad	LC

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

3.7.4.3.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 fish found in the study area. Few common species are; Catla (Catla catla), Dwarf panchax (Aplocheilus parvus), Mrigal (Cirrhinus mrigala), Roho (Labeo rohita) etc., Species of fish reported in the study area are given in Table No 3.36

Table 3.37. Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

S.No	Common name	Scientific name	Family
1.	Dwarf panchax	*Aplocheilus parvus*	Aplocheilidae
2.	Mrigal	*Cirrhinus mrigala*	Chordata
3.	Catla	*Catla Catla*	Cyprinidae
4.	Rohu	*Labeo rohita*	Cyprinidae
5.	Catfish	*Siluriformes*	Diplomystidae

3.6.3. Findings/Results

The assessment was carried out during the Winter 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 few reserve forest located way from the proposed project site. Kaveripakkam R.F. is located about 2.0 km on the South side and Appur R.F.is located about 8.0 Km- NE side. Idaimichi R.F. is located about 5.40Km-SW side.There is no Eco Sensitive zone/ critically polluted area/ HACA/CRZ located within 10 km radius of the area. 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.

There are no endangered, endemic and RET Species. There is no Schedule I species in study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] The proposed project is not going to have any direct or indirect adverse impact on the species mentioned above.

3.7. 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.

Reference : Reptiles : https://www.researchgate.net/publication/354269704
Butterflies : https://www.researchgate.net/publication/346393903
Birds : https://avibase.bsc-eoc.org/checklist.jsp?region=INsetnkc
Trees : http://www.ethnobiomed.com/content/2/1/43

3.6 SOCIO ECONOMIC ENVIRONMENT

The major developmental activities in Mining sector are required for economic development as well as creation of employment opportunities (direct and indirect) and to meet the basic/modern needs of the society, which ultimately results in overall improvement of the quality of life through upliftment of social, economic, health, education and nutritional status in the project region, state as well as the country. In this manner all developmental projects have direct as well as indirect relationships with socioeconomic aspects, which also include public acceptability for new/proposed developmental projects.

The study of these parameters helps in identification, prediction and evaluation of the likely impacts on the socio economics and parameters of human interest due to the project.

3.6.1Objectives

The primary objectives of the Social Impact Assessment study are:

- To assess the impact on socio-economic environment due to the project
- Understanding the baseline socio-economic environment obtaining in the impact zone.
- Identifying the key stakeholders who are likely to be impacted by the establishment of the proposed project.
- Predicting the positive and negative impacts of the project on the socioeconomic environment in the area.
- Suggesting mitigation measures to minimize the negative impacts.

3.6.2 Scope of Work

In keeping with its objectives, the scope of the study extends to:

- Making a reconnaissance of the villages and human settlements within the 10km radius from the proposed project site.
- Understanding the overall socio-economic profile of the impact area.
- Assessing the baseline socio-economic environment prevailing in the impact area focusing the core and buffer zones.
- Identifying key economic sectors and major sources of livelihood in the study area.
- Understanding social structures and lifestyles of people in the area who are likely to be affected the most by the proposed project.
- Assessing physical and social infrastructure facilities accessible to inhabitants in the project impact area.
- Predicting the likely socio-economic impacts as a consequence of establishing the project.
- Suggesting adverse impact mitigation measures in line with the felt needs, aspirations and expectations of the project affected population.
- Preparing an appropriate Socio-Economic Environment Management Plan.

3.6.3 Approach & Methodology

The basic approach for carrying out the SIA is focused on:

- Zeroing-in on the project impact area, covering all the villages and other habitations falling within the 10 km radius from the project site.
- Collecting basic information with respect to constituent villages in terms of census village code, name of the Tehsil in which a particular village falls, number of households, population level (as per Census 2011) and growth of village population during the last decade, distance from the proposed project site etc.
- Identifying critical knowledge/information gaps which impede an objective and reliable assessment of the socio-economic impacts of the project.
- Zeroing-in on the data/information to be collected for a fair impact assessment and deciding upon the sources and means to collecting the same.
- Identifying the key stakeholders and potential respondents for collecting the required information.
- Drawing a sampling frame and sample size specifying villages and number of households to be contacted for primary data/information collection and agencies to be contacted for eliciting information on various aspects relevant to the study.

3.6.4 Methodology

- The Social Impact Assessment (SIA) of the proposed project is relied on a judicious mix of Secondary (i.e., Census 2011, Govt. Dept., Maps and Literature Research) and Primary data (i.e., Field survey and Interview / Interactions) collected from different sources.
- Various socio-economic aspects considered for impact assessment include livelihoods, relocation and rehabilitation, incomes, employment, skills, education, health and overall lifestyles. The cultural aspects considered are archaeological, historical, religious and aesthetic places of importance, arts and crafts etc.

The SIA was carried out in the three distinct stages:

- Desktop review / research
- Field Survey
- Data Analysis & its interpretation

3.6.5 Project Impact Zones

The geographical area for impact assessment extends over 10kms. Radius from the project site and comprises of 14 census Villages and towns. To facilitate a more realistic and objective assessment, the 14 villages / towns Panchayat are categorized into three zones:

• Core zone (within 0 -3 Kms.) Radial distance from the project site)

• Buffer zone (> 3 – 7 Kms.)

• Transition/Outer zone (> 7 – 10 Kms.)

It is obvious from the above data that only 06 no. of villages fall in core impact zone, accounting for just 8% of the total population in the study area. 14no. of villages accounting for 26% of the total population fall in buffer impact zone, while 30no. of villages accounting for 66% of the total population fall in transition zone.

Table 3.38 Project Impact Zones

Impact Zone	No of villages	in %
0-3km	06	8
3-7km	14	26
7-10km	30	66
Total	**50**	**100%**

Source: census 2011.

Given the nature of the project, its socio-economic impacts will be more pronounced on the people inhabiting the core and buffer impact zones rather than on the transition zone. Hence the study focus was more on the socio-economic conditions obtaining among the households in the core and buffer zones.

The key demographic features of the villages / towns in the three impact zones are shown below:

FIGURE 3.35: NIGHT TIME NOISE LEVELS IN CORE AND BUFFER ZONE

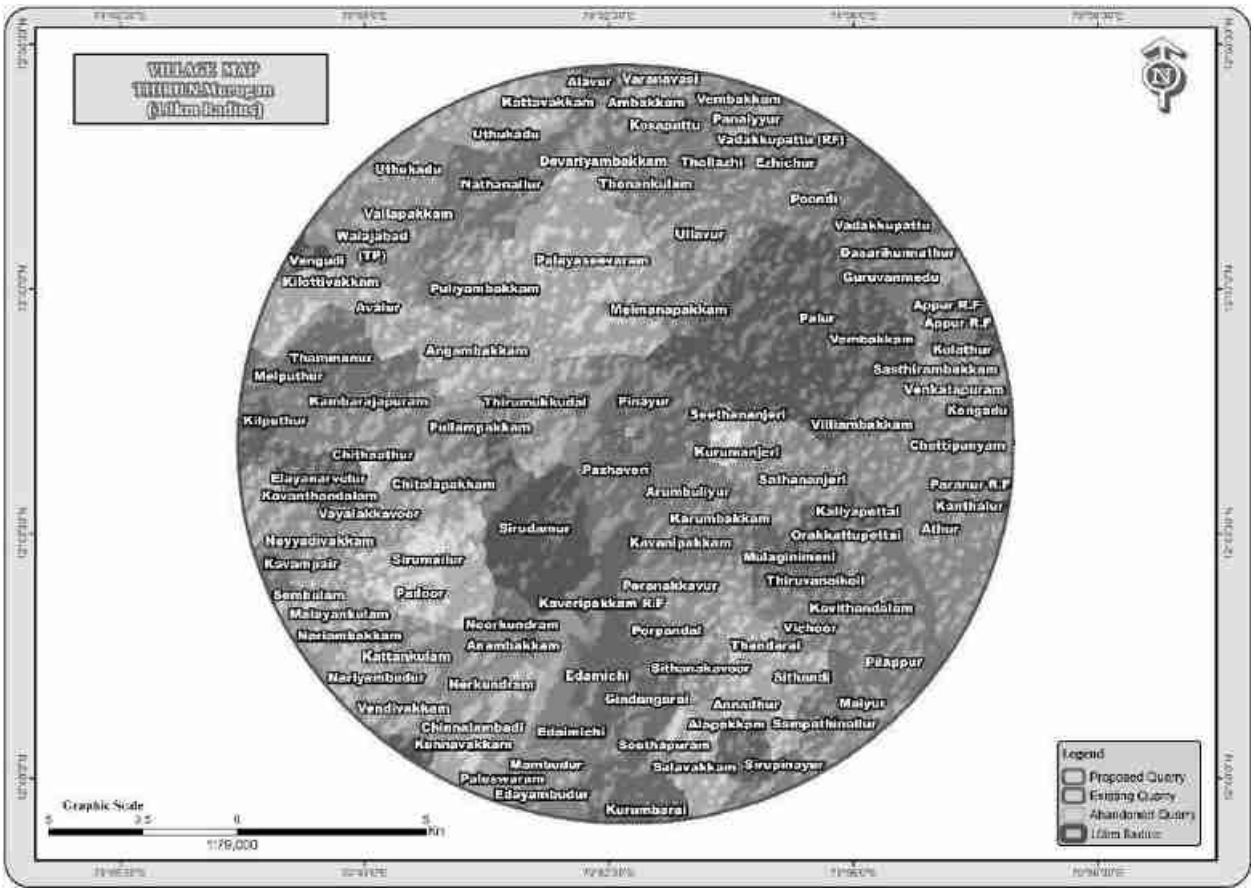


Table.3.39 Demographic characteristics (0-10km Radius)

Sno	Name	No.of Households	Total population	Total Male	Total Female	Population below 6	Male below 6	Female below 6	SC population	SC Male	SC Female	ST population	ST Male	ST Female
0-3km														
1	Thirumukkudal	406	1673	850	823	171	91	80	888	453	435	44	22	22
2	Pinayur	255	1068	520	548	104	46	58	377	178	199	6	3	3
3	Seethananjeri	110	494	247	247	54	23	31	285	143	142	21	11	10
4	Kurumanjeri	164	666	330	336	83	40	43	41	20	21	16	8	8
5	Arumbuliyur	402	1618	777	841	188	92	96	470	223	247	56	27	29
6	Sirumailur	247	1029	510	519	101	44	57	699	351	348	4	2	2
	Total	**1584**	**6548**	**3234**	**3314**	**701**	**336**	**365**	**2760**	**1368**	**1392**	**147**	**73**	**74**
3-7km														
1	Thonankulam	123	435	216	219	52	28	24	287	145	142	24	12	12
2	Palayaseevaram	1411	5634	2792	2842	681	325	356	2442	1208	1234	33	18	15
3	Vayalakkavoor	341	1429	752	677	146	90	56	809	440	369	0	0	0
4	Pullampakkam	209	872	424	448	122	64	58	671	328	343	44	24	20
5	Sirudamur	755	3097	1555	1542	365	186	179	1090	550	540	49	27	22
6	Chitalapakkam	153	592	288	304	69	32	37	9	5	4	0	0	0
7	Karumbakkam	211	850	438	412	81	44	37	538	273	265	0	0	0
8	Sathananjeri	544	2166	1095	1071	261	131	130	1037	523	514	15	5	10
9	Kaliyapettai	416	1640	829	811	195	102	93	471	244	227	8	4	4
10	Kavithandalam	461	1814	904	910	198	89	109	1359	678	681	19	9	10
11	Mulaginimeni	90	381	201	180	43	25	18	0	0	0	0	0	0
12	Mambakkam	156	627	311	316	68	37	31	519	255	264	0	0	0
13	Porpandal	253	941	491	450	95	59	36	429	223	206	43	27	16
14	Edamichi	349	1414	701	713	132	63	69	514	258	256	0	0	0
	Total	**5472**	**21892**	**10997**	**10895**	**2508**	**1275**	**1233**	**10175**	**5130**	**5045**	**235**	**126**	**109**
7-10km														
1	Villiambakkam	347	1344	673	671	122	70	52	4	2	2	34	17	17
2	Chettipunyam	387	1543	801	742	185	83	102	331	173	158	18	10	8
3	Athur	2960	11981	5972	6009	1229	634	595	4737	2446	2291	245	109	136

4	Kattavakkam	269	1063	523	540	103	52	51	824	412	412	38	15	23
5	Alavur	137	557	267	290	52	20	32	467	223	244	24	12	12
6	Ambakkam	269	1017	522	495	139	79	60	732	382	350	31	18	13
7	Thollazhi	272	980	501	479	108	60	48	443	233	210	0	0	0
8	Ullavur	444	1749	908	841	201	101	100	928	483	445	38	17	21
9	Nathanallur	520	2158	1047	1111	258	113	145	651	319	332	72	35	37
10	Elayanarvelur	299	1079	544	535	124	67	57	554	273	281	0	0	0
11	Walajabad (TP)	3590	14684	7189	7495	1689	827	862	4769	2305	2464	9	4	5
12	Kavampair	179	682	339	343	88	37	51	343	172	171	39	16	23
13	Neyyadivakkam	323	1360	666	694	140	62	78	682	316	366	48	24	24
14	Pazhaveri	191	727	362	365	76	36	40	368	190	178	5	3	2
15	Malayankulam	630	2390	1218	1172	250	140	110	937	480	457	58	35	23
16	Nariambakkam	12	35	14	21	1	1	0	0	0	0	0	0	0
17	Kattankulam	258	1028	514	514	100	59	41	289	142	147	0	0	0
18	Padoor	184	713	365	348	91	38	53	227	110	117	14	6	8
19	Orakkattupettai	201	744	368	376	86	42	44	88	48	40	18	6	12
20	Peranakkavur	235	926	478	448	118	54	64	634	325	309	9	5	4
21	Nerkundram	162	624	302	322	80	45	35	137	69	68	5	3	2
22	Chinnalambadi	110	434	227	207	38	20	18	91	50	41	0	0	0
23	Kunnavakkam	247	955	470	485	85	45	40	448	219	229	2	1	1
24	Paleswaram	205	802	400	402	106	52	54	356	184	172	14	6	8
25	Mambudur	78	296	164	132	19	14	5	0	0	0	13	8	5
26	Seethapuram	10	40	20	20	10	5	5	0	0	0	0	0	0
27	Salavakkam	787	3311	1635	1676	369	195	174	1144	575	569	39	16	23
28	Pilappur	331	1256	650	606	104	47	57	53	28	25	20	10	10
29	Sithandi	230	939	481	458	138	70	68	792	406	386	0	0	0
	Total	**13867**	**55417**	**27620**	**27797**	**6109**	**3068**	**3041**	**21029**	**10565**	**10464**	**793**	**376**	**417**
	G.Total	20923	83857	41851	42006	9318	4679	4639	33964	17063	16901	1175	575	600

Source: Census 2011, Kancheepuram district, Tamil Nadu

.

Table.3.40 Literacy and Workers characteristics (0-10km Radius)

Literate population	Male Literate	Female Literate	Total workers	Main workers	Marginal workers	Nonworkers
0-3km						
1216	672	544	540	527	13	1133
759	423	336	568	327	241	500
374	204	170	200	107	93	294
451	248	203	369	330	39	297
1025	546	479	657	583	74	961
638	364	274	603	365	238	426
4463	**2457**	**2006**	**2937**	**2239**	**698**	**3611**
3-7km						
270	149	121	241	241	0	194
3563	2013	1550	2158	1753	405	3476
890	526	364	663	625	38	766
494	269	225	425	412	13	447
1920	1101	819	1520	1316	204	1577
344	204	140	378	144	234	214
518	289	229	441	427	14	409
1387	796	591	1220	1212	8	946
1012	586	426	889	435	454	751
1203	674	529	927	855	72	887
241	137	104	185	47	138	196
385	209	176	294	237	57	333
640	361	279	483	323	160	458
1021	539	482	637	490	147	777
13888	**7853**	**6035**	**10461**	**8517**	**1944**	**11431**
7-10km						
879	511	368	697	405	292	647
959	570	389	658	455	203	885
8672	4668	4004	5576	3861	1715	6405
657	361	296	472	466	6	591
378	204	174	185	101	84	372
568	313	255	419	182	237	598
587	347	240	472	376	96	508
1096	662	434	657	369	288	1092
1288	690	598	1138	777	361	1020
643	352	291	551	475	76	528
11279	5891	5388	5695	4883	812	8989
427	244	183	383	318	65	299
896	513	383	652	592	60	708
477	271	206	264	260	4	463

1438	828	610	1152	1088	64	1238
24	10	14	20	20	0	15
606	343	263	491	445	46	537
463	262	201	384	361	23	329
567	307	260	290	260	30	454
586	332	254	536	533	3	390
341	187	154	337	213	124	287
274	164	110	129	108	21	305
554	295	259	389	95	294	566
450	262	188	401	361	40	401
204	119	85	133	54	79	163
26	15	11	14	13	1	26
2332	1257	1075	1429	1084	345	1882
772	470	302	653	550	103	603
627	357	270	573	534	39	366
38070	**20805**	**17265**	**24750**	**19239**	**5511**	**30667**
56421	31115	25306	38148	29995	8153	45709

Source: Census 2011, Kancheepuram district, Tamil Nadu

3.6.5.1Desktop Review / Research

A fairly comprehensive desk research to understand the socio-economic setting of the project area was the first initiative towards carrying out SIA. Accordingly, published and unpublished information available on the subject was referred, reviewed and critical information gaps identified by the SIA team.

It was during this stage, the key stakeholders were identified and study instruments – schedules and checklists – prepared, tested and finalised. Similarly, the sampling frame and sample size were also designed and finalised. The sampling frame for the study consisted of villages, households and District and Tehsil level officials, key informants as also local opinion leaders.

3.6.5.2 Baseline Data and Analysis of Surveyed Villages

A proportional random sampling technique was followed to select the sample villages and households. Accordingly, the sample villages were picked up at random from the three impact zones considered – Core, Buffer and Transition. The number of households to be contacted in each sample village was determined on the basis of the size of population of the respective village. In the absence of household level information, the respondent households were selected randomly during the course of visit to the respective village. However, while selecting the respondent households, emphasis was on contacting households, who are economically poor, susceptible to shifts in livelihood patterns and belonged to vulnerable social communities.

To ensure the accuracy of the primary data collected from the study area, all the village specific information was verified from the data of Census 2011 and secondary information collected from various Govt. Dept., Map, Literature etc.

Accordingly following no. of 8villages have been selected:

Table.3.41 Selection of sample village for Primary data

Sno	Name of the Village	Population	Distance and direction
1	Thirumukkudal	1673	2.0km-NW
2	Pinayur	1068	620m-S
3	Seethananjeri	494	3.0km-SE
4	Kurumanjeri	666	3.0km-E
5	Arumbuliyur	5634	2.2km-SE
6	Palayaseevaram	3169	3.2km-NW
7	Karumbakkam	850	3.7km-NE
8	Neerkundram	3097	4.3km-SW
	Total	**16,651**	

Source: Google earth image and Census 2011.

3.6.5.3 Field survey

Field survey helped in collecting fairly reliable primary data with respect to the major livelihood sources, education, health status, basic amenities and standard of living. It also helped in eliciting information from the natives about the negative environmental impacts of industrial units already existing in the area and the measures initiated by them (industrial units) to mitigate the impacts.

The potential respondents in the sample households were approached personally by members of the core **study team and Field Investigators** who explained the purpose of the visit and asked their participation by sharing the intended information unbiasedly. The study team clarified the doubts and addressed the apprehensions expressed by the respondents. Once the respondents were willing and ready to participate,

household level socio-economic information was collected with the help of a structured questionnaire. A number of questions were open ended to facilitate capturing perceptions of the respondents objectively.

In addition, Participatory Rapid Assessment (PRA) tools comprising Villages / Town Transect Walks, Focus Group Discussions (FGD), Key Informant Interviews and Local Opinion Leader interviews were used for collecting qualitative information with regards to key socio-economic challenges of the area.

3.7 Data Analysis & Its Interpretation

3.7.1Population Distribution and Composition of Study Area

The population as per 2011 Census records is 83857(for 10 km radius buffer zone). Total no. of household is 1584, 5472 and 13867respectively, in primary, secondary and tertiary zone. Sex ratio is 1025, 991 and 1006 (females per 1000 males) observed in primary, secondary and tertiary zone respectively. SC population distribution is 2760, 10175 and 21029 respectively in primary, secondary and tertiary zone. ST population distribution is 147,235 and 793 respectively in primary, secondary and tertiary. Average household size is 4. Zone wise Demographic profile of study area is given in the table below:

Source: https://censusindia.gov.in/census.website/data/census-tables

Table 3.42 Zone wise Demographic Profile of Study Area

Zone	No. of Villages	Total Household	Total Population	Male Population	%	Female Population	%
Primary Zone (0 - 3 Km)	6	1584	6548	3234	49.39	3314	50.61
Secondary Zone (3 - 7 Km)	14	5472	21892	10997	50.23	10895	49.77
Tertiary/Outer Zone (7 - 10 km)	30	13867	55417	27620	49.84	27797	50.16
Study Area (0-10 km)	**50**	**20923**	**83857**	**41851**	**49.91**	**42006**	**50.09**

Source: Census of India, 2011

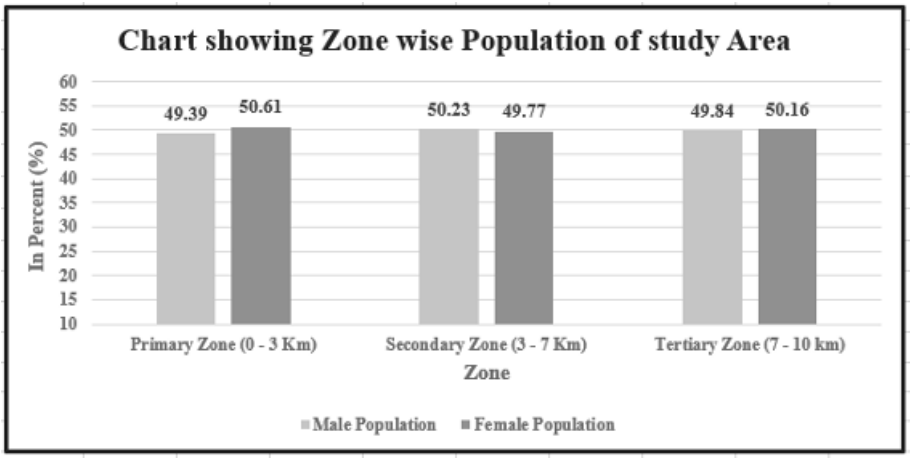


Figure.3.36 Population of study area

- ✓ Above table identifies the presence of villages and their subsequent population divided under three zones from Mine lease boundary (i.e., Primary, secondary and Outer zone)
- ✓ Primary zone has 6 village where as much as 1584 households with 6548population are located. Mostly lying on Built-up land for their livelihood and substance.
- ✓ Secondary and tertiary zone both comprise of 14 and 30 villages having a total population of 5 472 and 13, 867 respectively.

3.7.2 Gender and Sex Ratio

Sex ratio is used to describe the number of females per 1000 of males. Sex ratio is a valuable source for finding the population of women in India and what is the ratio of women to that of men in India. In the Population Census of 2011, it was revealed that the population ratio in India 2011 is 940 females per 1000 of males. The study area has 1004females per 1000 males. Gender and sex ratio determine the Human Development Index (HDI) of an area thereby understanding the status of women in that region. Following table entails information about sex ratio of 50 villages lying in study area (buffer zone) as primary, secondary and tertiary zone.

Table 3.43 Sex ratio of the study area

S. No.	Buffer Zone	Sex Ratio of Study area Female/ 1000 Male
1	Primary Zone (0-3 km)	1025
2	Secondary zone (3-7 km)	991
3	Tertiary/Outer Zone (7-10 km)	1006

Source: Census of India, 2011

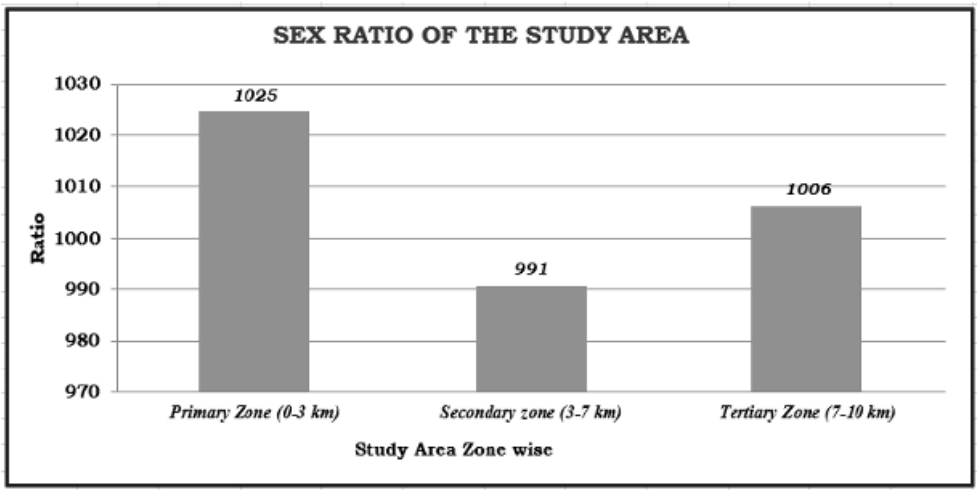


Figure.3.37 Sex Ratio within 10 Km study area

3.7.3 Literacy Rate in Study Area

Literacy Rate is the percentage of people in a country with the ability to read and write. The analysis of the literacy levels is done in the study area. The 10 km radius of study area demonstrates a literacy rate of 76% as per census data 2011. The male literacy rate in the study area indicates 84% whereas the female literacy rate, which is an important indicator for social change, is observed to be 68% as per the census data 2011. This needs to focus on the region and enhance further development focusing on education.

Table 3.44 Literacy Rate of the Study Area

Zone	No. of Villages	Male Literacy Population	Male literacy Rate	Female Literacy Population	Female literacy Rate	Total Literacy	Total Literacy Rate
Primary Zone (0 - 3 Km)	6	2457	84.78	2006	68.02	4463	76.33
Secondary Zone (3 - 7 Km)	14	7853	80.78	6035	62.46	13888	71.65
Tertiary/Outer Zone (7 - 10 Km)	30	20805	84.74	17265	69.74	38070	77.21
Study Area (0-10km)	**50**	**31115**	**83.71**	**25306**	**67.72**	**56421**	**75.69**

Source: Census of India, 2011

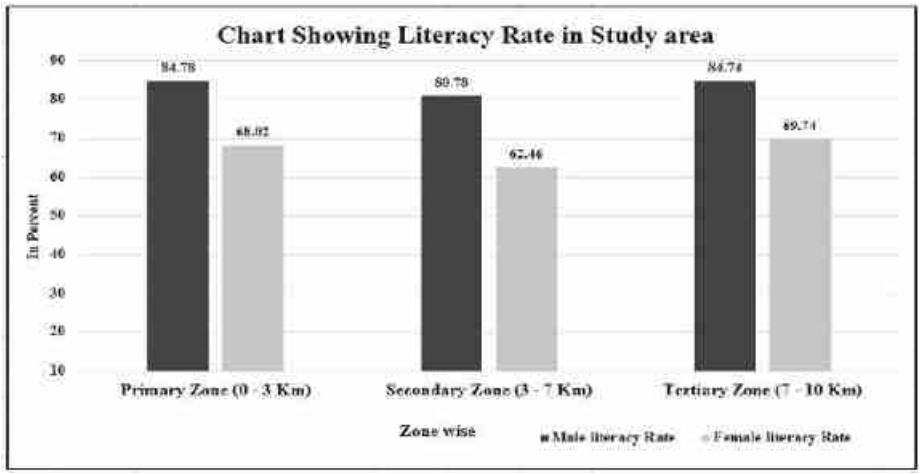


Figure.3.38 Gender wise Literacy Rate in the study area

3.7.4 Family Size

Size of family also describes about family functioning, resource consumption, total income generated and their expenditure pattern. Census 2011 data suggests that most of these households have a family size of up to 4 members, knowing the size of family also give fair understanding of relating how much resource consumption is being incurred, and annual income being generated and spent.

3.7.5 Vulnerable Group

While developing an action plan, it is very important to identify the population who fall under the marginalized and vulnerable groups and special attention has to be given towards these groups while making action plans. Special provisions should be made for them. In the observed villages schedule caste (SC) population is 40.50% and Schedule Tribe population 1.40%, Other Population is 58% in the total study area.

Table. 3.45 Vulnerable groups of the study area

Zone	No. of Villages	Vulnerable Groups					
		SC Population	%	ST Population	%	Other Population	%
Primary Zone (0 - 3 Km)	6	2760	42.15	147	2.24	3641	55.60
Secondary Zone (3 - 7 Km)	14	10175	46.48	235	1.07	11482	52.45
Tertiary Zone (7 - 10 Km)	30	21029	37.95	793	1.43	33595	60.62
Total area (10km)	**50**	**33964**	**40.50**	**1175**	**1.40**	**48718**	**58.10**

Source: Census of India, 2011

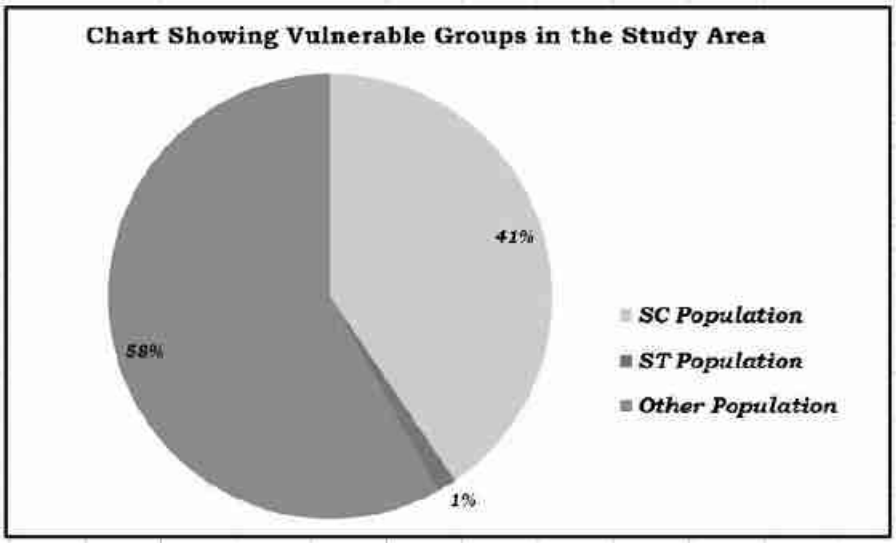


Figure.3.39 vulnerable groups

3.7.6 Economic Activities

The economy of an area is defined by the occupational pattern and income level of the people in the area. The occupational structure of residents in the study area is studied with reference to work category. The population is divided occupation wise into three categories, viz., Total workers, Main workers and non-workers. The main workers include cultivators, agricultural laborers, those engaged in household industry and other services. The non-workers include those engaged in unpaid household duties like, students, retired persons, dependents, beggars, vagrants etc. besides Institutional intimates or all other non-workers who do not fall under the above categories.

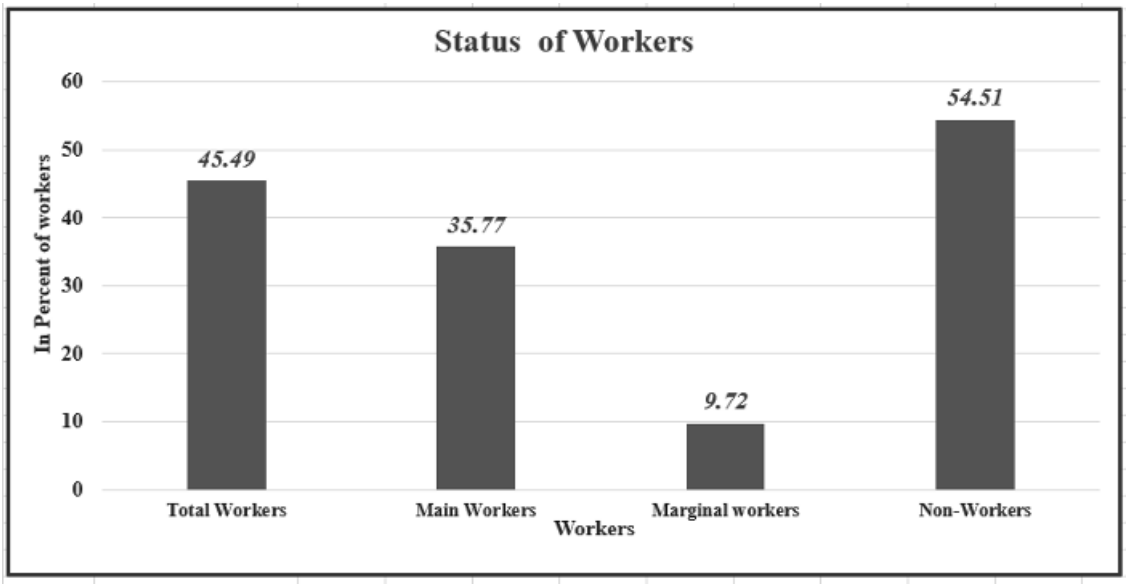
Table.3.46 Shows the work force of the study area

Zone	No. of Villages	Total Workers	%	Main Workers	%	Marginal Workers	%	Non-Workers	%
Primary Zone (0 - 3 Km)	6	2937	44.85	2239	34.19	698	10.66	3611	55.15
Secondary Zone (3 - 7 Km)	14	10461	47.78	8517	38.90	1944	8.88	11431	52.22
Tertiary Zone (7 - 10 Km)	30	24750	44.66	19239	34.72	5511	9.94	30667	55.34
Study Area (10 Km)	**50**	**38148**	**45.49**	**29995**	**35.77**	**8153**	**9.72**	**45709**	**54.51**

Source: Census of India, 2011

The above table shows that out of the total working population, the percentage of main workers is 36% while 10% are marginal workers. Number of working populations is 45.49% and non-working population is 54.51% in the study area. As per the data obtained from the survey (as mentioned previously in occupational structure) most of these people are employed for major period of the year. Also, to mention the natural environment also restricts the people in finding stable business is performed for only certain months. Thus, proposed project will act as possible exposure for them to get enrol and earn sustain livelihood.

Figure.3.40 Working Population in the Study Area



3.7.7 Structure Map 300m Radius

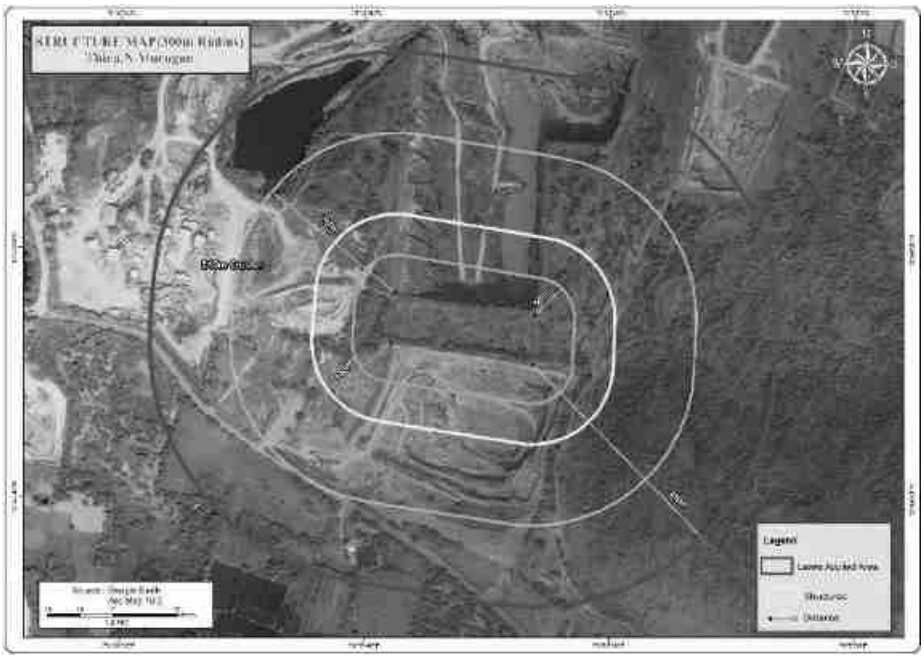


Figure.3.41 Structure map 300m Radius

Interpreatation:

There are no structure details in 0-50, 50-100, 100-200, and 240m only crusher NW and Lake, etc., in the study area.

3.7.8 Other Issues in the Study Area

1. Agriculture Land decreases
2. Lack of awareness among vulnerable groups for their welfare
3. Medical facilities and PHC need for the impact zone area
4. Environmental clean with solid wastage pin each village.
5. Need proper drainage system with public toilet men and women separately.

6. Road damage when load carriage way.
7. Issue of noise and air dust nearest house.
8. Employment and wages issue during quarry operation.

3.7.9 Interpretation

Based on the data, following inferences could be drawn:

- Total literacy rate in the study area is 76%.
- The study area had average educational facilities. The overall status depicts that the education is limited to primary and middle level.
- The schedule tribe community forms 1.40% and Scheduled Caste forms 40.5% of the total population of study area.
- The Other Population forms 58.10% of the total population of study area.
- The study area is well connected by District/Village Road.
- The study area well healthcare facilities of primary level in core zone.
- Considering the above facts, the Existing project will boost the socio-economic development activities in the area and hence will leave positive impact.
- The study area has mobile connectivity.

3.7.10 Recommendation and Suggestions

The village development plans are made in consultation with the community through Gram Sabha; these appear to address the needs of the community. However, it may be noted that at the implementation stage these plans often are fraught with problem of inadequate funds, lack of proper planning, corruption, vested interests and political agendas. Hence while ascertaining the scope for convergence with the government activities, care must be taken to ascertain realistic possibilities for implementation.

- **Women empowerment–** Home based income generation activities, vocational training programs and common education centre for increasing the literacy rate.
- **Education –** Free uniform, construction of common rooms and library, computer education and physical education, additional schools for girls, furniture and equipment in schools, up-gradation of existing school infrastructure.
- **Agriculture/livestock –** Infrastructure such as agricultural practices, electricity connections, assistance with buying improved tools and equipment, capacity building, supply and/or knowledge of better variety of seeds, pasture land development and trainings on animal husbandry & facility of veterinary doctor.
- **Health –** Improvements in sanitary conditions of villages, assistance with construction of latrines, improvement in drainage system, health camps and awareness campaigns for diseases like Covid-19, malaria, typhoid, tuberculosis, yellow fever and pneumonia. Repairing of PHCs and Anganwadi centers.
- **People with disability –** Establishment of center for special education, sensitization of the community towards disabled and awareness on Government schemes.
- 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.

- **Connectivity** –Transport connectivity to easiness accessibility to the region.

3.7.11 Conclusion

To evaluate the impacts of proposed quarry project on the surrounding area, it is vital to assess the baseline status of the environmental quality in the locality of the site. Hence it can be concluded that the present environment status of the study area will not be affected by the project as **Thiru. N. Murugan** will adopt adequate control measures to protect the surrounding environment and will contribute in development of the study areas.

The proposed quarry 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

- 0.62.0 Ha of the land will be under mining sine the Permanent or temporary change on land use and land cover will occur
- 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 causes the siltation of water course

4.1.2 Mitigation Measures

- The 0.62.0 Ha of the land will be converted into temporary reservoir which will full fill the water scarcity in the drought season and the nearby agriculture land will benefitted by the supply of water
- About 500 Nos of trees will be planted in the lease area and approach road will retain the eco system.
- The mining activity will be gradual confined in blocks and excavation will be undertaken progressively along with other mitigative measures like phase wise development in the production
- Construction of garland drains all around the quarry pits and construction of silt trap at strategic location in lower elevations to prevent erosion due to surface runoff during rainfall and also to collect the storm water for various uses within the proposed area.
- 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.,
- Fencing will be constructed before starting the mining operation and it will be maintained in the conceptual stage Security will be posted round the clock, to prevent inherent entry of the public and cattle.

4.1.3 Soil Environment

4.1.4 Impact on Soil Environment

- Removal of vegetation cover
- Soil Erosion in the project site during rainy season due to quarry operation

4.1.5 Mitigation Measures

- Garland drains will be constructed all around the project boundary to prevent surface flows from entering the quarry. 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 (Silt pond). These trap sediment and reduce suspended sediment loads before runoff is discharged from the quarry site. Sedimentation ponds should be designed based on runoff, retention times, and soil characteristics. There may be a need to provide a series of sedimentation ponds to achieve the desired outcome.
- Retain vegetation – Retain existing or re-plant the vegetation at the site wherever possible.
- Monitoring and maintenance – Weekly monitoring and daily maintenance of erosion control systems so that they perform as specified specially during rainy season.

4.1.6 Waste Dump Management

There is no waste anticipated in this Rough Stone and gravel quarrying operation. The entire quarried out materials will be utilized (100%).

4.2 WATER ENVIRONMENT

4.2.1 Anticipated Impact

- The major sources of water pollution normally associated due to mining and allied operations are:
    - Generation of waste water from vehicle washing.
    - Washouts from surface exposure or working areas
    - Domestic sewage
    - Disturbance to drainage course in the project area
    - Mine Pit water discharge
- 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
- Abstraction of water may lead to depletion of water table
- 1.4 KLD water will be utilized for the quarrying operation

4.2.2 Mitigation Measures

- Water for the quarrying operation such as sprinkling on haul roads, Greenbelt development will be sourced from the lower part of the mine pit which is specifically allotted to collect the rain water.
- 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
- Rainwater will be collected in sump in the mining pits and will be allowed to store and pumped out to surface setting tank of 15 m x 10m x 3m to remove suspended solids if any. This collected water will be judiciously used for dust suppression and such sites where dust likely to be generated and for developing green belt. The proponent will collect and judicially utilize the rainwater as part of rainwater harvesting system.
- Periodic (every 6 month once) analysis of quarry pit water and ground water quality in nearby villages.
- Domestic sewage from site office & urinals/latrines provided in ML is discharged in septic tank followed by soak pits.
- Waste water discharge from mine will be treated in settling tanks before using for dust suppression and tree plantation purposes.
- De-silting will be carried out before and immediately after the monsoon season.

4.3 AIR ENVIRONMENT

4.3.1. Anticipated Impact

- During mining, at various stages activities such as excavation, drilling, blasting, and transportation of materials, particular matter (PM), gases such as Sulphur dioxide, oxides of Nitrogen from vehicular exhaust are the main air pollutants.
- Emissions of noxious gases due to incomplete detonation of explosive may sometimes pollute the air.
- The fugitive dust released from the mining operations may cause effect on the mine workers who are directly exposed to the fugitive dust.
- Simultaneously, the air-borne dust may travel to longer distances and settle in the villages located near the mine lease area.

4.3.1.1. Modelling of Incremental Concentration from all Proposed Projects

Wind erosion of the exposed areas and the air borne particulate matter generated by quarrying operation, and transportation are mainly PM_{10} & $PM_{2.5}$ and emissions of Sulphur dioxide (SO_2) & Oxides of Nitrogen (NOx) 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 Rough Stone, 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 quarrying activity and net increase in emissions due to quarrying activities within 500 meters around the project area is predicted by Open Pit Source modelling using

AERMOD Software.

Prediction of impacts on air environment has been carried out taking into consideration cumulative production all the quarries falls in the Cluster. Air environment and net increase in emissions by Open pit source modelling in AERMOD Software AERMOD 12.

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 Rough Stone. 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

Suspended Particulate Matter (SPM) is the major pollutant occurred during quarrying activities. The prediction included the impact of Excavation, Drilling, Blasting (Occasionally), 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 10km 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 PM_{10} was observed close to the source due to low to moderate wind speeds. Incremental value of PM_{10} was superimposed on the base line data monitored at the proposed site to predict total GLC of PM_{10} due to combined impacts

TABLE 4.1: ESTIMATED EMISSION RATE

PM_{10}			
Activity	**Source type**	**Value**	**Unit**
Drilling	Point Source	0.045083368	g/s
Blasting	Point Source	0.000045050	g/s
Mineral Loading	Point Source	0.035450244	g/s
Haul Road	Line Source	0.002483799	g/s/m
Overall Mine	Area Source	0.037726816	g/s
SO_2			
Activity	**Source type**	**Value**	**Unit**
Overall Mine	Area Source	9.97261E-05	g/s
NO_X			
Overall Mine	Area Source	0.000002307	g/s

FIGURE 4.1: AERMOD TERRAIN MAP

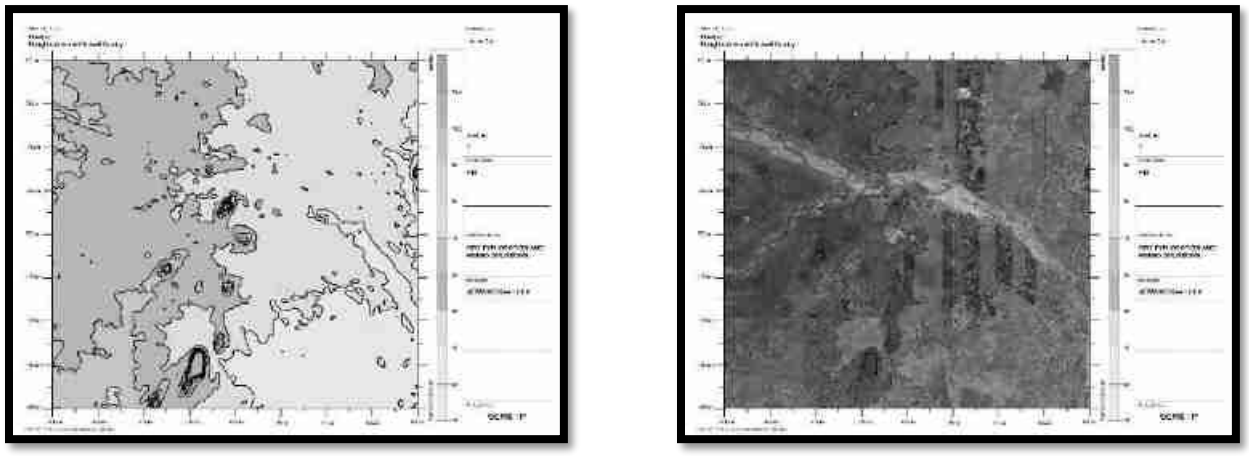


FIGURE 4.2: PREDICTED INCREMENTAL CONCENTRATION OF PM_{10}

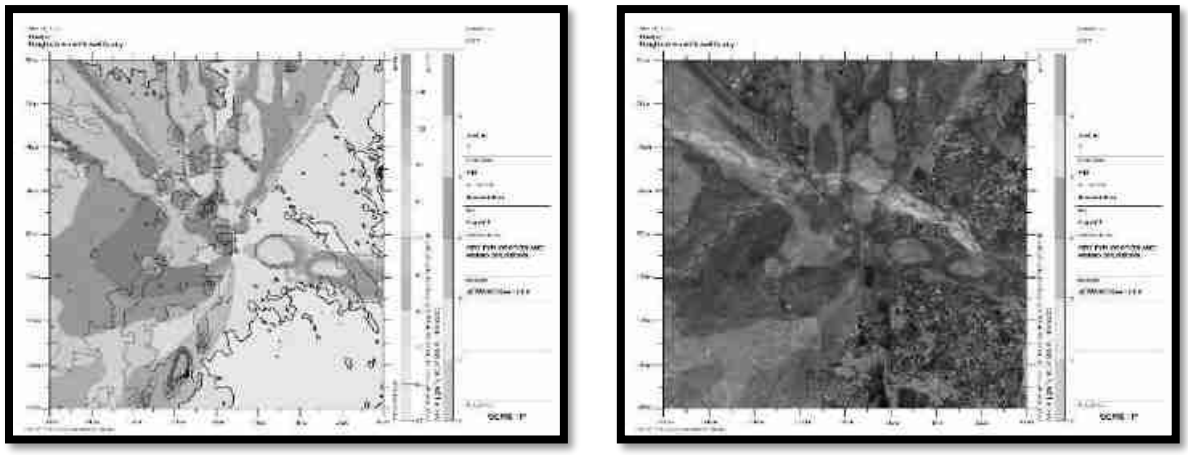


FIGURE 4.3: PREDICTED INCREMENTAL CONCENTRATION OF PM_{25}

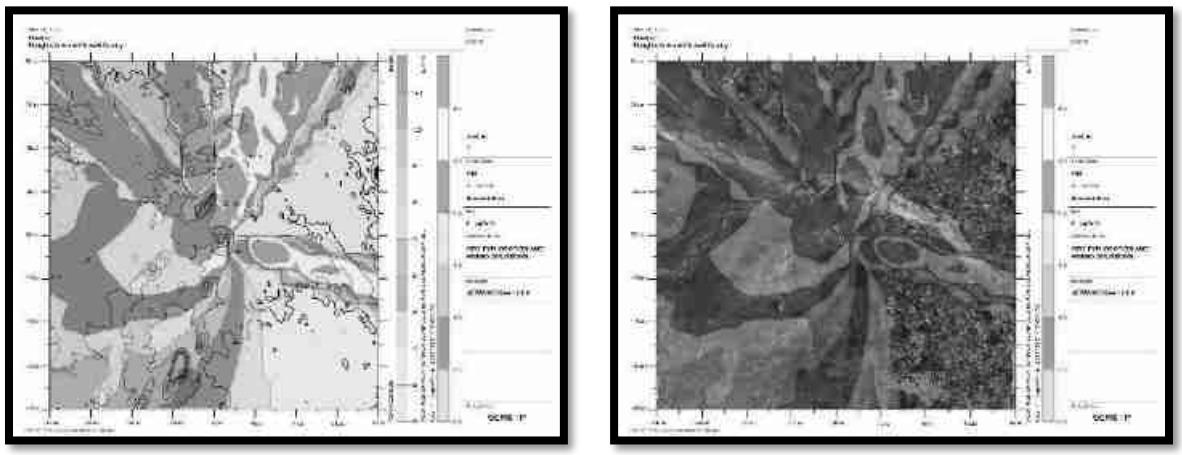


FIGURE 4.4: PREDICTED INCREMENTAL CONCENTRATION OF NO_X

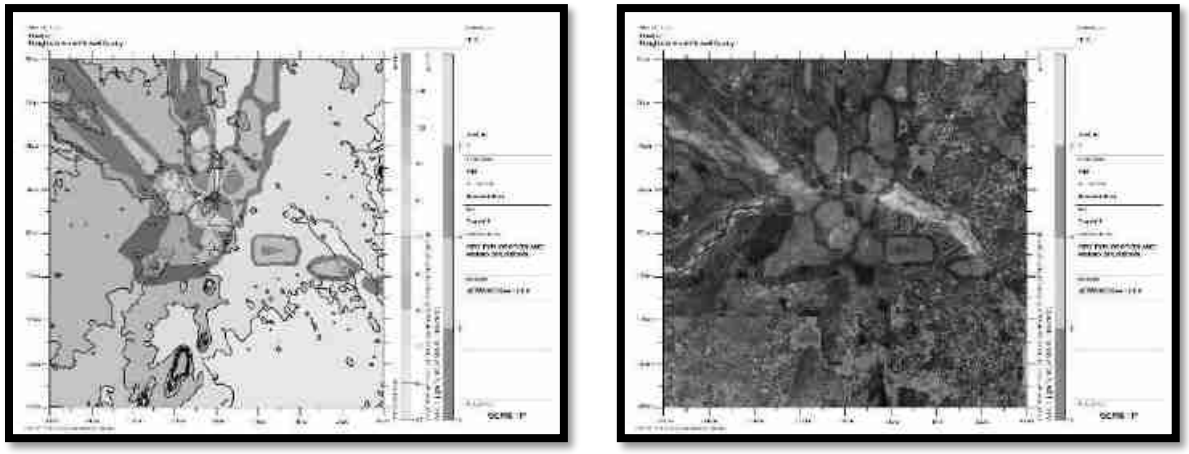


FIGURE 4.5: PREDICTED INCREMENTAL CONCENTRATION OF SO2

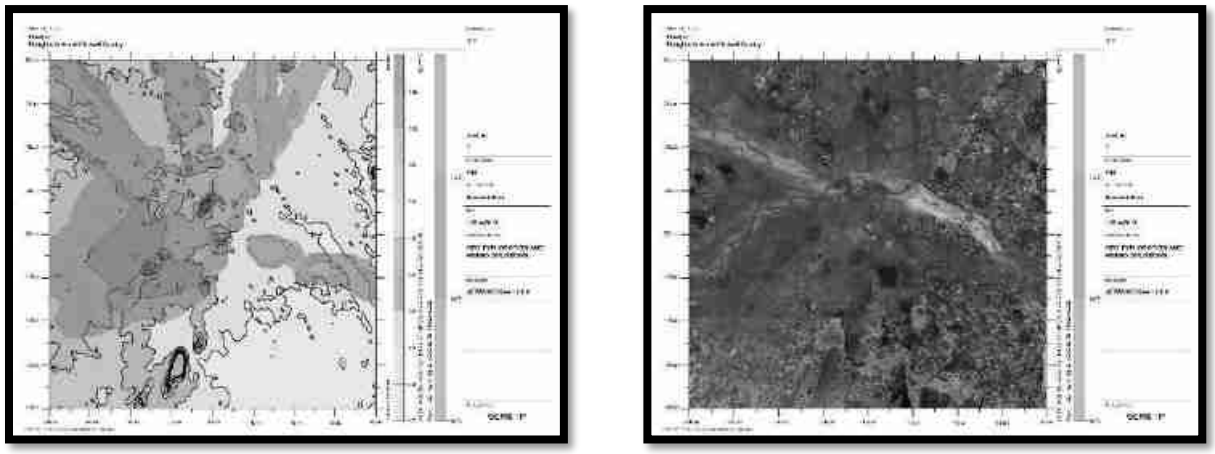
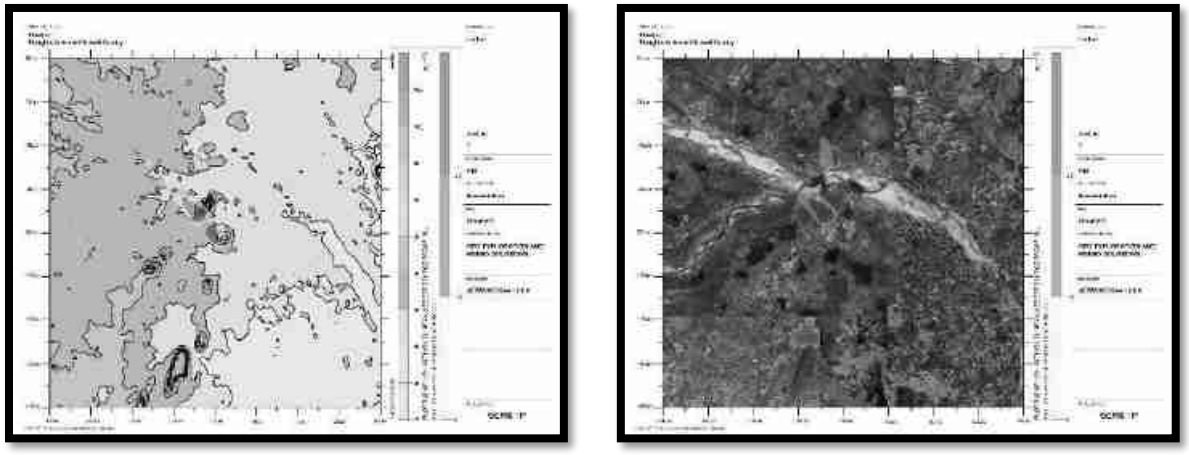


FIGURE 4.6: PREDICTED INCREMENTAL CONCENTRATION OF FUGITIVE DUST



4.3.2.1 Model Results

The post project Resultant Concentrations of PM_{10}, $PM_{2.5}$, SO_2 & NO_X (GLC) is given in Table below:

TABLE 4.2: INCREMENTAL & RESULTANT GLC OF PM_{10}

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline PM_{10} ($\mu g/m^3$)	Incremental value of PM_{10} due to mining ($\mu g/m^3$)	Total PM_{10} ($\mu g/m^3$)
AAQ1	12°44'47.04"N 79°52'46.82"E	84	8	43.9	9.69	53.6
AAQ2	12°44'29.28"N 79°52'52.16"E	248	-542	45.5	7.5	53.0
AAQ3	12°47'36.56"N 79°51'30.23"E	-2237	5230	46.8	0	46.8
AAQ4	12°42'45.69"N 79°54'36.75"E	3413	-3738	42.5	0	42.5
AAQ5	12°42'48.48"N 79°51'23.04"E	-2455	-3648	46.8	4	50.8
AAQ6	12°47'29.69"N 79°53'26.67"E	1286	5020	46.8	8.8	55.6
AAQ7	12°44'57.73"N 79°48'52.95"E	-6999	334	43.2	2.91	46.1

TABLE 4.3: INCREMENTAL & RESULTANT GLC OF $PM_{2.5}$

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline $PM_{2.5}$ ($\mu g/m^3$)	Incremental value of $PM_{2.5}$ due to mining ($\mu g/m^3$)	Total $PM_{2.5}$ ($\mu g/m^3$)
AAQ1	12°44'47.04"N 79°52'46.82"E	84	8	21.2	4.85	26.0
AAQ2	12°44'29.28"N 79°52'52.16"E	248	-542	21.4	3.74	25.2
AAQ3	12°47'36.56"N 79°51'30.23"E	-2237	5230	25.1	1.39	26.5
AAQ4	12°42'45.69"N 79°54'36.75"E	3413	-3738	22.6	0	22.6
AAQ5	12°42'48.48"N 79°51'23.04"E	-2455	-3648	46.8	2.4	49.2
AAQ6	12°47'29.69"N 79°53'26.67"E	1286	5020	43.0	4	47.0
AAQ7	12°44'57.73"N 79°48'52.95"E	-6999	334	21.8	1.82	23.7

TABLE 4.4: INCREMENTAL & RESULTANT GLC OF SO2

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline SO_2 ($\mu g/m^3$)	Incremental value due to mining ($\mu g/m^3$)	Total SO_2 ($\mu g/m^3$)
AAQ1	12°44'47.04"N 79°52'46.82"E	84	8	6.8	1.29	8.0
AAQ2	12°44'29.28"N 79°52'52.16"E	248	-542	6.5	1	7.5
AAQ3	12°47'36.56"N 79°51'30.23"E	-2237	5230	6.7	0	6.7
AAQ4	12°42'45.69"N 79°54'36.75"E	3413	-3738	6.3	0	6.3
AAQ5	12°42'48.48"N 79°51'23.04"E	-2455	-3648	6.7	0.31	7.0
AAQ6	12°47'29.69"N 79°53'26.67"E	1286	5020	6.9	1.2	8.1
AAQ7	12°44'57.73"N 79°48'52.95"E	-6999	334	6.4	0.12	6.5

TABLE 4.5: INCREMENTAL & RESULTANT GLC OF NOX

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline NOx (µg/m^3)	Incremental value due to mining (µg/m^3)	Total NOx (µg/m^3)
AAQ1	12°44'47.04"N 79°52'46.82"E	84	8	24.1	7	31.1
AAQ2	12°44'29.28"N 79°52'52.16"E	248	-542	23.6	3	26.6
AAQ3	12°47'36.56"N 79°51'30.23"E	-2237	5230	23.3	0	23.3
AAQ4	12°42'45.69"N 79°54'36.75"E	3413	-3738	24.1	0	24.1
AAQ5	12°42'48.48"N 79°51'23.04"E	-2455	-3648	24.8	0	24.8
AAQ6	12°47'29.69"N 79°53'26.67"E	1286	5020	23.1	3.88	26.9
AAQ7	12°44'57.73"N 79°48'52.95"E	-6999	334	23.9	0	23.9

TABLE 4.6: INCREMENTAL & RESULTANT GLC OF FUGITIVE DUST

Station Code	Location	X Coordinate (m)	Y Coordinate (m)	Average Baseline Fugitive (µg/m^3)	Incremental value due to mining (µg/m^3)	Total Fugitive Dust (µg/m^3)
AAQ1	10°54'25.78"N 77° 4'8.34"E	51	1	66.20	21	87.2
AAQ2	10°54'11.51"N 77° 4'29.65"E	703	-442	66.42	0	66.4
AAQ3	10°54'37.41"N 77° 2'20.12"E	-3257	358	66.63	0	66.6
AAQ4	10°55'16.54"N 77° 6'30.52"E	4398	1572	65.05	0	65.1
AAQ5	10°52'18.84"N 77° 3'39.38"E	-835	-3924	66.63	0	66.6
AAQ6	10°52'35.83"N 77° 5'56.31"E	3352	-3396	68.70	0	68.7
AAQ7	10°57'3.71"N 77° 4'38.09"E	963	4885	65.28	0	65.3

From the resultant of cumulative concentration i.e., Background + Incremental Concentration of pollutant in all the receptor locations without effective mitigation measures are still within the prescribed NAAQ limits of 100, 80 & 80 µg/m3 for PM10, SO2 & NOX respectively. By adopting suitable mitigation measures, the pollutant levels in the atmosphere can be further being controlled.

4.3.4. Mitigation Measures

Drilling – To control dust at source, wet drilling will be practiced. Where there is a scarcity of water, suitably designed dust extractor will be provided for dry drilling along with dust hood at the mouth of the drill-hole collar.

Advantages of Wet Drilling: -

- In this system dust gets suppressed close to its formation. Dust suppression become very effective and the work environment will be improved from the point of occupational comfort and health.
- Due to dust free atmosphere, the life of engine, compressor etc., will be increased.
- The life of drill bit will be increased.
- The rate of penetration of drill will be increased.
- Due to the dust free atmosphere visibility will be improved resulting in safer working conditions.

Blasting –

- Establish time of blasting to suit the local conditions and water sprinkling on blasting face.
- Avoid blasting i.e., when temperature inversion is likely to occur and strong wind blows towards residential areas.

- Controlled blasting includes Adoption of suitable explosive charge and short delay detonators, adequate stemming of holes at collar zone and restricting blasting to a particular time of the day i.e. at the time lunch hours, controlled charge per hole as well as charge per round of hole
- Before loading of material water will be sprayed on blasted material
- Dust mask will be provided to the workers and their use will be strictly monitored

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 taurpaulin
- 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-metaled 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 –

- 500Nos of trees will be planted through this project in the lease area and village roads (Approach road) 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

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. These activities will not cause any problem to the inhabitants of this area because there is no human settlement within 300m radius from the project site. Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities.

Predictions have been carried out to compute the noise level at various distances around the working pit due to these major noise-generating sources. Noise modelling has been carried out to assess the impact on surrounding ambient noise levels.

Basic phenomenon of the model is the geometric attenuation of sound. Noise at a point generates spherical waves, which are propagated outwards from the source through the air at a speed of 1,100 ft/sec, with the first wave making an ever-increasing sphere with time. As the wave spreads the intensity of noise diminishes as the fixed amount of energy is spread over an increasing surface area of the sphere. The assumption of the model is based on point source relationship i.e., for every doubling of the distance the noise levels are decreased by 6 dB (A).

For hemispherical sound wave propagation through homogeneous loss free medium, one can estimate noise levels at various locations at different sources using model based on first principle.

$Lp_2 = Lp_1 - 20 \log (r_2/r_1) - Ae_{1,2}$

Where:

Lp_1& Lp_2 are sound levels at points located at distances r_1& r_2 from the source.

$Ae_{1,2}$ is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

$Lp_{total} = 10 \log \{10^{(Lp1/10)} + 10^{(Lp2/10)} + 10^{(Lp3/10)} + \ldots\ldots\}$

4.4.1 Anticipated Impact

Attenuation due to Green Belt has been taken to be 4.9 dB (A). The inputs required for the model are:

- Source data
- Receptor data
- Attenuation factor

Source data has been computed taking into account of all the machinery and activities used in the mining process. Same has been listed in Table 4-8.

TABLE 4.7: ACTIVITY AND NOISE LEVEL PRODUCED BY MACHINERY

Sl.No.	Machinery / Activity	Impact on Environment?	Noise Produced in dB(A) at 50 ft from source*
1	Blasting	Yes	94
2	Jack Hammer	Yes	88
3	Compressor	No	81
4	Excavator	No	85
5	Tipper	No	84
Total Noise Produced			95.8

Source: U.S. Department of Transportation (Federal Highway Administration) – Construction Noise Handbook

The total noise to be produced by mining machineries 95.8 dB (A). Generally, most mining operations produce noise between 100-109 dB (A). We have considered equipment and operation noise levels (max) to be approx. 109 dB (A) for nose prediction modelling.

TABLE 4.8: PREDICTED NOISE INCREMENTAL VALUES

Location ID	**N1**	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**
Maximum Monitored Value (Day) dB(A)	48.3	49.7	43.2	45.9	49.5	47.10	47.10
Incremental Value dB(A)	60.1	45.8	25.3	26.5	27.6	25.8	23.4
Total Predicted Noise level dB(A)	60.4	51.2	43.3	45.9	49.5	47.1	47.1

The incremental noise level is found within the range of 47.3dB (A) in Core Zone and 60.1 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A) the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations are within permissible limits of Industrial area (core zone) & Residential area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 (The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.).

4.4.2 Mitigation Measures

The following noise mitigation measures are proposed for control of Noise

- Usage of sharp drill bits while drilling which will help in reducing noise;
- Secondary blasting will be totally avoided and hydraulic rock breaker will be used for breaking boulders;
- Controlled blasting with proper spacing, burden, stemming and optimum charge/delay will be maintained;
- 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;
- Silencers / mufflers will be installed in all machineries;
- Green Belt/Plantation will be developed around the project area and along the haul roads. The plantation minimizes propagation of noise;
- Personal Protective Equipment (PPE) like ear muffs/ear plugs will be provided to the operators of HEMM and persons working near HEMM and their use will be ensured though training and awareness.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects

4.4.3 Ground Vibrations

Ground vibrations due to the proposed mining activities are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc., However, the major source of ground vibration from the quarry is blasting. The major impact of the ground vibrations is observed on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground vibrations. Apart from this, the ground vibrations may develop a fear factor in the nearby settlements.

Another impact due to blasting activities is fly rocks. These may fall on the houses or agricultural fields nearby the mining lease area and may cause injury to persons or damage to the structures. Nearest habitation from the proposed project areas is listed in below table. The ground vibrations due to the blasting in the quarry are calculated using the empirical equation.

The empirical equation for assessment of peak particle velocity (PPV) is:

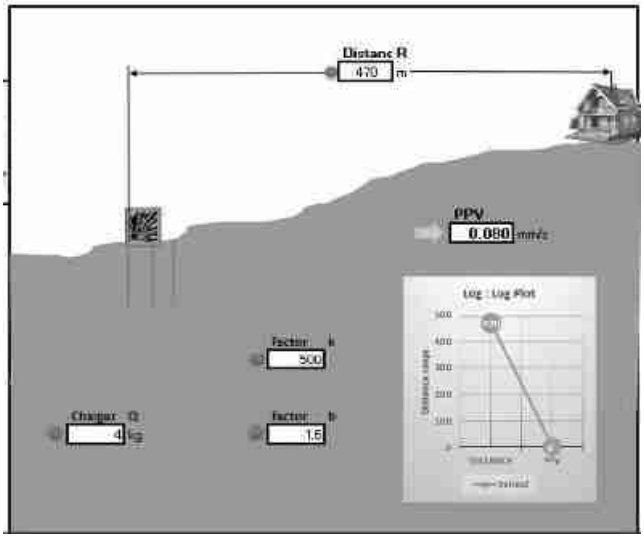
$$V = K [R/Q^{0.5}]^{-B}$$

Where –
V = peak particle velocity (mm/s)
K = site and rock factor constant
Q = maximum instantaneous charge (kg)
B = constant related to the rock and site (usually 1.6)
R = distance from charge (m)

TABLE 4.9: PREDICTED PPV VALUES DUE TO BLASTING

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	4	470-SE	0.080

FIGURE 4.6: GROUND VIBRATION PREDICTION



From the above graph, the charge per blast of 4 kg is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997. But the all the project proponents ensure that the charge per blast shall be less than 85 kg and carry out blasting twice or thrice a day based on the onsite conditions under the supervision of competent person employed. However, as per statutory requirement control measures will be adopted to avoid the impacts due to ground vibrations and fly rocks due to blasting**.**

4.4.3.1 Mitigation Measures

- It is proposed to carry out blasting operation 20kg per round so that the vibration will be minimal
- The mining operation will be carried out without deep hole drilling, 25mm small dia cartridge will be utilized for the blasting
- The blasting operations in the project site without deep hole drilling and blasting using delay detonators, which reduces the ground vibrations;
- Proper quantity of explosive, suitable stemming materials and appropriate delay system will be adopted to avoid overcharging and for safe blasting;
- Adequate safe distance from blasting will be maintained as per DGMS guidelines;
- Blasting shelter will be provided as per DGMS guidelines;
- Blasting operations will be carried out only during day time;
- The charge per delay will be minimized and preferably a greater number of delays will be used per blasts;
- During blasting, other activities in the immediate vicinity will be temporarily stopped;
- Drilling parameters like depth, diameter and spacing will be properly designed to give proper blast;
- A fully trained explosives blast man (Mining Mate, Mines Foreman, 2nd Class Mines Manager/ 1st Class Mines Manager) will be appointed.
- A set of shot firing rules will be drawn up and blasting shall commence outlining the detailed operating procedures that will be followed to ensure that shot firing operations on site take place without endangering the workforce or public.
- The detonators will be connected in a predetermined sequence to ensure that only one charge is detonated at any one time and a NONEL or similar type initiation system will be used.
- The detonation delay sequence shall be designed so as to ensure that firing of the holes is in the direction of free faces so as to minimise vibration effects.

- Appropriate blasting techniques shall be adopted such that the predicted peak particle velocity shall not exceed 8 mm/s.
- Vibration monitoring will be carried out every 6 months to check the efficacy of blasting practices

4.5 Impact on The Biological Environment

Environmental impact studies are required for systematic identification, qualification, and interpretation of the anticipated changes. The main environmental problems associated with mining activities are deforestation, land degradation (change in topography, soil erosion), visual intrusion, disturbance to the hydrological system, and water, air, and noise pollution which ultimately impact the floral and faunal status of the project area. However, the occurrence and magnitude of these impacts entirely depend on project location, mode of operation, and adoption of the latest technologies.

4.5.1. Impact Identification and Evaluation

In general, impact prediction methods argue that the foremost step in impact appraisal must consider and identify project actions that are likely to bring significant changes in the project environment. The present study determined to predict the likely impacts of the Proposed Rough and Gravel Quarry mining Project in the surrounding environment with a specific focus on biological attributes covering habitats/ecosystems and associated biodiversity. Likely impacts identified were categorized into different levels like direct or primary and indirect or secondary impacts based on the influence of sources of impacts.

There is no National Park or 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 Schedule- I species were found in the buffer zone of the proposed project area during the biodiversity assessment.

4.5.2. Impact on Flora

The proposed mine lease exhibits plain topography and it is Patta land which is not fit for cultivation. It is mostly devoid of any considerable vegetation. The proposed mine lease area (core zone) does not encompass any designated forest land within it. The vegetation is very sparse and scanty. So, there will be no impact on flora from the mining operation. There will not be much contamination of soil or any other materials from the mining operation. No threatened plant species were reported in the core and buffer study area during the field survey.

4.5.2.1. Anticipated Impact on agricultural land associated with flora

1. There are no impacts on the nearby agricultural land due to this mining activity.
2. None of the plants will be cut during the operational phase of the mine.
3. Dust particle settle on neighbouring agricultural land located about 200m on the north and west side. Mostly dust emission from during operation and minerals are transported in approach roads.
4. Dust deposition on leaf observed on nearby lease boundary local plant species which may result in decline the rate of photosynthesis and retards the plant growth.

4.5.2.2. Mitigation Measures

4.5.2.3. General Guidelines for Green Belt Development

Drone survey was covered the green belt and fencing as per the terms of references. The green belt and plantation purposes in and around the proposed mine lease area native species, fruit-bearing trees, medicinal plants, and dense canopy trees should be selected. These species should be tolerant to pollution levels as per Bio- Geography zones of India.

After the operation of mining production capacity, Green belt and Plantation species should be in accordance with the Terms and Conditions of the Environmental Clearance Green belt is created not only for the purpose of protecting sensitive areas or maintaining the ecological balance but because they also act as efficient biological filters or sinks for particulate and gaseous emissions, generated by vehicular movements and various industrial and mining activities. Optimally designed green belts can be effective in reducing the impact of fugitive emissions and pollutants accidentally or otherwise released at ground levels.

4.5.3. Proposed Green Belt

Extensive green belt development will be started during the construction phase, which will continue till the operation of the plant. About 1500-2000 trees will be planted per hectare all around the plant, approach roads, and

township premises. Locally available types of trees that are resistant to pollutants will be planted. In addition to the above, all open spaces available within the premises will be developed as nurseries, parks, gardens, and other forms of greenery. 5 m wide greenbelt will be developed along the plant premises, as per land available.

4.5.3.1. Development of Green Belt

The plantation matrix adopted for the green belt development includes pit of 0.3 m x 0.3 m in size with a spacing of 2 m x 2 m. In addition, earth filling and manure may also be required for the proper nutritional balance and nourishment of the sapling. It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration. Multi-layered plantations comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt.

4.5.3.2. Selection of Plant Species for Green Belt Development

It is also recommended that the plantation has to be taken up randomly and the landscaping aspects could be taken into consideration. Multi-layered plantations comprising of medium height trees (7 m to 10 m) and shrubs (5 m height) are proposed for the green belt. Green belt is plantation of trees for reducing the air pollution as they absorb both gaseous and particulate pollutant, thus removing them from atmosphere. Green plants form a surface capable of absorbing air pollutants and forming sinks for pollutants. It improves the aesthetic value of local environment. Under present project, green belts have been planned with emphasis on creating biodiversity; enhance natural surroundings and mitigating pollution. Regional tree saplings in eco-friendly bags like Pterocarpus marsupium, Pongamia pinnata, Limonia acidissima, and Cassia roxburghii will be planted along the Lease boundary and avenues as well as over Non-active dumps with intervals 3m in between with the GPS Coordinates. The greenbelt development plan aims to overall improvement in the environmental conditions of the region Native plant species will be preferred.

- The species should be wind-firm and deep-rooted.
- The species should form a dense canopy.
- Fast-growing plants will be planted
- Species tolerance to air pollution like SO2 and NO2 should be preferred.
- Plants having large leaf area index will be considered
- Soil improving plants (Nitrogen fixing rapidly decomposable leaf litter).
- Attractive appearance with good flowering and fruit-bearing.
- Birds and insects attract tree species.
- Roadsides will be planted with local vegetation.

Table No 4.10. List of plant species proposed for Greenbelt development

S. No	Scientific name	Tamil Name
1	Aegle marmelos	Vilva maram
2	Albizia lebbeck	Vaagai maram
3	Cassia fistula	Konrai tree
4	Lannea coromandelica	Othiyam
5	Limonia acidissima	Vila maram
6	Syzygium cumini	Naval maram
7	Toona ciliata	Santhana Vembu
8	Ficus hispida	Aththi maram
9	Borassus flabellifer	Panai-maram
10	Madhuca longifolia	Illupai maram

(*Source: Term of Reference-ToR)

Table No 4.11. Species suitable for abatement of noise and dust pollution

S. No	Botanical name	Common name
1	Azadirachta indica	Vembhu maram
2	Ficus religiosa	Arasan maram
3	Ficus hispida	Aththi maram

4	Bombax ceiba	Mul Elavu
5	Syzygium cumini	Naval maram
6	Tamarindus indica	Puliyamaram
7	Mangifera indica	Manga maram
8	Harwickia binata	Anjan maram
9	Delonix regia	Neruppu Kondrai
10	Cassia Fistula	Sara Kondrai

(*Source: Guidance for Developing Green belts Manual, CPCB 2000)

The above-suggested list covers species with thick canopy cover, perennial green nature, native origin, and a large leaf area index. The proposed species will help in forming an effective barrier between the mine site area and the surroundings.

These species need to be planted along the periphery of the lease area for absorb fugitive emissions and noise levels which is generated during mining activities. All the open spaces, where tree plantation may not be possible, should be covered with shrubs and grass to prevent erosion of topsoil.

4.5.4. Anticipated Impact on Fauna

- Noise generation due to vehicle may affect avifauna.
- The lease area is not inhabited by any wild life, as there is no forest cover, hence there will not be any effect on migration or extinction of wildlife.
- There is no National Park, Biosphere Reserve, Wildlife corridors, and Tiger/Elephant Reserve found within 10 km radius of the project site.

4.5.4.1. Measures for protection and conservation of wildlife species

- Topsoil has a large number of seeds of native plant species in the mining area.
- Topsoil will be used for restoration and suitable surfaces for planted seedlings.
- Checks and controls the movement of vehicles in and out of the mine.
- Undertaking mitigative measures for a conducive environment to the flora and fauna in consultation with Forest Department.
- A dust suppression system will be installed within the mine and periphery of the mine.
- Plantation around the mine area will help in creating habitats for small faunal species and create a better environment for various fauna. Creating and developing awareness for nature and wildlife in the adjoining villages.

4.5.3. Impact on Aquatic Biodiversity

- The major lake along the project sites doesn't have a rich biodiversity and almost all the species of both fauna and flora listed are either least concerned or not evaluated.
- There is no impact on fish habitats and the food WEB/ food chain in the water body and Reservoir.

Table No: 4.12. General Impacts vs. Mitigation Matrix

Particulars	Issues	Reason/Status in relation to the mine site	Reference/Method	Suggestions
Species	Rare/ Endangered/ Threatened species	Not reported	Field observation, interviews of local people	**Nil**
	Endemic Species	No endemic species of any flora, fauna or wildlife are present in the study area.	Field survey, Literature review	**Nil**
	Protected Areas	No National Park, Wildlife Sanctuary, Tiger reserve, and Biosphere Reserve falls in the 10-km radius study area	ENVIS, Government of Tamil Nadu protected area website, Google Earth, Project Maps, etc.	**Nil**

Important Natural Habitats	Important Bird Areas	No Important Bird Areas are falling in the 10-km radius area for Migratory Bird Habitat	ENVIS Centre on Wildlife & Protected Areas, Important Bird Area in India, IBA Book (Birdlife International)	**Nil**
	Ramsar site	No Ramsar sites present in the surrounding area region	Ramsar Web site	**Nil**
	Wetlands of National Importance	Nil	ENVIS Centre on Wildlife & Protected Areas, Wetlands directory of Government of India	**Nil**
	Wetlands of International Importance	Nil	Nil	**Nil**
	Wildlife Corridors	No Wildlife Corridor is falling in 10 km radius project study area	Protected Areas, Consultation with local naturalists & and authenticated location map.	**Nil**
	Eco-sensitive zone identified by the government	No Eco-sensitive zone is falling 10 km radius project study area	ENVIS, Consultation with local naturalists & authenticated location map	**Nil**
	Forest Areas	Kaveripakkam R.F. is located about 2.0 km on the South side and Appur R.F.is located about 8.0 Km- NE side. Idaimichi R.F. is located about 5.40Km- SW side	ENVIS, Government of Tamil Nadu protected area website, Google Earth, Project Maps, etc.	NIL, Applicant will create the green belt plantation on the periphery of mine sites.
	Water bodies	Nil	Project Map and local maps, Google Earth	Ensure minimum destruction during in operation phase.
	Breeding/nesting areas	No breeding/Nesting site are falling in the study area	Literature Survey Project Map and local maps, Google Earth	NIL

TABLE 4.13: RECOMMENDED SPECIES FOR GREENBELT DEVELOPMENT PLAN

SI.No	Name of the plant (Botanical)	Family Name	Common Name	Habit
1	*Azadirachta indica*	Meliaceae	Neem, Vembu	Tree
2	*Albiziafalcatoria*	Fabaceae	Tamarind, Puliyamaram	Tree
3	*Polyalthialongifolia*	Annonaceae	Kattumaram	Tree
4	*Borassus Flabellifer*	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 will be planted along the Lease boundary and avenue plantation will be carried out in the project site. The rate of survival expected to be 80% in this area. Greenbelt development Plan is given in

TABLE 4.14: GREENBELT DEVELOPMENT PLAN

Year	No. of tress proposed to be planted	Area to be covered in m^2	Name of the species

I	500	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Neem, Pongamia Pinnata etc.,

4.6 SOCIO ECONOMIC

4.1 Construction Phase

Anticipated Impacts:

♣ No. of people will get employment during the construction stage resulting in the ancillary development and growth. Nearby Local people will be given preference for employment on the basis of their skill and experience.

♣ Further due to proposed project, influx of working community will also generate an indirect employment through development of nearby market/ shops, trade centers, activities, transportation etc.

♣ Population influx during the construction phase can introduce various water and vector borne diseases which can lead to various unhygienic health problems in the area by disturbing the existing sanitation infrastructure.

♣ Rapid diverse population influx at the project site can create unusual behavioural activity such as worker-community conflicts, increase violence such as theft/stabbing, and increased consumption of drugs/alcohol within the area.

♣ Impacts on the health of nearby villagers can be envisaged due to the transportation activities leading to short term exposure of fugitive dust, resulting in various acute diseases such as increased eye irritation, nausea, headache etc.

Mitigation measures:

♣ Deploying of mobile toilets or the construction of temporary toilets will be done near to the construction site with the adequate water supply.

♣ Awareness programme will be conducted before the monsoon season regarding the spread of water borne/ vector diseases.

♣ Mosquito repellents will be provided in the nearby villages and at construction site to avoid the spread of diseases.

♣ To overcome behavioral impact, proper site in charge with timely supervision will be done. In advance, facilities with equipped medical and safety services will be provided to take a control over the incident/violence if any caused.

♣ To overcome behavioral impact, supervision will be done by site in charge. In advance, emergency cell will be formed with fully equipped communication system, medical and safety services to take control over the incident/violence caused.

4.2 Operation Phase:

Anticipated Impacts:

♣ Long term exposure to the pollutants such as PM, SO_2 and NO_2 Cement dust have a potential to create health impacts such as risk of cardiovascular and respiratory disease, eye irritation, bronchitis, lung damage, increased heart ailments, etc.

♣ Other impacts, associated with the applied for rough stone and gravel quarry project will create a positive impact as it will result in the overall development of the area in respect to the infrastructure development, educational growth, health facilities etc., as a part of the CSR activity.

Mitigation Measures:

♣ In order to mitigate the long-term health impacts, efficient Air Pollution Control Equipment (APCE) like Bag House / Bag Filter / ESP will be installed at all major stacks to keep the emissions within the permissible limits. To reduce the gaseous emission, Pyro-process itself acts as a long SO_2 scrubber and De - NOx system will be installed for fuel burning along with calciner for low NO_x formation. To reduce fugitive emission from vehicles and machineries will be regularly monitored and maintained.

♣ For emergency, proposed to develop an occupational health center for its employees and nearby villagers.

4.3 Impact Evaluation:

Table 4.15 Impact Evaluation

Impact Evaluation Element	Impact on socio economics due to the applied for rough stone and Gravel quarry over an extent of 0.96.50ha of Patta lands in S.F.Nos. 415/2A & 415/2B of Pinayur Village, Uthiramerur Taluk, Kancheepuram District, Tamil Nadu State.			
Potential Effect/ Concern	Proposed project will provide direct & indirect employment opportunities to the local residents, which will help to increase their earning and better living standard as well as further up-liftment of socio-economic status of the area.			
Characteristics of Impacts				
Nature	Positive		Nagative	Netural
	✓			
Type	Direct	Indirect	Cumulative	
			✓	
Extent	Project area	Local	Zonal	Regional
	✓			
Duration	Short time		Long term	
			✓	
Intensity	Low		Medium	High
			✓	
Frequency	Remote (R)	Occasional (O)	Periodic (P)	Continuous (C)
			✓	
Significance of Impact				
Significance	Insignificant	Minor	Moderate	Major
			✓	

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;
- Work site assessment will be done by rock scaling of each surface exposed to workers to prevent accidental rock falling and / or landslide, especially after blasting activities;
- 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, Spirometric 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, the entire mined out material will be sold to needy crushers and customers.

4.9 MINE CLOSURE

The ultimate depth of the mine is 20m bgl and the life of the mine is 10 years, after completion of mining operation the following action will be taken in the project site as a part of Mine closure plan

- The total Mined out land would be around 0.62.0 Ha this land will be converted into temporary water reservoir which will facilitate to collect the rain water
- The stagnant water will be supplied to the nearby agriculture land during drought seasons
- Fencing will be re constructed around the pit after closure, the warning/ danger display board will be placed on all the sides of the project site
- The un utilized area and haul roads will be converted as plantation area, fruit bearing trees will be planted to retain the eco system of the area
- Final Mine closure plan will be prepared and submitted to the concerned authority

Mine closure plan is the most important environmental requirement in mining project. The mine closure plan should cover technical, environmental, social, legal and financial aspects dealing with progressive and post closure activities. The closure operation is a continuous series of activities starting from the decommissioning of the project.

As progressive mine closure is a continuous series of activities, it is obvious that the proposals of scientific mining have included most of the activities to be included in the closure plan. While formulating the closure objectives for the site, it is important to consider the existing or the pre-mining land use of the site; and how the operation will affect this activity.

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 discharge 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

The surrounding areas already undergone quarrying operation, there are 1-2 Crushers within the radius of 200m-W. Most of the quarries in the regions are abandoned and lease expired quarries. Hence this quarry will feed the Rough stone material to the crushing units.

The Rough Stone and Gravel Quarry Project for excavation of Rough Stone, which is site specific. The proposed mining lease areas have 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.
- There is no river, stream, nallah and water bodies in the applied mine lease areas.
- 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 Proposed fresh quarries in the area operated by Opencast Mechanised Mining operation with drilling and blasting method will be used to extract Rough Stone in the area. 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.
- Blasting and availability of drills along with controlled blasting technology gives desired fragmentation so that the mineral is handled safely and used without secondary blasting.
- Semi-skilled labours fit for quarrying operations are easily available around the nearby villages.

5.4 ANALYSIS OF ALTERNATIVE TECHNOLOGY

Open cast mechanized method has been selected for these projects. 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 main objective of environmental monitoring is to ensure that the obtained results in respect of environmental attributes and prevailing conditions during operation stage are in conformity with the prediction during the planning stage. In case of substantial deviation from the earlier prediction of results, this forms as base data to identify the cause and suggest remedial measures. 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 the project proponent. A comprehensive monitoring mechanism has been devised for monitoring of impacts due to this project; 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 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.

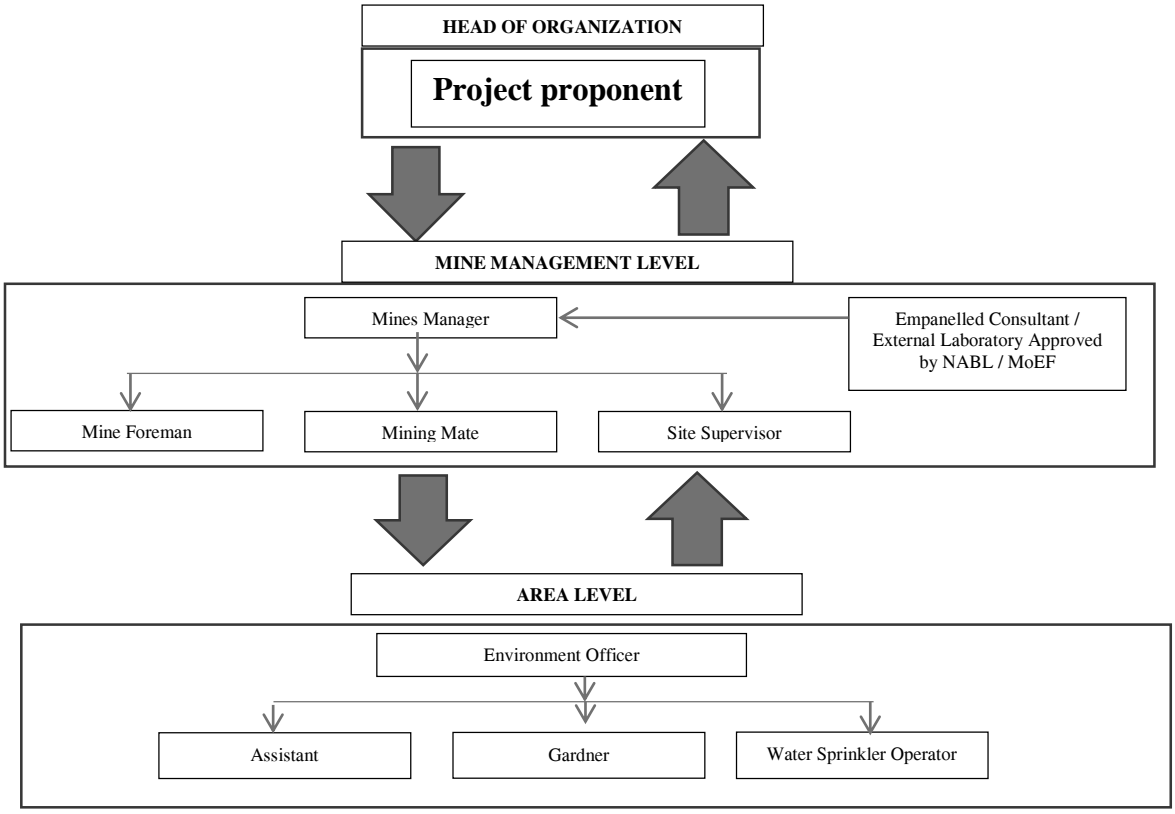
The responsibilities of this cell will be:

- 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 P1



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

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 FOR P1

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	Depth in bgl
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)	–	During blasting Operation	Peak Particle Velocity
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 3,80,000/- per annum for each Proposed Project.

TABLE 6.3 ENVIRONMENT MONITORING PROGRAM BUDGET

PROPOSAL – P1			
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 Cluster Mine Management Coordinator and Respective 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 quarry operation will be carried out under the direction of a Qualified Competent Mine Manager holding certificate of competency to manage a metalliferous mine granted by the DGMS, Dhanbad for 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	Improper handling and unsafe working practice	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; Workers will be sent to the Training in the nearby Group Vocational Training Centre Entry of unauthorized persons will be prohibited; Fire-fighting and first-aid provisions in the mine office complex and mining area; Provisions of all the safety appliances such as safety boot, helmets, goggles etc. will be made available to the employees and regular check for their use Working of quarry, as per approved plans and regularly updating the mine plans;

			Cleaning of mine faces on daily basis shall be daily done in order to avoid any overhang or undercut; Handling of explosives, charging and firing shall be carried out by competent persons only under the supervision of a Mine Manager; Maintenance and testing of all mining equipment as per manufacturer 's guidelines.
2	Drilling	Improper and unsafe practices Due to high pressure of compressed air, hoses may burst Drill Rod may break	Safe operating procedure established for drilling (SOP) will be strictly followed. Only trained operators will be deployed. No drilling shall be commenced in an area where shots have been fired until the blaster/blasting foreman has made a thorough Examination of all places, Drilling shall not be carried on simultaneously on the benches at places directly one above the other. Periodical preventive maintenance and replacement of worn-out accessories in the compressor and drill equipment as per operator manual. All drills unit shall be provided with wet drilling shall be maintained in efficient working in condition. Operator shall regularly use all the personal protective equipment.
4	Blasting	Fly rock, ground vibration, Noise and dust. Improper charging, stemming & Blasting/ fining of blast holes Vibration due to movement of vehicles	Restrict maximum charge per delay as per regulations and by optimum blast hole pattern, vibrations will be controlled within the permissible limit and blasting can be conducted safely. SOP for Charging, Stemming & Blasting/Firing of Blast Holes will be followed by blasting crew during initial stage of operation Shots are fired during daytime only. All holes charged on any one day shall be fired on the same day. The danger zone will be distinctly demarcated (by means of red flags)
5	Transportation	Potential hazards and unsafe workings contributing to accident and injuries Overloading of material While reversal & overtaking of vehicle Operator of truck leaving his cabin when it is loaded.	Before commencing work, drivers personally check the dumper/truck/tipper 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. Not allow any unauthorized person to ride on the vehicle nor allow any unauthorized person to operate the vehicle. Concave mirrors should be kept at all corners All vehicles should be fitted with reverse horn with one spotter at every tipping point Loading according to the vehicle capacity Periodical maintenance of vehicles as per operator manual

6	Natural calamities	Unexpected happenings	Escape Routes will be provided to prevent inundation of storm water Fire Extinguishers & Sand Buckets
7	Failure of Mine Benches and Pit Slope	Slope geometry, Geological structure	Ultimate or over all pit slope shall be below 60° and each bench height shall be 5m height.

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

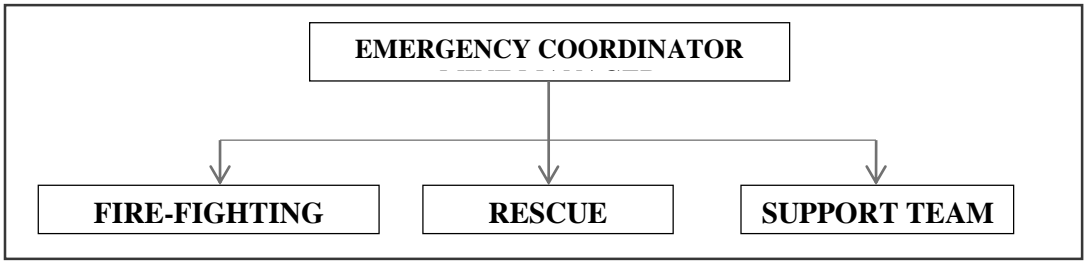
The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities.

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. 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.

Roles and responsibilities of emergency team –

(a) Emergency coordinator (EC)

The emergency coordinator shall assume absolute control of site and shall be located at MECR.

(b) Incident controller (IC)

Incident controller shall be a person who shall go to the scene of emergency and supervise the action plan to overcome or contain the emergency. Shift supervisor or Environmental Officer shall assume the charge of IC.

(c) Communication and advisory team

The advisory and communication team shall consist of heads of Mining Departments i.e., Mines Manager

(d) Roll call coordinator

The Mine Foreman shall be Roll Call Coordinator. The roll call coordinator will conduct the roll call and will evacuate the mine personnel to assembly point. His prime function shall be to account for all personnel on duty.

(e) Search and rescue team

There shall be a group of people trained and equipped to carryout rescue operation of trapped personnel. The people trained in first aid and fire-fighting shall be included in search and rescue team.

(f) Emergency security controller

Emergency Security Controller shall be senior most security person located at main gate office and directing the outside agencies e.g. fire brigade, police, doctor and media men etc.,

Emergency control procedure –

The onset of emergency, will in all probability, commence with a major fire or explosion or collapse of wall along excavation and shall be detected by various safety devices and also by members of operational staff on duty. If located by a staff member on duty, he (as per site emergency procedure of which he is adequately briefed) will go to nearest alarm call point, break glass and trigger off the alarms. He will also try his best to inform about location and nature of accident to the emergency control room. In accordance with work emergency procedure the following key activities will immediately take place to interpret and take control of emergency.

- On site fire crew led by a fireman will arrive at the site of incident with fire foam tenders and necessary equipment.
- Emergency security controller will commence his role from main gate office
- Incident controller shall rush to the site of emergency and with the help of rescue team and will start handling the emergency.
- Site main controller will arrive at MECR with members of his advisory and communication team and will assume absolute control of the site.
- He will receive information continuously from incident controller and give decisions and directions to:
    - Incident controller
    - Mine control rooms
    - Emergency security controller

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

Alarm system to be followed during disaster –

On receiving the message of disaster from Site Controller, fire-fighting team, the mine control room attendant will sound siren wailing for 5 minutes. Incident controller will arrange to broadcast disaster message through public address system. On receiving the message of "Emergency Over" from Incident Controller the emergency control room attendant will give "All Clear Signal", by sounding alarm straight for 2 minutes.

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 QUARRY					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
P1	**Thiru.N.Murugan,** S/o. Nagan, No. 3, Navasi Street, Thiruneermalai, Chennai - 600 044.	Pinayur	415/2A & 415/2B	0.96.50	Lr.No. SEIAA-TN/ F.No. 8782/SEAC/ToR-1069/ 2022 Dated: 01.03.2022**.**
			TOTAL EXTENT	**0.96.50**	
EXISTING QUARRIES					
CODE	**Name of the Owner**	**Village**	**S.F. Nos**	**Extent in Ha**	**Status**
E-1	Thiru S. Vinothkumar S/o,Subbiah Reddiar, No.8A, Duraisamy pillai street, Tambaram west, Chennai-600 045	Pinayur	394/1F,394/2B,394/2C	1.92.0	12.08.2017 to 11.08.2022
E-2	Thiru S.Ravisundar, S/o Sandhiyagu, No.1, 1178-A,1 st street, Bethel nagar, Injampakkam, Chennai- 115	Pinayur	415/A,415/1B	3.23.50	21.12.2017 to 20.12.2022
E-3	Thiru.S.Dharmaraj S/o,Shitrambala Reddiyar, No.2A,North street, Mundalaapuram,Ondipulinaickanur,	Pinayur	394/1A,394/1B,394/1C,394/1D,394/1E,412/1,412/2A,412/2B,414/2	4.93.50	31.07.2020 to 30.07.2025
E-4	Thiru S.Ravisundar, S/o Sandhiyagu, No.1, 1178-A,1 st street, Bethel nagar, Injampakkam, Chennai- 115	Pinayur	417	1.88.0	01.02.2021 to 31.01.2031
E-5	Tvl Udhayam Civil Construction pvt ltd., Managing Director Thiru D. Karthikeyan, No 66, Rajendra prasad road, Krishna Nagar, Kancheepuram.	Pazhaveri	203/1A1A, 204/1A,204/2, 205/1A, 2, 3, 206/1A,2A, 207/1, 2A,2B,2C,2D, 3, 4A,5A, 6A,7A & 8A	3.66.86	12.07.2019 to 11.07.2024
			TOTAL EXTENT	**15.63.86**	
ABANDONED QUARRIES					
Ex-1	Thiru S.udhayasooriyan	Pinayur	**415/1A**	2.42.5	20.09.2010 to 19.09.2015

Ex-2	Thiru.O.Ganesan	Pinayur	**415/1B**	0.81.0	24.09.2010 to 23.09.2015
			TOTAL EXTENT	**3.235**	
			TOTAL CLUSTER EXTENT	**16.60.36**	

- **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 Project	Thiru N. Murugan Rough Stone and Gravel Quarry		
S.F. No.	415/2A & 415/2B		
Extent	0.96.50 ha		
Village Taluk and District	Pinayur Village, Uthiramerur Taluk, Kancheepuram District.		
Land Type	It is a patta land registered in the name of SAH foundations (P) Ltd, vide patta No.351. The applicant has obtained consent from the pattadhars.		
Toposheet No	57-P/14		
Latitude between	**12° 44' 45.44"N to 12° 44' 48.14"N**		
Longitude between	**79° 52' 41.25"E to 79° 52' 47.03"E**		
Lease period	10 Years		
Mining Plan period	10 Years		
Proposed Depth of Mining	20m bgl (2m Gravel + 3m Weathered Gravel + 15m Rough stone)		
Geological Resources	Rough Stone in m^3	Weathered Rock m^3	Gravel m^3
Mineable Reserves	1,42,725	28,545	19,030
	42,895	18,819	12,546
Year wise Production for first five years	13,915	18,819	12,546
Year wise Production for next five years	28,980	-	-
Ultimate Pit Dimension	153m (L) x 55m (W) x 20m(D) bgl		
Water Level in the region	45-50m bgl		
Method of Mining	Opencast Mechanized Mining Method involving small drilling and Controlled blasting using Slurry Explosives		
Topography	The lease applied area is exhibits plain topography. The area has gentle sloping towards eastern side. The altitude of the area is 64m (Max) above Mean Sea level. The area is covered by 2.0m thickness of Gravel, 3m Weathered Rock and followed by Massive Charnockite is found after 5.0m (Gravel + Weathered Rock) which is clearly inferred from the nearby existing quarrying pits.		
Machinery proposed	Jack Hammer	2 Nos	
	Compressor	1 No.	
	Excavator with Bucket and Rock Breaker	1 No.	
	Tippers	1 No.	
Blasting Method	Controlled Blasting Method by shot hole drilling and small dia of 25mm slurry explosive are proposed to be used for shattering and heaving effect for removal and winning of Rough Stone. No deep hole drilling is proposed.		
Proposed Manpower Deployment	13 Nos		
Project Cost	Rs. 22,08,000/-		
EMP Cost	Rs. 7,60,000/-		

Total Project cost	Rs. 29,68,000/-	
CER Cost	Rs. 5,00,000/-	
Nearby Water Bodies	Tank	420m_NW
	Tank	430m_SW
	Vaikkaal	410m_NW
	Kavanipakkam Lake	1.5Km_SE
	Palar River	2Km_N
	Cheyyar River	2.7km_NW
	Palur Lake	3.5Km_NE
	Salavakkam Lake	6.2km_SE
Greenbelt Development Plan	Proposed to plant 500 Nos of trees considering 500 Nos of trees/ Ha criteria The plantation will be developed around the project site and nearby village roads	
Proposed Water Requirement	2.0 KLD	
Nearest Habitation	470m – South East	
Nearest Reserve Forest	Kaveripakkam R.F - 2.0 km- South side Idaimichi R.F - 5.40 km- SW side Appur R.F- 8.0 km- NE side	
Nearest Wild Life Sanctuary	Karkili Birds sanctuary-16km-SW Vedanthangal Birds sanctuary-22km-S	

Source: Approved Mining Plan

TABLE 7.6: SALIENT FEATURES OF PROPOSAL "E1"

Name of the Quarry	Thiru S. Vinothkumar Rough Stone Quarry	
S.F No	394/1F,394/2B,394/2C	
Area	1.92.0ha	
Toposheet No	57-P/14	
Lease period	12.08.2017 to 11.08.2022	
Geological Resources	Rough Stone in m^3	Gravel m^3
	4,94,000m^3	32,350 m^3
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	1,98,450m^3	16,500
Year wise production	1,98,450m^3	16,500
Lease Period	5 years	
Depth of mining	45m Bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	2Nos
	Compressor	1 No
	Hydraulic Excavator	1 No
	Tippers	1 Nos
Proposed Manpower Deployment	15	
Total Project Cost	65,07,000/-	

TABLE 7.7: SALIENT FEATURES OF PROPOSAL "E2"

Name of the Quarry	Thiru S. Ravisundar Rough Stone Quarry
S.F No	415/A,415/1B
Lease Area	3.23.50ha

Toposheet No	57-P/14		
Latitude between	12°44'47.74"N to 12°44'54.60"N		
Longitude between	79°52'41.71"E to 79°52'47.37"E		
Geological Resources	Rough Stone in m^3	Weathered Rock	Topsoil m^3
	12,94,000m^3	97,050 m^3	32,350 m^3
Mineable Reserves	Rough Stone in m^3		Gravel m^3
	2,80,900m^3	-	-
Year wise production	2,80,900m^3		
Lease Period	5 years		
Ultimate Pit Dimension	181(L) * 146(W) * 44 (D)		
Depth of mining	44m Bgl		
Existing Depth	19m Bgl		
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting		
Machinery proposed	Jack Hammer	2Nos	
	Compressor	1 No	
	Hydraulic Excavator	1 No	
	Tippers	1 Nos	
Proposed Manpower Deployment	11		
Total Project Cost	57,07,000/-		
Nearest habitation	820m-NE		

Source: Approved Mining Plan

TABLE 7.8: SALIENT FEATURES OF PROPOSAL "E3"

Name of the Quarry	Thiru.S.Dharmaraj Rough Stone Quarry	
S.F No	394/1A,394/1B,394/1C,394/1D,394/1E,412/1,412/2A,412/2B,414/2	
Lease Area	4.93.50ha	
Toposheet No	57-P/14	
Geological Resources	Rough Stone in m^3	Gravel m^3
	9,94,000m^3	64,850 m^3
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	3,98,950m^3	36,600
Year wise production	3,98,950m^3	36,600
Lease Period	5 years	
Depth of mining	48m Bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	4Nos
	Compressor	2 No
	Hydraulic Excavator	2No
	Tippers	3 Nos
Proposed Manpower Deployment	35	
Total Project Cost	1,45,50,000/-	

Source: Approved Mining Plan

TABLE 7.9: SALIENT FEATURES OF PROPOSAL "E4"

Name of the Quarry	Thiru S.Ravisundar Rough Stone Quarry
S.F No	417
Lease Area	1.88.0ha

Toposheet No	57-P/14	
Geological Resources	Rough Stone in m^3	Topsoil m^3
	4,85,000m^3	44,500 m^3
Mineable Reserves	Rough Stone in m^3	Gravel m^3
	1,80,000 m^3	28,300
Year wise production	1,80,000 m^3	28,300
Lease Period	5 years	
Depth of mining	42m Bgl	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	2Nos
	Compressor	1 No
	Hydraulic Excavator	1 No
	Tippers	2 Nos
Proposed Manpower Deployment	15	
Total Project Cost	65,08,000/-	

Source: Approved Mining Plan

TABLE 7.10: SALIENT FEATURES OF PROPOSAL "E5"

Name of the Quarry	Tvl Udhayam Civil Construction Pvt Ltd Rough Stone and Gravel Quarry	
S.F No	203/1A1A, 204/1A,204/2, 205/1A, 2, 3, 206/1A,2A, 207/1, 2A,2B,2C,2D, 3, 4A,5A, 6A,7A & 8A	
Lease Area	3.66.86ha	
Toposheet No	57-P/14	
Latitude between	12°44'39.77"N to 12°44'46.40"N	
Longitude between	79°52'39.66"E to 79°52'48.88"E	
Geological Resources	Rough Stone in m^3	Gravel
	33,01,740m^3	73,372 m^3
Mineable Reserves	Rough Stone in m^3	Gravel
	11,46,405m^3	73,230 m^3
Year wise production (Five year plan)	11,46,405m^3	73,230 m^3
Lease Period	5 years	
Ultimate Pit Dimension	215(L) * 183(W) * 92m (D) Max from the elevated portion of the area	
Depth of mining	92m from the elevated topography of the area	
Existing details	Fresh lease application	
Method of Mining	Opencast Mechanized Mining Method involving drilling and blasting	
Machinery proposed	Jack Hammer	10Nos
	Compressor	2 Nos
	Hydraulic Excavator	3 Nos
	Dumpers	10 Nos
Proposed Manpower Deployment	41	
Total Project Cost	1,24,81,677	
Nearest habitation	320m-SE	

Source: Approved Mining Plan

The Cumulative Impact is mainly anticipated due to drilling & blasting and excavation and transportation activities in all the quarries (proposed and existing) within the cluster and major impact anticipated is on Air & Noise Environment and Ground Vibrations due to blasting.

Air Environment –

Calculating the Cumulative Load of Mining within the cluster is as shown in table 7.16 & 7.17.

TABLE 7.11: CUMULATIVE PRODUCTION LOAD OF ROUGH STONE

Quarry	Production for five-year plan period in m^3	Per Year Production in m^3	Per Day Production in m^3	Number of Lorry Load Per Day
P1	42,895	4,290	14	1
Total	**42,895**	**4,290**	**14**	**1**
E1	1,98,450	39,690	132	11
E2	2,80,900	56,180	187	16
E3	3,98,950	79,790	266	22
E4	1,80,000	36,000	120	10
E5	11,46,405	2,29,281	765	64
Total	**22,04,705**	**4,40,941**	**1,470**	**123**
Grand Total	**22,47,600**	**4,45,231**	**1,484**	**124**

TABLE 7.12: CUMULATIVE PRODUCTION LOAD OF GRAVEL

Quarry	Production for 2-3 year plan period in m^3	Per Year Production in m^3	Per Day Production in m^3	Number of Lorry Load Per Day
P1	12,546	4,182	14	1
Total	**12,546**	**4,182**	**14**	**1**
PROPOSED PRODUCTION OF GRAVEL				
E1	16,500	5,500	18	2
E2	-	-	-	-
E3	36,600	12,200	40	3
E4	28,300	9,433	32	3
E5	73,230	24,410	82	7
Total	**1,54,630**	**51,543**	**172**	**15**
Grand Total	**1,67,176**	**55,725**	**186**	**16**

TABLE 7.13: CUMULATIVE PRODUCTION LOAD OF WEATHERED ROCK

Quarry	Production during 2-3-year plan period in m^3	Per Year Production in m^3	Per Day Production in m^3	Number of Lorry Load Per Day
P1	18,819	6,273	21	2
Total	**18,819**	**6,273**	**21**	**2**

On a cumulative basis considering the proposed quarries, it can be seen that the overall production of Rough Stone is 1484m^3 per day and overall production of Gravel is 186 m^3 per day with a capacity of 124trips of Rough Stone per day and 16 Trips per day of Gravel and weathered rock 2 Trips per day from the cluster.

Note: Per day production of Rough Stone is calculated for 5 Years Lease Period and for Gravel production with 3 years, Weathered rock 3 years of production period. And the load of existing quarries is covered under existing environment of the cluster.

Based on the above production quantities the emissions due to various activities in all the 6 mines includes various activities like ground preparation, excavation, handling and transport of ore. 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 7.18.

TABLE 7.14: EMISSION ESTIMATION FROM QUARRIES WITHIN 500 METER RADIUS

EMISSION ESTIMATION FOR QUARRY "P1"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.045083368	g/s
	Blasting	Point Source	0.000045050	g/s
	Mineral Loading	Point Source	0.035450244	g/s
	Haul Road	Line Source	0.002483799	g/s/m
	Overall Mine	Area Source	0.037726816	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	9.97261E-05	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000002307	g/s
EMISSION ESTIMATION FOR QUARRY "E1"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.086737010	g/s
	Blasting	Point Source	0.001187508	g/s
	Mineral Loading	Point Source	0.042265152	g/s
	Haul Road	Line Source	0.002491673	g/s/m
	Overall Mine	Area Source	0.051235639	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000649043	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000028452	g/s
EMISSION ESTIMATION FOR QUARRY "E2"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.092037934	g/s
	Blasting	Point Source	0.001597529	g/s
	Mineral Loading	Point Source	0.042705841	g/s
	Haul Road	Line Source	0.002492713	g/s/m
	Overall Mine	Area Source	0.063421574	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000770033	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000054150	g/s
EMISSION ESTIMATION FOR QUARRY "E3"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.110480897	g/s
	Blasting	Point Source	0.003981534	g/s
	Mineral Loading	Point Source	0.045854437	g/s
	Haul Road	Line Source	0.002503654	g/s/m
	Overall Mine	Area Source	0.078145830	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.001562479	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000164969	g/s
EMISSION ESTIMATION FOR QUARRY "E4"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.085067701	g/s
	Blasting	Point Source	0.001077551	g/s
	Mineral Loading	Point Source	0.042454349	g/s

	Haul Road	Line Source	0.002492107	g/s/m
	Overall Mine	Area Source	0.050853105	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.000663844	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000028572	g/s
EMISSION ESTIMATION FOR QUARRY "E5"				
Estimated Emission Rate for PM_{10}	**Activity**	**Source type**	**Value**	**Unit**
	Drilling	Point Source	0.142942309	g/s
	Blasting	Point Source	0.014435055	g/s
	Mineral Loading	Point Source	0.049941869	g/s
	Haul Road	Line Source	0.002532645	g/s/m
	Overall Mine	Area Source	0.076667796	g/s
Estimated Emission Rate for SO_2	Overall Mine	Area Source	0.003330895	g/s
Estimated Emission Rate for NOx	Overall Mine	Area Source	0.000287617	g/s

Source: Emission Calculation

TABLE 7.15: INCREMENTAL & RESULTANT GLC WITHIN CLUSTER

PM_{10} in µg/m^3	
Background	43.9
Incremental	9.69
Resultant	53.6
NAAQ Norms	**100 µg/m^3**
$PM_{2.5}$ in µg/m^3	
Background	27.3
Incremental	2.4
Resultant	29.7
NAAQ Norms	**60 µg/ m^3**
So2 in µg/m^3	
Background	6.9
Incremental	1.2
Resultant	8.1
NAAQ Norms	**80 µg/ m^3**
No2 in µg/m^3	
Background	24.1
Incremental	7.0
Resultant	31.1
NAAQ Norms	**80 µg/ m^3**

Noise Environment –

Noise pollution is mainly due to operation like drilling & blasting and plying of trucks & HEMM. Cumulative Noise modelling has been carried out considering blasting and compressor operation (drilling) and transportation activities. Predictions have been carried out to compute the noise level at various distances around the different quarries within the 500 m radius.

For hemispherical sound wave propagation through homogeneous loss free medium, one can estimate noise levels at various locations at different sources using model based on first principle.

$$\mathbf{Lp_2 = Lp_1 - 20 \log (r_2/r_1) - Ae_{1,2}}$$

Where:

Lp_1& Lp_2 are sound levels at points located at distances r_1& r_2 from the source.

$Ae_{1,2}$ is the excess attenuation due to environmental conditions. Combined effect of all sources can be determined at various locations by logarithmic addition.

$$\mathbf{Lp_{total} = 10 \log \{10^{(Lp1/10)} + 10^{(Lp2/10)} + 10^{(Lp3/10)} + \ldots\ldots\}}$$

Attenuation due to Green Belt has been taken to be 4.9 dB (A). The inputs required for the model are:
Source data has been computed taking into account of all the machinery and activities used in the mining process.

TABLE 7.16: PREDICTED NOISE INCREMENTAL VALUES FROM CLUSTER

Location ID	Background Value (Day) dB(A)	Incremental Value dB(A)	Total Predicted dB(A)	Residential Area Standards dB(A)
Habitation Near P1	47.3	46.4	45.8	55
Habitation Near E1	34.6	46.5	46.7	
Habitation Near E2	36.5	48.1	48.4	
Habitation Near E3	35.4	47.4	47.7	
Habitation Near E4	36.7	50.0	50.2	
Habitation Near E5	3.5	45.3	45.6	

Source: Lab Monitoring Data

The incremental noise level is found within the range of 45.3 – 50.0 dB (A) in Buffer zone. The noise level at different receptors in buffer zone is lower due to the distance involved and other topographical features adding to the noise attenuation. The resultant Noise level due to monitored values and calculated values at the receptors are based on the mathematical formula considering attenuation due to Green Belt as 4.9 dB (A)the barrier effect. From the above table, it can be seen that the ambient noise levels at all the locations near habitations are within permissible limits of Residential Area (buffer zone) as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000(The Principal Rules were published in the Gazette of India, vide S.O.123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E),dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment(Protection) Act, 1986).

Ground Vibrations

Ground vibrations due to mining activities in the all the 6 Mines within cluster are anticipated due to operation of Mining Machines like Excavators, drilling and blasting, transportation vehicles, etc. However, the major source of ground vibration from the all the 6 mines is blasting. The major impact of the ground vibrations is observed on the domestic houses located in the villages nearby the mine lease area. The kuchha houses are more prone to cracks and damage due to the vibrations induced by blasting whereas RCC framed structures can withstand more ground vibrations. Apart from this, the ground vibrations may develop a fear factor in the nearby settlements nearby the mining areas and may cause injury to persons or damage to the structures. Nearest Habitations from 6 mines respectively are as in below Table 7.21.

TABLE 7.17: NEAREST HABITATION FROM EACH MINE

Location ID	Distance & Direction
Habitation Near P1	470m- South East
Habitation Near E1	670m South East
Habitation Near E2	520m South East
Habitation Near E3	760m South East
Habitation Near E4	650m South
Habitation Near E5	320m South East

The ground vibrations due to the blasting in all the mines are calculated using the empirical equation for assessment of peak particle velocity (PPV) is:

$$V = K [R/Q^{0.5}]^{-B}$$

Where –

V = peak particle velocity (mm/s)

K = site and rock factor constant

Q = maximum instantaneous charge (kg)

B = constant related to the rock and site (usually 1.6)

R = distance from charge (m)

TABLE 7.18: GROUND VIBRATIONS AT 6MINES

Location ID	Maximum Charge in kgs	Nearest Habitation in m	PPV in m/ms
P1	4	470m- South East	0.080
E1	57	670m South East	0.382
E2	81	520m South East	0.759
E3	115	760m South East	0.547
E4	52	650m South	0.372
E5	82	320m South East	1.666

Source: Blasting Calculations

From the above table, the charge per blast is considered as maximum in each mine and the resultant PPV is well below the Peak Particle Velocity of 8 mm/s as per Directorate General of Mines Safety for safe level criteria through Circular No. 7 dated 29/8/1997.

Socio Economic Environment –

The 6 mines shall contribute towards CER and the community shall develop.

TABLE 7.19: SOCIO ECONOMIC BENEFITS FROM 6 MINES

Location ID	Project Cost	CER
P1	Rs. 29,68,000	Rs.5,00,000
Total	**Rs. 29,68,000**	**Rs.5,00,000**

As per para 6 (II) of the office memorandum, all the mines being a green field project & Capital Investment is ≤ 100 crores, they shall contribute 2% of Capital Investment towards CER as per directions of EAC/SEAC.

- Proposed Projects shall fund towards CER – **Rs 5,00,000/-**

TABLE 7.20: EMPLOYMENT BENEFITS FROM 6MINES

Description	Employment
P1	13
Total	**13**
E1	15
E2	11
E3	35
E4	15
E5	41
Total	**117**
Grand Total	**130**

A total of 13 people will get employment due to 1 proposed mines in cluster and 117 people are already employed at existing mines.

TABLE 7.21: GREENBELT DEVELOPMENT BENEFITS FROM 6 MINES

CODE	No of Trees proposed to be planted	Survival %	Area Covered Sq.m	Name of the Species
P1	500	80%	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development	Neem, Pinnata, Pongamia, Ashoka etc.,
Total	**500**			
E1	1000			
E2	1600			
E3	2500			
E4	900			
E5	1800			
Total	**7800**			
G.Total	**8300**			

Based on the Proposed Mining Plans it's anticipated that there shall growth of native species of Neem, Pinnata et., in the Cluster at a rate of 8300 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.

TABLE 7.22: ACTION PLAN TO MANAGE PLASTIC WASTE

Sl.No.	Activity	Responsibility
1	Framing of Layout Design by incorporating provision of the Rules, user fee to be charged from waste generators for plastic waste management, penalties/fines for littering, burning plastic waste or committing any other acts of public nuisance	Mines Manager
2	Enforcing waste generators to practice segregation of bio-degradable, recyclable and domestic hazardous waste	Mines Manager
3	Collection of plastic waste	Mines Foreman
4	Setting up of Material Recovery Facilities	Mines Manager
5	Segregation of Recyclable and Non-Recyclable plastic waste at Material Recovery Facilities	Mines Foreman
6	Channelization of Recyclable Plastic Waste to registered recyclers	Mines Foreman
7	Channelization of Non-Recyclable Plastic Waste for use either in Cement kilns, in Road Construction	Mines Foreman
8	Creating awareness among all the stakeholders about their responsibility	Mines Manager
9	Surprise checking's of littering, open burning of plastic waste or committing any other acts of public nuisance	Mine Owner

Source: Proposed by FAE's and EC

8.PROJECT BENEFITS

8.0 GENERAL

The Proposed Project for Quarrying Rough Stone and gravel at Pinayur Village aims to produce 42,895m^3 Rough Stone over a period of 10 Years & Weathered Rock 18,819 m^3 for period of 3 years and Gravel 12,546m^3 for period of 3 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 13 persons for carrying out mining operations and give preference to the local people in providing employment in the three proposed quarries in the cluster. 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 proposed quarries are located in Pinayur Village, Uthiramerur Taluk and Kancheepuram 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 proposed mine.

- 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

The 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.

CSR Cost Estimation

- CSR activities will be taken up in the Pinayur 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

For the existing quarries 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.

Proponent intends to spent Rs 5,00,000/- towards CER for the Government School near the project site the details are given below:

TABLE 8.1 CER – ACTION PLAN

Activity	CER
• Renovation/ Construction of Existing Toilet • Providing Environmental Related books to the school Library • Carrying out plantation and maintenance in the school Ground • Any other requirements in consultation with the school Head master	Rs 5,00,000/-

9. ENVIRONMENTAL COST BENEFIT ANALYSIS

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

10. ENVIRONMENTAL MANAGEMENT PLAN

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 Thiru N.Murugan 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 Quarry.

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 quarrying operation, restoration of the land by converting the quarry pit into temporary reservoir and the remaining part of the area (un utilized areas, infrastructure, haul Roads) will be utilized for greenbelt development. There is no major vegetation in the project area during the course of quarrying operation and after completion of the quarrying 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
Refueling to be undertaken in a safe location, away from vehicle movement pathways&100 m away of any watercourse Refueling activity to be under visual observation at all times. Drainage of refueling 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 overburden in the form of Gravel which will directly loaded into tippers for the filling and levelling of low lying areas.

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 quarrying project, no process is involved for the effluent generation, only oil & grease from the machinery wash is anticipated and domestic sewage from mines office. The quarrying operation is proposed upto a depth of 20 m BGL, the water table in the area is 50 m – 45 m below ground level, hence the proposed projects will not intersect the Ground water table during entire quarry period.

TABLE 10.3. PROPOSED CONTROLS FOR WATER ENVIRONMENT

CONTROL	RESPONSIBILITY
To maximize the reuse of pit water for water supply	Mines Foreman
Temporary and permanent garland drain will be constructed to contain the catchments of the mining area and to divert runoff from undisturbed areas through the mining areas	Mines Manager
Natural drains/nallahs/brooklets outside the project area should not be disturbed at any point of mining operations	Mines Manager
Ensure there is no process effluent generation or discharge from the project area into water bodies	Mines Foreman
Domestic sewage generated from the project area will be disposed in septic tank and soak pit system	Mines Foreman
Monthly or after rainfall, inspection for performance of water management structures and systems	Mines Manager
Conduct ground water and surface water monitoring for parameters specified by CPCB	Manager Mines

Source: Proposed by FAE's & EIA Coordinator

10.5. AIR QUALITY MANAGEMENT

The proposed quarrying 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
Wet drilling procedure /drills with dust extractor system to control dust generation during drilling at source itself is implemented	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, drilling and blasting and cutting activities. 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
Preventive maintenance of mining machinery and replacement of worn-out accessories to control noise generation	Mines Foreman
Deployment of mining equipment with an inbuilt mechanism to reduce noise	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
Provision of sound proof AC operator cabins to HEMM	Mines Manager
Sharp drill bits are used to minimize noise from drilling	Mines Foreman
Controlled blasting technologies are adopted by using delay detonators to minimize noise from blasting	Mines Manager
Annual ambient noise level monitoring are 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 noise control measures. Additional noise control measures will be adopted if required as per the observations during monitoring	Mines Manager
Reduce maximum instantaneous charge using delays while blasting	Mining Mate
Change the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination	Mines Manager
Undertake noise or vibration monitoring	Mines Manager

Source: Proposed by FAE's & EIA Coordinator

10.7. GROUND VIBRATION AND FLY ROCK CONTROL

The Rough stone quarry operation creates vibration due to the blasting and movement of Heavy Earth moving machineries, fly rocks due to the blasting.

TABLE 10.6.: PROPOSED CONTROLS FOR GROUND VIBRATIONS & FLY ROCK – P1

CONTROL	RESPONSIBILITY
Controlled blasting using delay detonators will be carried out to maintain the PPV value (below 8Hz) well within the prescribed standards of DGMS	Mines Manager
Drilling and blasting will be carried under the supervision of qualified persons	Mines Manager
Proper stemming of holes should be carried out with statutory competent qualified blaster under the supervision of statutory mines manager to avoid any anomalies during blasting	Mines Manager
Suitable spacing and burden will be maintained to avoid misfire / fly rocks	Manager Mines
Number of blast holes will be restricted to control ground vibrations	Manager Mines
Blasting will be carried out only during noon time	Mining Mate
Undertake noise or vibration monitoring	Mines Manager
ensure blast holes are adequately stemmed for the depth of the hole and stemmed with suitable angular material	Mines Foreman

Source: Proposed by FAE's & EIA Coordinator

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 500nos. 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 tress proposed to be planted	Area to be covered in m^2	Name of the species
I	500	The safety zone along the boundary barrier has been identified to be utilized for Greenbelt development.	Neem, Pongamia Pinnata etc.,

Source: Approved Mining plan

The objectives of the greenbelt development plan are –

- Provide a green belt around the periphery of the quarry 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 FOR THE PLANTSAITON

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 quarrying 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 –

The health status of workers in the mine will 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 10.9. MEDICAL EXAMINATION SCHEDULE

Sl.No	Activities	1st Year	2nd Year	3rd Year	4th Year	5th 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)					

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.
- Lightweight and loose-fitting clothes having light colours will be preferred to wear.
- Noise exposure measurements will be taken to determine the need for noise control strategies.
- 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.
- In respect of contract work, safety code for contractors and workers will be implemented. They will be allowed to work under strict supervision of statutory person/officials only after they will impart training at vocational training centres. All personal protective equipment's will be provided to them.
- 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 quarry owners.

FIGURE 10.1.: PERSONAL PROTECTIVE EQUIPMENT TO THE MINE WORKERS

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 as per Metalliferous Mines Regulation, 1961.

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 10.10: EMP BUDGET FOR PROPOSED PROJECT

Activities	Mitigation Measure	Provision for Implementation	Capital	Recurring
Air Environment	Compaction, gradation and drainage on both sides for Haulage Road	Rental Dozer & drainage construction on haul road @ Rs. 10,000/- per hectare; and yearly maintenance @ Rs. 10,000/- per hectare	9650	9650
	Fixed Water Sprinkling Arrangements + Water sprinkling by own water tankers	Fixed Sprinkler Installation and New Water Tanker Cost for Capital; and Water Sprinkling (thrice a day) Cost for recurring	800000	50000
	Muffle blasting – To control fly rocks during blasting	Blasting face will be covered with sand bags / steel mesh / old tyres / used conveyor belts	0	5000
	Wet drilling procedure / latest eco-friendly drill machine with separate dust extractor unit	Dust extractor @ Rs. 25,000/- per unit deployed as capital & @ Rs. 2500 per unit recurring cost for maintenance - 2 Units	50000	5000
	No overloading of trucks/tippers/tractors	Manual Monitoring through Security guard	0	5000
	Stone carrying trucks will be covered by tarpaulin	Monitoring if trucks will be covered by tarpaulin	0	10000
	Enforcing speed limits of 20 km/hr within ML area	Installation of Speed Governers @ Rs. 5000/- per Tipper/Dumper deployed - 1 Units	5000	250
	Regular monitoring of exhaust fumes as per RTO norms	Monitoring of Exhaust Fumes by Manual Labour	0	5000
	Regular sweeping and maintenance of approach roads for at least about 200 m from ML Area	Provision for 2 labours @ Rs.10,000/labour (Contractual) per Hectare	0	19300
	Installing wheel wash system near gate of quarry	Installation + Maintenance + Supervision	50000	20000
Noise Environment	Source of noise will be during operation of transportation vehicles, HEMM for this proper maintenance will be done at regular intervals.	Provision made in Operating Cost	0	0
	Oiling & greasing of Transport vehicles and HEMM at regular interval will be done	Provision made in Operating Cost	0	0
	Adequate silencers will be provided in all the diesel engines of vehicles.	Provision made in Operating Cost	0	0
	It will be ensured that all transportation vehicles carry a fitness certificate.	Provision made in Operating Cost	0	0

	Safety tools and implements that are required will be kept adequately near blasting site at the time of charging.	Provision made in OHS part	0	0
	Line Drilling all along the boundary to reduce the PPV from blasting activity and implementing controlled blasting.	Provision made in Operating Cost	0	0
	Proper warning system before blasting will be adopted and clearance of the area before blasting will be ensured.	Blowing Whistle by Mining Mate / Blaster / Compentent Person	0	0
	Provision for Portable blaster shed	Installation of Portable blasting shelter	50000	2000
	NONEL Blasting will be practiced to control Ground vibration and fly rocks	Rs. 30/- per 6 Tonnes of Blasted Material	0	111527
Waste Management	Waste management (Spent Oil, Grease etc.,)	Provision for domestic waste collection and disposal through authorized agency	5000	20000
		Installation of dust bins	5000	2000
	Bio toilets will be made available outside mine lease on the land of owner itself	Provision made in Operating Cost	0	0
Mine Closure	1. Progressive Closure Activity - Surface Runoff managent	Provision for garland drain @ Rs. 10,000/- per Hectare with maintenance of Rs. 5,000/- per annum	9650	5000
	2. Progressive Closure Activity Barbed Wire Fencing to quarry area will be provisioned.	Per Hectare fencing Cost @ Rs. 2,00,000/- with Maintenance of Rs 10,000/- per annum	193000	10000
	3. Progressive Closure Activity Green belt development - 500 trees per one hectare - Proposal for 500 Trees - (400 Inside Lease Area & 100 Outside Lease Area)	Site clearance, preparation of land, digging of pits / trenches, soil amendments, transplantation of saplings @ 200 per plant (capital) for plantation inside the lease area and @ 30 per plant maintenance (recurring)	80000	12000
		Avenue Plantation @ 300 per plant (capital) for plantation outside the lease area and @ 30 per plant maintenance (recurring)	30000	3000

	4. Implementation of Final Mine Closure Actity as per Approved Mining Plan on Last Year	Few activities already covered as progressive closure activities as greenbelt development, wire fencing, garland drain. *For Final Closure Activities 15% of the proposed closure cost will be spent during the final mine closure stage - Last Year	43200	0
	5. Contribution towards Green Fund. As per TNMMCR 1959, Rule 35 A	The Contribution towards Green Funds @ 10% of Seigniorage fee are indicated as part of EMP Budge and not necessarily implemented in the Project Site	386055	0
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 Quarry Entrance as permanent structure mentioning Environmental Conditions	10000	1000
	Air, Water, Noise and Soil Quality Sampling every 6 Months for Compliance Report of EC Conditions	Submission of 2 Half Yearly Compliance - Lab Monitoring Report as per CPCB norms	0	50000
	Workers will be provided with Personal Protective Equipment's	Provision of PPE @ Rs. 4000/- per employee with recurring based on wear and tear (say, @ Rs. 1000/- per employee) - 13 Employees	52000	13000
	Health check up for workers will be provisioned	IME & PME Health check up @ Rs. 1000/- per employee	0	13000
	First aid facility will be provided	Provision of 2 Kits per Hectare @ Rs. 2000/-	0	1930
	Mine will have safety precaution signages, boards.	Provision for signages and boards made	10000	2000
	No parking will be provided on the transport routes. Separate provision on the south side of the hill will be made for vehicles /HEMMs. Flaggers will be deployed for traffic management	Parking area with shelter and flags @ Rs. 50,000/- per hectare project and Rs. 10,000/- as maintenance cost	48250	10000

	Installation of CCTV cameras in the mines and mine entrance	Camera 4 Nos, DVR, Monitor with internet facility	30000	5000
	Implementation as per Mining Plan and ensure safe quarry working	Mines Manager (1st Class / 2nd Class / Mine Foreman) under regulation 34 / 34 (6) of MMR, 1961 and Mining Mate under regulation 116 of MMR,1961 @ 40,000/- for Manager & @ 25,000/- for Foreman / Mate	0	780000
CER	As per MoEF &CC OM 22-65/2017-IA.III Dated 25.02.2021	Detailed Description in following slides and Budget allocation is included as per MoeEF & CC OM	500000	0
TOTAL			**1937550**	**1170657**

*Marked cost is already discussed in the mining plan hence that is not included in the total Environmental Management plan cost Total Cost for the five years. The EMP has been prepared for the entire **lease period of 10 years** for the peak production capacity of **6300m^3 of Rough stone**.

Year	Total Cost
1st	₹ 31,08,207
2nd	₹ 12,29,190
3rd	₹ 12,90,649
4th	₹ 13,55,182
5th	₹ 14,66,141
6th	₹ 25,08,223
7th	₹ 16,64,859
8th	₹ 17,48,102
9th	₹ 18,35,507
10th	₹ 19,70,483
Total	**₹ 182 Lakhs**

Cost inflation 5% per annum

Note: This Environmental Management plan cost will vary according to the public consultation comments

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.

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11. SUMMARY AND CONCLUSION

This EIA & EMP report prepared for the proposed Rough stone and Gravel quarry project located in S.F.No 415/2A & 415/2B, Pinayur Village, Uthiramerur Taluk and Kancheepuram District belongs to ThiruN.Murugan. the Project falls in the Cluster category consist of 1 Proposed, 5 Existing Quarries falls under "B" category as per MoEF & CC Notification S.O. 3977 (E).

Now, as per Order Dated: 04.09.2018 & 13.09.2018 passed by Hon'ble National Green Tribunal, New Delhi in O.A. No. 173 of 2018 & O.A. No, 186 of 2016 and MoEF & CC Office Memorandum F. No. L-11011/175/2018-IA-II (M) Dated: 12.12.2018 clarified the requirement for EIA, EMP and therefore, Public Consultation for all areas from 5 to 25 ha falling in Category B-1 and appraised by SEAC/ SEIAA as well as for cluster situation.

The proposed project are categorized under category "B1" Activity 1(a) (mining lease area in cluster situation) and will be considered at SEIAA – TN after conducting Public Hearing and Submission of EIA/EMP Report for Grant of Environmental Clearance. **"**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".

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 Dec 2023 – Feb 2024 for various environmental components so as to assess the anticipated impacts of the cluster quarry 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 quarrying 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 Rough Stone as per market demand. Sustainable and modern mining leads us to see positive impact of mining operation and providing consistent employment for nearly 13 people directly in the proposed projects and indirectly around 50 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 Thiru N.Murugan Rough Stone and Gravel Cluster Quarry (Extent – 0.96.50 ha).

12. DISCLOSURE OF CONSULTANT

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, Advaitha Ashram Road,
Alagapuram, Salem – 636 004
Tamil Nadu, India
Email:infogeoexploration@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

This EIA/EMP for Thiru N.Murugan Rough Stone & Gravel Quarry over an Extent of 0.96.50ha in Pinayur Village of Uthiramerur Taluk, Kancheepuram District of Tamil Nadu is prepared as per the Generic Structure of EIA Guidelines manual. 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**

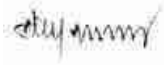
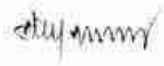
Date & Signature: 

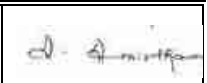
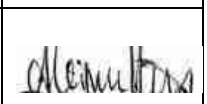
Period of Involvement: **January 2019 to till date**

Associated Team Member with EIA Coordinator:

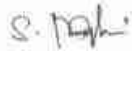
1. **Mr. S. Nagamani**
2. **Mr.P. Viswanathan**
3. **Mr. M. Santhoshkumar**
4. **Mr. S. Ilavarasan**

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. ▪ Impact of the project on flora and fauna. ▪ Suggesting species for greenbelt development.	Mrs. Amirtham	
			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 Cluster EIA/EMP for Thiru N.Murugan Rough Stone & Gravel Quarry over an Extent of 0.96.50 ha in Pinayur Village of Uthiramerur Taluk, Kanchepuram 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/RA 0276 Dated: 20-2-2023**
Validity:	**Valid till 06.08.2025**